Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

Interpoll Laboratories, Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014-1819

TEL: (612) 786-6020
FAX: (612) 786-7854

RESULTS OF THE FEBRUARY 20 - 22, 1996 EPA AND STATE AIR EMISSION COMPLIANCE TESTING AT THE LOUISIANA PACIFIC OSB PLANT IN HAYWARD, WISCONSIN

Submitted to:

LOUISIANA-PACIFIC CORPORATION
Route 8, Box 8263
Hayward, Wisconsin 54843

Attention:

Keith Seelig

Reviewed by:



Daniel J. Despen
Manager
Stationary Source Testing Department

Report Number 6-7318
March 14, 1996
SL/sll

Interpoll Laboratories, Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014-1819

TEL: (612) 786-6020
FAX: (612) 786-7854

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interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

March 19, 1996

Keith Seelig
Louisiana-Pacific Corporation
Route 8, Box 8263
Hayward, Wisconsin 54843

Dear Keith:

Enclosed are three (3) copies of Interpoll Report No. 6-7318 entitled "Results of the February 20 - 22, 1996 EPA and State Air Emission Compliance Testing at the Louisiana Pacific OSB Plant in Hayward, Wisconsin".

If you have any questions please do not hesitate to contact me either by fax or telephone.

Sincerely,
INTERPOLL LABORATORIES, INC.

Kathy Eickstadt
Department Coordinator
Stationary Source Testing Department

KE:kce

Test No. 20
Dryer E - Tube Outlet

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run.....	02-20-96	02-20-96	02-20-96	02-20-96
Time of run.....(HRS)	951	1005	1025	1040
Flask number.....	37	38	39	40
Volume of flask.....(ML)	2054	2056	2062	2093
Data: time of sampling				
flask temperature..(DEG-F)	41.00	41.00	39.00	39.00
bar. press.....(IN.HG)	28.48	28.48	28.48	28.48
flask vacuum.....(IN.HG)	27.01	27.37	27.29	27.26
flask abs. press...(IN.HG)	1.47	1.11	1.19	1.22
Data: Time of Flask Opening				
flask temperature..(DEG-F)	62.00	62.00	62.00	62.00
lab. bar. press....(IN.HG)	28.78	28.78	28.78	28.78
flask static press.(IN.HG)	-0.60	0.30	1.10	-2.50
flask abs. press...(IN.HG)	28.18	29.08	29.88	26.28
Volume gas sampled....(DSML)	1827	1916	1971	1747
Nitrate in gas sample...(JG)	77.5	64.0	50.5	46.5
NO2 in gas sample.....(JG)	57.5	47.5	37.5	34.5
NOx Concentration				
(GR/DSCF).....	0.0138	0.0108	0.0083	0.0086
(MG/DSCM).....	31	25	19	20
(PPM-DRY).....	16	13	10	10
NOX Emission rate....(LB/HR)	7.26	5.71	4.38	4.55

Test No. 20
Dryer E - Tube Outlet

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 2A	Run 2B	Run 2C	Run 2D
Date of run.....	02-20-96	02-20-96	02-20-96	02-20-96
Time of run.....(HRS)	1142	1155	1212	1231
Flask number.....	41	42	7	8
Volume of flask.....(ML)	2076	2094	2081	2088
Data: time of sampling				
flask temperature..(DEG-F)	38.00	39.00	39.00	40.00
bar. press.....(IN.HG)	28.48	28.48	28.48	28.48
flask vacuum.....(IN.HG)	27.09	27.05	27.27	27.27
flask abs. press...(IN.HG)	1.39	1.43	1.21	1.21
Data: Time of Flask Opening				
flask temperature..(DEG-F)	62.00	62.00	62.00	63.00
lab. bar. press....(IN.HG)	28.78	28.78	28.78	28.78
flask static press.(IN.HG)	-0.10	1.10	-0.30	1.80
flask abs. press...(IN.HG)	28.68	29.88	28.48	30.58
Volume gas sampled....(DSML)	1887	1985	1891	2040
Nitrate in gas sample...(JG)	50.5	55.0	51.5	42.5
NO2 in gas sample.....(JG)	37.5	40.8	38.2	31.5
NOx Concentration				
(GR/DSCF).....	0.0087	0.0090	0.0088	0.0068
(MG/DSCM).....	20	21	20	15
(PPM-DRY).....	10	11	11	8
NOX Emission rate....(LB/HR)	4.58	4.74	4.66	3.56

Test No. 20
Dryer E - Tube Outlet

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run.....	02-20-96	02-20-96	02-20-96	02-20-96
Time of run.....(HRS)	1322	1340	1355	1410
Flask number.....	9	10	11	12
Volume of flask.....(ML)	2080	2063	2062	2111
Data: time of sampling				
flask temperature..(DEG-F)	46.00	46.00	44.00	44.00
bar. press.....(IN.HG)	28.48	28.48	28.48	28.48
flask vacuum.....(IN.HG)	27.02	27.38	27.38	27.38
flask abs. press...(IN.HG)	1.46	1.10	1.10	1.10
Data: Time of Flask Opening				
flask temperature..(DEG-F)	63.00	63.00	63.00	63.00
lab. bar. press....(IN.HG)	28.78	28.78	28.78	28.78
flask static press.(IN.HG)	1.60	2.00	1.60	-0.80
flask abs. press...(IN.HG)	30.38	30.78	30.38	27.98
Volume gas sampled....(DSML)	2001	2038	2009	1888
Nitrate in gas sample...(JG)	69.5	57.0	55.0	59.0
NO2 in gas sample.....(JG)	51.6	42.3	40.8	43.8
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0113	0.0091	0.0089	0.0101
(MG/DSCM).....	26	21	20	23
(PPM-DRY).....	13	11	11	12
NOX Emission rate....(LB/HR)	5.94	4.79	4.68	5.35

LOUISIANA-PACIFIC CORPORATION
ROUTE 8, BOX 8263 - GEHRTS ROAD
HAYWARD, WI 54843

ROUTE TO:

_____ HAYDEN LAKE, ID
- _____ JIM ELLISOR
- _____ JIM EVENSEN
- _____ LIZ JACOBS
- _____
- _____

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✓ ~~DEL SALQUIST~~ BRENT K.
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_____ MIKE ANDERSON
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_____ GREG CORMIER
_____ JOE KOPNICK

_____ HAYWARD, WI
- _____ TONY CAVADEAS
- _____ BOB SCHULTZ
- _____ MARK BECKER
- _____ ROB MITTLESDORF

_____ KEITH SEELIG
_____ SUE SOMERS
_____ MIKE HARE

COMMENTS: _____

DATE: 3/22/96

FROM: Keith Seelig

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ABBREVIATIONS

ACFM	actual cubic feet per minute
cc (ml)	cubic centimeter (milliliter)
DSCFM	dry standard cubic foot of dry gas per minute
DSML	dry standard milliliter
DEG-F (°F)	degrees Fahrenheit
DIA.	diameter
FP	finished product for plant
FT/SEC	feet per second
g	gram
GPM	gallons per minute
GR/ACF	grains per actual cubic foot
GR/DSCF	grains per dry standard cubic foot
g/dscm	grams per dry standard cubic meter
HP	horsepower
HRS	hours
IN.	inches
IN.HG.	inches of mercury
IN.WC.	inches of water
LB	pound
LB/DSCF	pounds per dry standard cubic foot
LB/HR	pounds per hour
LB/10^6BTU	pounds per million British Thermal Units heat input
LB/MMBTU	pounds per million British Thermal Units heat input
LTPD	long tons per day
MW	megawatt
mg/Nm^3	milligrams per dry standard cubic meter
ug/Nm^3	micrograms per dry standard cubic meter
microns (um)	micrometer
MIN.	minutes
ng	nanograms
ohm-cm	ohm-centimeter
PM	particulate matter
PPH	pounds per hour
PPM	parts per million
ppmC	parts per million carbon
ppm,d	parts per million, dry
ppm,w	parts per million, wet
ppt	parts per trillion
PSI	pounds per square inch
SQ.FT.	square feet
TPD	tons per day
ug	micrograms
v/v	percent by volume
w/w	percent by weight
<	≤ (when following a number)

Standard conditions are defined as 68°F (20°C) and 29.92 IN. of mercury pressure.

g:\stack\wp\misc\abbrev.frm

1 INTRODUCTION

During February 20 - 22, 1996, Interpoll Laboratories conducted EPA and State air emission compliance tests at the Louisiana Pacific OSB Plant in Hayward, Wisconsin on the following sources:

Source	Parameters
Dryer RTO Stack	PM,NO_x,VE,CO,CH_2O,Benzene,THC's,Phenol,PAH's
Line 1 Core Dryer Duct	NO_x,CO,THC's
Line 1 Surface Dryer Duct	NO_x,CO,THC's
Press Vent RTO Stack	PM,NO_x,VE,CO,THC's,MDI,CH_2O
Line 1 Press RTO Inlet	NO_x,CO,THC's
Line 1 Thermal Oil Heater	PM,NO_x,VE,CO,CH_2O,Benzene,Phenol,PAH's
Dryer E-Tube Outlet	NO_x

On-site testing was performed by Ed Trowbridge, Mark Kaehler, Duane Van Hoever, Ed Juers, Steve Kelker, Jim Lorenz, Jamie Bainville, Lee Hanson, Dan Despen, and Sheryl Bergeron. Coordination between testing activities and plant operation was provided by Keith Selig of Louisiana-Pacific. The tests were witnessed by Jim Ross of the Wisconsin Department of Natural Resources.

Particulate determinations were performed in accordance with EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1995). Preliminary volumetric flow rate determinations were used to select the appropriate nozzle diameter for isokinetic sample withdrawal. Interpoll Labs Model 3 M5 sampling trains which meet or exceed specifications in the above-cited reference were used to extract particulate samples by means of heated stainless steel probe. Wet catch samples were collected in the back half of the Method 5 sampling train at the stack test site and analyzed as per Wisconsin DNR protocol.

Oxides of nitrogen, carbon monoxide, oxygen, and carbon dioxide concentrations were determined in accordance with Methods 7E, 10, and 3A (Ibid). A slip stream of sample gas was withdrawn from the exhaust gas stream using a heated stainless steel probe equipped with a filter to remove interfering particulate material. The particulate-free gas was transported to the analyzers by means of a heat-traced probe and filter assembly. After passing

through the filter, the gas passed through a chilled condenser-type moisture removal system. The particulate-free dry gas was then transported to the analyzers with the excess exhausted to the atmosphere through a calibrated orifice which was used to ensure that the flow from the stack exceeds the requirements of the analyzers. A three-way valve on the probe was used to introduce standard gas for the "system bias check".

The analog response of each analyzer was recorded with a computer datalogger and backed up with a strip chart recorder. The NO_x, CO, O_2 and CO_2 analyzers were calibrated with National Specialty Gases and Air Products and Chemicals standard gases. The instrument was calibrated before and after each run as per EPA Method 7E, 10, and 3A. The sample probe was moved through a three-point traverse (1/6, 3/6, 5/6 of the stack diameter) to measure oxides of nitrogen and carbon monoxide concentrations.

Formaldehyde samples were collected using EPA Method 0011 (SW 846 3rd Ed.). The samples were collected isokinetically using a Method 5 sampling train with an aqueous acidic 2,4-dinitrophenylhydrazine absorbing solution and analyzed by high performance liquid chromatography.

Benzene samples were collected in the accordance with EPA Method 18 (Section 7.4 - Absorption Tube Procedure) using 800/200 mg charcoal tubes. The samples were returned to the laboratory and analyzed by Modified NIOSH 1501.

Total gaseous hydrocarbon concentrations were determined instrumentally using a Ratfisch Model RS 55 heated flame ionization detector (HFID) calibrated against propane in air standards. The THC concentration was continuously monitored by extracting a slipstream of exhaust gas by means of a heated probe and filter holder. A heat-traced teflon line was used to transport the sample gas from the filter holder outlet to the analyzer inlet.

MDI concentrations were determined in accordance with the 1,2-PP Method as developed by Radian Corporation under contract to USEPA. This method employs collection of MDI with 1,2-PP in toluene reagent, with analysis by HPLC.

Phenol concentrations were determined using a Method 5 sampling train with a neutral buffered absorbing reagent followed by extraction with methylene chloride and direct

analysis by GC/MS with no concentration (EPA Method 8270). The samples were field spiked with 5.33 mg of phenol d5.

Polyaromatic hydrocarbons sampling was conducted using the EPA Modified Method 5 sampling procedure as per EPA Method 010 SW 846. The four-part sample and field blank were extracted, concentrated to 1000 ul and cleaned up as required (column chromatography as per Interpoll Labs Method II-8904-2 or GPC) prior to final concentration and analysis. The samples were then further concentrated to 100 ul and analyzed in accordance with EPA Method 8270 by HRGC/LRMS using electron impact (EI) with total ion monitoring (TIM). Quantification was performed using the six standard M-8270 internal standards. Each XAD-2 resin cartridge was field spiked with 20 ug of d_{10}-fluoroanthene in order to document overall collection and analytical efficiency and recovery. Analytical accuracy and recovery for extraction and cleanup was documented using the six m-8270-recommended surrogate standards.

Integrated flue gas samples were extracted simultaneously with each of the above-referenced sample trains from the sampling train exhaust ports as part of the overall project quality assurance using a specially designed gas sampling system. Integrated flue gas samples were collected in 44-liter Tedlar bags. Prior to sampling, the Tedlar bags are leak checked at 15 IN.HG. vacuum with an in-line rotameter. Bags with any detectable inleakage are discarded. After sampling was complete, the bags were sealed and returned to the laboratory for Orsat analysis.

A summary and discussion of all of the important results of this compliance test is given in the following section. More detailed results of the various samplings are presented in Section 3, together with pertinent sampling parameters. Supplemental information such as field data sheets, laboratory results, procedures and calculation equations are presented in the appendices.

2 SUMMARY AND DISCUSSION

The results of the air emission compliance tests are presented in Tables 1 - 12. An overview of the results is presented in the table below:

PARAMETER		MEASURED
DRYER RTO STACK		
Particulate		
DRY + WET CATCH		
	(GR/DSCF)	0.0039
	(LB/HR)	2.4
DRY CATCH ONLY		
	(GR/DSCF)	0.0030
	(LB/HR)	1.9
Oxides of Nitrogen		
	(ppm,d)	20
	(LB/HR)	10.1
Opacity	(%)	0
Carbon Monoxide		
	(ppm,d)	202
	(LB/HR)	63
Formaldehyde		
	(ppm,d)	6.6
	(LB/HR)	2.3
Benzene		
	(ppm,d)	0.081
	(LB/HR)	0.071
TGNMO's		
	(ppmC,w)	11.7
	(LB/HR)	2.0
Phenol		
	(ppb,d)	< 173
	(10^{-3}LB/HR)	< 174
LINE 1 CORE DRYER DUCT		
Oxides of Nitrogen		
	(ppm,d)	36
	(LB/HR)	5.9
Carbon Monoxide		
	(ppm,d)	786
	(LB/HR)	78
TGNMO's		
	(ppmC,w)	362
	(LB/HR)	20.7

PARAMETER		MEASURED
LINE 1 SURFACE DRYER DUCT		
Oxides of Nitrogen		
	(ppm,d)	54
	(LB/HR)	8.4
Carbon Monoxide		
	(ppm,d)	1250
	(LB/HR)	~~354~~ 117.87
TGNMO's		
	(ppmC,w)	614
	(LB/HR)	35.8
PRESS VENT RTO STACK		
Particulate		
DRY + WET CATCH		
	(GR/DSCF)	0.0045
	(LB/HR)	2.9
DRY CATCH ONLY		
	(GR/DSCF)	0.0026
	(LB/HR)	1.7
Oxides of Nitrogen		
	(ppm,d)	24
	(LB/HR)	12.9
Opacity	(%)	0
Carbon Monoxide		
	(ppm,d)	24
	(LB/HR)	7.7
Formaldehyde		
	(ppm,d)	0.37
	(LB/HR)	0.13
TGNMO's		
	(ppmC,w)	< 1
	(LB/HR)	< 0.14
MDI		
	(ppm,d)	< 0.00065
	(LB/HR)	< 0.0019
LINE 1 PRESS RTO INLET		
Oxides of Nitrogen		
	(ppm,d)	7
	(LB/HR)	3.5
Carbon Monoxide		
	(ppm,d)	6.9
	(LB/HR)	2.3
TGNMO's		
	(ppmC,w)	30.5
	(LB/HR)	4.3

PARAMETER		MEASURED
LINE 1 THERMAL OIL HEATER		
Particulate		
DRY + WET CATCH		
	(GR/DSCF)	0.15
	($LB/10^6BTU$)	0.67
DRY CATCH ONLY		
	(GR/DSCF)	0.14
	($LB/10^6BTU$)	0.60
Oxides of Nitrogen		
	(ppm,d)	92
	(LB/HR)	8.0
Opacity	(%)	5.4
Carbon Monoxide		
	(ppm,d)	278
	(LB/HR)	14.1
Formaldehyde		
	(ppm,d)	0.08
	(LB/HR)	0.0043
Benzene		
	(ppm,d)	< 0.012
	(LB/HR)	< 0.0017
Phenol		
	(ppb,d)	< 170
	(10^{-3}LB/HR)	< 30

The PAH results are summarized in Tables 11 and 12. No difficulties were encountered in the field or in the laboratory evaluation of the samples. On the basis of these facts and a complete review of the data and results, it is our opinion that the concentrations and emission rates reported herein are accurate and closely reflect the actual values which existed at the time the tests were performed.

Table 1a Summary of the Results of th. February 20, 1996 Particulate Emission Compliance Test of the Dryer RTO Stack at the Louisiana Pacific Plant in Hayward, Wisconsin.

ITEM	Run 1	Run 2	Run 3	
Date of test	02-20-96	02-20-96	02-20-96	
Time runs were done (HRS)	950/1057	1140/1248	1320/1430	
Volumetric flow				
actual (ACFM)	132569	133714	133572	$\bar{x}$ = 133,285
standard (DSCFM)	71993	70905	71496	$\bar{x}$ = 71,465
Gas temperature (DEG-F)	258	263	257	
Moisture content (%V/V)	22.29	23.60	23.48	
Gas composition (%V/V,dry)				
carbon dioxide	4.20	3.50	4.20	
oxygen	16.20	16.90	16.30	
nitrogen	79.60	79.60	79.50	
Isokinetic variation (%)	101.0	101.5	100.2	
Particulate concentration				
actual (GR/ACF)	.003293	.001528	.001451	
standard (GR/DSCF)	.006067	.002883	.002713	
Part. emission rate (LB/HR)	3.74	1.75	1.66	2.34

Note: Dry + Organic/Inorganic Wet Catch

Table 1b Summary of the Results of the February 20, 1996 Particulate Emission Compliance Test of the Dryer RTO Stack at the Louisiana Pacific Plant in Hayward, Wisconsin.

ITEM	Run 1	Run 2	Run 3
Date of test	02-20-96	02-20-96	02-20-96
Time runs were done (HRS)	950/1057	1140/1248	1320/1430
Volumetric flow			
actual (ACFM)	132569	133714	133572
standard (DSCFM)	71993	70905	71496
Gas temperature (DEG-F)	258	263	257
Moisture content (%V/V)	22.29	23.60	23.48
Gas composition (%V/V,dry)			
carbon dioxide	4.20	3.50	4.20
oxygen	16.20	16.90	16.30
nitrogen	79.60	79.60	79.50
Isokinetic variation (%)	101.0	101.5	100.2
Particulate concentration			
actual (GR/ACF)	.002254	.001296	.001314
standard (GR/DSCF)	.004153	.002445	.002456
Part. emission rate (LB/HR)	2.56	1.49	1.51

Note: Dry Catch Only

Table 2a Summary of the Results of the February 21, 1996 Particulate Emission Compliance Test of the Press RTO Stack at the Louisiana Pacific Plant in Hayward, Wisconsin.

ITEM		Run 1	Run 2	Run 3
Date of test		02-21-96	02-21-96	02-21-96
Time runs were done	(HRS)	1215/1316	1400/1501	1535/1636
Volumetric flow				
actual	(ACFM)	102862	105533	103860
standard	(DSCFM)	74155	75440	74754
Gas temperature	(DEG-F)	242	249	243
Moisture content	(%V/V)	1.81	1.60	1.88
Gas composition	(%V/V,dry)			
carbon dioxide		0.03	0.03	0.03
oxygen		20.90	20.90	20.90
nitrogen		79.07	79.07	79.07
Isokinetic variation	(%)	99.6	99.6	99.9
Particulate concentration				
actual	(GR/ACF)	.004349	.002901	.002554
standard	(GR/DSCF)	.006035	.004060	.003550
Part. emission rate	(LB/HR)	3.84	2.63	2.27

Note: Dry + Organic/Inorganic Wet Catch

Table 2b Summary of the Results of the February 21, 1996 Particulate Emission Compliance Test of the Press RTO Stack at the Louisiana Pacific Plant in Hayward, Wisconsin.

ITEM		Run 1	Run 2	Run 3
Date of test		02-21-96	02-21-96	02-21-96
Time runs were done	(HRS)	1215/1316	1400/1501	1535/1636
Volumetric flow				
actual	(ACFM)	102862	105533	103860
standard	(DSCFM)	74155	75440	74754
Gas temperature	(DEG-F)	242	249	243
Moisture content	(%V/V)	1.81	1.60	1.88
Gas composition	(%V/V,dry)			
carbon dioxide		0.03	0.03	0.03
oxygen		20.90	20.90	20.90
nitrogen		79.07	79.07	79.07
Isokinetic variation	(%)	99.6	99.6	99.9
Particulate concentration				
actual	(GR/ACF)	.001740	.002276	.001650
standard	(GR/DSCF)	.002414	.003185	.002294
Part. emission rate	(LB/HR)	1.53	2.06	1.47

Note: Dry Catch Only

Table 3a. Summary of the Results of the February 21, 1996 Particulate Emission Compliance Test of the Line 1 Thermal Oil Heater Stack at the Louisiana Pacific Plant in Hayward, Wisconsin.

ITEM	Run 1	Run 2	Run 3
Date of test	02-21-96	02-21-96	02-21-96
Time runs were done (HRS)	1535/1651	1725/1829	1900/2004
Volumetric flow			
actual (ACFM)	21684	21755	21474
standard (DSCFM)	12014	11940	12113
Gas temperature (DEG-F)	384	383	375
Moisture content (%V/V)	9.28	10.28	8.70
Gas composition (%V/V,dry)			
carbon dioxide	5.90	7.30	5.90
oxygen	14.80	13.30	14.80
nitrogen	79.30	79.40	79.30
Isokinetic variation (%)	99.5	100.7	98.7
Particulate concentration			
actual (GR/ACF)	.0904	.0902	.0736
standard (GR/DSCF)	0.163	0.164	0.131
Part. emission rate (LB/HR)	16.81	16.82	13.55
Emission factor (LB/MMBTU)	0.767	0.620	0.613

Note: Dry + Organic/Inorganic Wet Catch

Table 3b. Summary of the Results of the ebruary 21, 1996 Particulate Emission Compliance Test of the Line 1 Thermal Oil Heater Stack at the Louisiana Pacific Plant in Hayward, Wisconsin.

ITEM		Run 1	Run 2	Run 3
Date of test		02-21-96	02-21-96	02-21-96
Time runs were done	(HRS)	1535/1651	1725/1829	1900/2004
Volumetric flow				
actual	(ACFM)	21684	21755	21474
standard	(DSCFM)	12014	11940	12113
Gas temperature	(DEG-F)	384	383	375
Moisture content	(%V/V)	9.28	10.28	8.70
Gas composition	(%V/V,dry)			
carbon dioxide		5.90	7.30	5.90
oxygen		14.80	13.30	14.80
nitrogen		79.30	79.40	79.30
Isokinetic variation	(%)	99.5	100.7	98.7
Particulate concentration				
actual	(GR/ACF)	.0722	.0849	.0733
standard	(GR/DSCF)	0.130	0.155	0.130
Part. emission rate	(LB/HR)	13.42	15.85	13.49
Emission factor	(LB/MMBTU)	0.613	0.584	0.610

Note: Dry Catch Only

Table 4. Summary of the Results of the February 20 - 22, 1996 **Oxides of Nitrogen Determinations** at the Louisiana Pacific Plant in Hayward, Wisconsin.

Date	Time	Concentration (ppm,d)	Emission Rate (LB/HR)
(Dryer RTO Stack)			
2-20-96	0920-1057	21	10.7
2-20-96	1140-1248	18	9.2
2-20-96	1320-1420	20	10.3
Avg		20	10.1
(Line 1 Core Dryer Duct)			
2-20-96	0950-1050	35	5.6
2-20-96	1140-1240	38	6.4
2-20-96	1320-1420	36	5.7
Avg		36	5.9
(Line 1 Surface Dryer Duct)			
2-20-96	0950-1050	21	3.2
2-20-96	1140-1240	68	10.9
2-20-96	1320-1420	74	11.2
Avg		54	8.4
(Press Vent RTO Stack)			
2-21-96	1215-1316	24	13.0
2-21-96	1400-1501	24	13.0
2-21-96	1535-1636	24	12.6
Avg		24	12.9
(Line 1 Press RTO Inlet)			
2-21-96	1215-1315	11	6.0
2-21-96	1400-1500	5	2.6
2-21-96	1535-1635	3	1.8
Avg		7	3.5
(Line 1 Thermal Oil Heater Stack)			
2-22-96	0900-1005	90	8.2
2-22-96	1053-1157	98	8.1
2-22-96	1303-1403	89	7.6
Avg		92	8.0

Table 5a. Summary of the Results of the February 20 - 22, 1996 **Carbon Monoxide Determinations** at the Louisiana Pacific Plant in Hayward, Wisconsin.

Date	Time	Concentration (ppm,d)	Emission Rate (LB/HR)
(Dryer RTO Stack)			
2-20-96	0920-1057	179	56
2-20-96	1140-1248	225	70
2-20-96	1320-1420	203	63
Avg		202	63
(Line 1 Core Dryer Duct)			
2-20-96	0950-1050	669	65
2-20-96	1140-1240	910	93
2-20-96	1320-1420	778	75
Avg		786	78
(Line 1 Surface Dryer Duct)			
2-20-96	0950-1050	983	92
2-20-96	1140-1240	1424	138
2-20-96	1320-1420	1342	124
Avg		1250	~~384~~ 118
(Press Vent RTO Stack)			
2-21-96	1215-1316	16	5.0
2-21-96	1400-1501	24	8.0
2-21-96	1535-1636	31	10.1
Avg		24	7.7
(Line 1 Press RTO Inlet)			
2-21-96	1215-1315	10.2	3.3
2-21-96	1400-1500	7.6	2.5
2-21-96	1535-1635	3.0	1.0
Avg		6.9	2.3

Table 5b. Summary of the Results of the February 20 - 22, 1996 **Carbon Monoxide Determinations** at the Louisiana Pacific Plant in Hayward, Wisconsin.

Date	Time	Concentration (ppm,d)	Emission Rate (LB/HR)
(Line 1 Thermal Oil Heater Stack)			
2-20-96	1550-1905	764	36.2
2-21-96	0835-1130	126	6.4
2-21-96	1329-1618	86	4.4
Avg		325	15.7
2-21-96	1535-1651	120	6.3
2-21-96	1725-1829	595	31.0
2-21-96	1900-2004	271	14.3
Avg		329	17.2
2-22-96	0900-1005	177	9.8
2-22-96	1053-1157	248	12.6
2-22-96	1303-1403	114	5.9
Avg		180	9.4

Table 6. Summary of the Results of the February 20 & 21, 1996 ***TGNMO Determinations** at the Louisiana Pacific Plant in Hayward, Wisconsin.

Date	Time	Concentration (ppmC,w)	Emission Rate (LB/HR)
(Dryer RTO Stack)			
2-20-96	0920-1057	8.7	1.5
2-20-96	1140-1248	12.3	2.1
2-20-96	1320-1420	14.0	2.4
Avg		11.7	2.0
(Line 1 Core Dryer Duct)			
2-20-96	0950-1050	312	18.0
2-20-96	1140-1240	399	22.4
2-20-96	1320-1420	375	21.6
Avg		362	20.7
(Line 1 Surface Dryer Duct)			
2-20-96	0950-1050	740	42.9
2-20-96	1140-1240	541	32.5
2-20-96	1320-1420	560	32.0
Avg		614	35.8
(Press Vent RTO Stack)			
2-21-96	1215-1316	< 1	< 0.14
2-21-96	1400-1501	< 1	< 0.14
2-21-96	1535-1636	< 1	< 0.14
Avg		< 1	< 0.14
(Line 1 Press RTO Inlet)			
2-21-96	1215-1315	23.4	3.3
2-21-96	1400-1500	29.4	4.2
2-21-96	1535-1635	38.7	5.4
Avg		30.5	4.3

*** TGNMO = Total Gaseous Non-Methane Organics**

Table 7. Summary of the Results of the February 21 & 22, 1996 **Formaldehyde Determinations** at the Louisiana Pacific Plant in Hayward, Wisconsin.

Date	Time	Concentration (ppm,d)	Emission Rate (LB/HR)
(Dryer RTO Stack)			
2-21-96	0830-0938	5.9	2.0
2-21-96	1020-1127	6.4	2.2
2-21-96	1205-1310	7.4	2.6
Avg		6.6	2.3
(Press Vent RTO Stack)			
2-22-96	1335-1436	0.40	0.14
2-22-96	1450-1551	0.32	0.11
2-22-96	1608-1708	0.38	0.14
Avg		0.37	0.13
(Line 1 Thermal Oil Heater Stack)			
2-22-96	0900-1003	0.07	0.0042
2-22-96	1053-1157	0.09	0.0047
2-22-96	1303-1406	0.07	0.0041
Avg		0.08	0.0043

Table 9. Summary of the Results of the February 20 & 21, 1996 **Phenol Determinations** at the Louisiana Pacific Plant in Hayward, Wisconsin.

Date	Time	Concentration (ppb,d)	Emission Rate (10^{-3}LB/HR)
(Dryer RTO Stack)			
2-20-96	1520-1620	< 172	< 174
2-20-96	1635-1735	< 174	< 174
2-20-96	1750-1850	< 173	< 175
Avg		< 173	< 174
(Line 1 Thermal Oil Heater Stack)			
2-21-96	0934-1038	< 169	< 31
2-21-96	1056-1158	< 171	< 29
2-21-96	1341-1441	< 169	< 29
Avg		< 170	< 30

Table 8. Summary of the Results of the February 20 & 22, 1996 **Benzene Determinations** at the Louisiana Pacific Plant in Hayward, Wisconsin.

Date	Time	Concentration (ppm,d)	Emission Rate (LB/HR)
(Dryer RTO Stack)			
2-20-96	0950-1050	0.074	0.065
2-20-96	1149-1249	0.084	0.072
2-20-96	1320-1420	0.086	0.075
Avg		0.081	0.071
(Line 1 Thermal Oil Heater Stack)			
2-22-96	0900-1005	< 0.012	< 0.0019
2-22-96	1053-1157	< 0.011	< 0.0015
2-22-96	1303-1403	< 0.012	< 0.0017
Avg		< 0.012	< 0.0017

Table 10. Summary of the Results of the February 20 - 21, 1996 **MDI Determinations** at the Louisiana Pacific Plant in Hayward, Wisconsin.

Date	Time	Concentration (ppm,d)	Emission Rate (LB/HR)
(Press Vent RTO Stack)			
2-22-96	0800-0913	< 0.00065	< 0.0019
2-22-96	0941-1052	< 0.00066	< 0.0019
2-22-96	1117-1229	< 0.00065	< 0.0019
Avg		< 0.00065	< 0.0019

ɔle 11 Summary of the Results of the February 21 & 22, 1996 PAH Determinations of the Dryer RTO Stack at the Louisiana Pacific Plant in Hayward, Wisconsin.

Item	RUN 1	RUN 2	RUN 3
(Concentration ug/Nm³)			
Benzo-a-anthracene	.56<	.56<	.56<
Benzo-b-fluoranthene	.31<	.31<	.31<
Benzo-a-pyrene	.37<	.38<	.37<
Dibenzo-a,h-anthracene	.27<	.28<	.27<
Indeno,1,2,3-pyrene	.28<	.28<	.28<
Dibenzo-a,i-pyrene	6.2<	6.3<	6.2<
Dibenzo-a,h-acridine	4.7<	4.7<	4.7<
Dibenzo-a,j-acridine	.5<	.50<	.5<
7H-Dibenzo-c,g-carbazole	.37<	.38<	.37<
Dibenzo-a,h-pyrene	6.2<	6.3<	6.2<
(Emission Rate 10^{-8}g/sec)			
Benzo-a-anthracene	19<	19<	19<
Benzo-b-fluoranthene	11<	11<	11<
Benzo-a-pyrene	13<	13<	13<
Dibenzo-a,h-anthracene	9.5<	9.5<	9.4<
Indeno,1,2,3-pyrene	9.7<	9.7<	9.6<
Dibenzo-a,i-pyrene	215<	215<	213<
Dibenzo-a,h-acridine	161<	162<	160<
Dibenzo-a,j-acridine	17<	17<	17<
7H-Dibenzo-c,g-carbazole	13<	13<	13<
Dibenzo-a,h-pyrene	215<	215<	213<

)le 12 Summary of the Results of the February 20 & 21, 1996 PAH Determinations of the Line 1 Thermal Oil Heater at the Louisiana Pacific Plant in Hayward, Wisconsin.

Item	RUN 1	RUN 2	RUN 3
(Concentration ug/Nm³)			
Benzo-a-anthracene	.48<	.49<	.49
Benzo-b-fluoranthene	.26<	1.4	1.6
Benzo-a-pyrene	.32<	1.4	1.6
Dibenzo-a,h-anthracene	.23<	.24<	.24<
Indeno,1,2,3-pyrene	.24<	2.7	2.3
Dibenzo-a,i-pyrene	5.3<	5.5<	5.4<
Dibenzo-a,h-acridine	4<	4.1<	4.1<
Dibenzo-a,j-acridine	.42<	.44<	.44<
7H-Dibenzo-c,g-carbazole	.32<	.33<	.33<
Dibenzo-a,h-pyrene	5.3<	5.5<	5.4<
(Emission Rate 10^{-6}g/sec)			
Benzo-a-anthracene	2.4<	2.7<	2.7
Benzo-b-fluoranthene	1.3<	7.6	8.8
Benzo-a-pyrene	1.6<	7.9	8.8
Dibenzo-a,h-anthracene	1.2<	1.3<	1.3<
Indeno,1,2,3-pyrene	1.2<	15	13
Dibenzo-a,i-pyrene	27<	30<	30<
Dibenzo-a,h-acridine	20<	23<	23<
Dibenzo-a,j-acridine	2.2<	2.4<	2.4<
7H-Dibenzo-c,g-carbazole	1.6<	1.8<	1.8<
Dibenzo-a,h-pyrene	27<	30<	30<

3 RESULTS

The results of all field and laboratory evaluations are presented in this section. Gas composition results (Orsat and moisture) are presented first followed by the computer printout of the gas composition, particulate, oxides of nitrogen, opacity, carbon monoxide, total hydrocarbons, formaldehyde, phenol, benzene, PAH, and MDI determinations . Preliminary measurements including test port locations are given in the appendices.

The results have been calculated on a personal computer using programs written in Extended BASIC specifically for source testing calculations. EPA-published equations have been used as the basis of the calculation techniques in these program. Emission rates have been calculated using the product of the concentration times flow method.

3.1 Results of Orsat and Moisture Analyses

Test No. 1
Dryer RTO Stack

(Particulate)

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	02-20-96	02-20-96	02-20-96
Dry basis (orsat)			
carbon dioxide.....	4.20	3.50	4.20
oxygen.....	16.20	16.90	16.30
nitrogen.....	79.60	79.60	79.50
Wet basis (orsat)			
carbon dioxide.....	3.26	2.67	3.21
oxygen.....	12.59	12.91	12.47
nitrogen.....	61.85	60.81	60.83
water vapor.....	22.29	23.60	23.48
Dry molecular weight.....	29.32	29.24	29.32
Wet molecular weight.....	26.80	26.58	26.66
Specific gravity.....	0.926	0.918	0.921
FO	1.119	1.143	1.095

Test No. 2
Dryer RTO Stack

(Formaldehyde)

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	02-21-96	02-21-96	02-21-96
Dry basis (orsat)			
carbon dioxide.....	3.80	3.80	3.80
oxygen.....	16.90	16.90	16.90
nitrogen.....	79.30	79.30	79.30
Wet basis (orsat)			
carbon dioxide.....	2.95	2.96	2.97
oxygen.....	13.10	13.17	13.22
nitrogen.....	61.47	61.82	62.05
water vapor.....	22.49	22.05	21.75
Dry molecular weight.....	29.28	29.28	29.28
Wet molecular weight.....	26.75	26.80	26.83
Specific gravity.....	0.924	0.926	0.927
FO	1.053	1.053	1.053

Test No. 4
Dryer RTO Stack
(PAH's)

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	02-21-96	02-22-96	02-22-96
Dry basis (orsat)			
carbon dioxide.....	3.70	3.80	3.80
oxygen.....	16.90	16.90	16.90
nitrogen.....	79.40	79.30	79.30
Wet basis (orsat)			
carbon dioxide.....	2.87	2.95	2.91
oxygen.....	13.10	13.13	12.95
nitrogen.....	61.54	61.62	60.75
water vapor.....	22.49	22.30	23.40
Dry molecular weight.....	29.27	29.28	29.28
Wet molecular weight.....	26.73	26.77	26.64
Specific gravity.....	0.923	0.925	0.920
FO	1.081	1.053	1.053

Test No. 9
Press Vent RTO Stack
(Particulate)

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	02-21-96	02-21-96	02-21-96
Dry basis (orsat)			
carbon dioxide.....	0.03	0.03	0.03
oxygen.....	20.90	20.90	20.90
nitrogen.....	79.07	79.07	79.07
Wet basis (orsat)			
carbon dioxide.....	0.03	0.03	0.03
oxygen.....	20.52	20.57	20.51
nitrogen.....	77.64	77.81	77.58
water vapor.....	1.81	1.60	1.88
Dry molecular weight.....	28.84	28.84	28.84
Wet molecular weight.....	28.64	28.67	28.64
Specific gravity.....	0.989	0.990	0.989
Water mass flow.....(LB/HR)	3836	3433	4026

Test No. 11
Press Vent RTO Stack
(MDI)

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	02-22-96	02-22-96	02-22-96
Dry basis (orsat)			
carbon dioxide.....	0.40	0.40	0.40
oxygen.....	20.50	20.50	20.50
nitrogen.....	79.10	79.10	79.10
Wet basis (orsat)			
carbon dioxide.....	0.39	0.39	0.39
oxygen.....	19.76	20.17	20.06
nitrogen.....	76.23	77.83	77.42
water vapor.....	3.63	1.60	2.13
Dry molecular weight.....	28.88	28.88	28.88
Wet molecular weight.....	28.49	28.71	28.65
Specific gravity.....	0.984	0.992	0.990
FO	1.000	1.000	1.000

Test No. 12
Press Vent RTO Stack
(Formaldehyde)

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	02-22-96	02-22-96	02-22-96
Dry basis (orsat)			
carbon dioxide.....	0.40	0.40	0.40
oxygen.....	20.50	20.50	20.50
nitrogen.....	79.10	79.10	79.10
Wet basis (orsat)			
carbon dioxide.....	0.40	0.40	0.40
oxygen.....	20.36	20.27	20.29
nitrogen.....	78.57	78.21	78.29
water vapor.....	0.67	1.12	1.02
Dry molecular weight.....	28.88	28.88	28.88
Wet molecular weight.....	28.81	28.76	28.77
Specific gravity.....	0.995	0.994	0.994
FO	1.000	1.000	1.000

Test No. 14
Line 1 Thermal Oil Heater Stack

(PAH's)
Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	02-20-96	02-21-96	02-21-96
Dry basis (orsat)			
carbon dioxide.....	8.20	6.50	6.60
oxygen.....	12.40	14.20	14.00
nitrogen.....	79.40	79.30	79.40
Wet basis (orsat)			
carbon dioxide.....	7.41	5.90	6.04
oxygen.....	11.20	12.89	12.81
nitrogen.....	71.71	72.00	72.67
water vapor.....	9.68	9.21	8.48
Dry molecular weight.....	29.81	29.61	29.62
Wet molecular weight.....	28.66	28.54	28.63
Specific gravity.....	0.990	0.986	0.989
FO	1.037	1.031	1.045

Test No. 16
Line 1 Thermal Oil Heater Stack

(Formaldehyde)

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	02-22-96	02-22-96	02-22-96
Dry basis (orsat)			
carbon dioxide.....	6.00	8.50	8.00
oxygen.....	14.60	12.10	12.60
nitrogen.....	79.40	79.40	79.40
Wet basis (orsat)			
carbon dioxide.....	5.44	7.47	7.09
oxygen.....	13.24	10.63	11.17
nitrogen.....	71.99	69.78	70.39
water vapor.....	9.34	12.12	11.34
Dry molecular weight.....	29.54	29.84	29.78
Wet molecular weight.....	28.47	28.41	28.45
Specific gravity.....	0.983	0.981	0.983
FO	1.050	1.035	1.037

Test No. 17
Line 1 Thermal Oil Heater Stack

(Particulate)

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	02-21-96	02-21-96	02-21-96
Dry basis (orsat)			
carbon dioxide.....	5.90	7.30	5.90
oxygen.....	14.80	13.30	14.80
nitrogen.....	79.30	79.40	79.30
Wet basis (orsat)			
carbon dioxide.....	5.35	6.55	5.39
oxygen.....	13.43	11.93	13.51
nitrogen.....	71.94	71.24	72.40
water vapor.....	9.28	10.28	8.70
Dry molecular weight.....	29.54	29.70	29.54
Wet molecular weight.....	28.47	28.50	28.53
Specific gravity.....	0.983	0.984	0.986
Water mass flow.....(LB/HR)	3447	3838	3238
FO	1.034	1.041	1.034

3.2 Results of Particulate Loading Determinations

Test No. 1
Dryer RTO Stack

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	02-20-96	02-20-96	02-20-96
Time run start/end.....(HRS)	950/1057	1140/1248	1320/1430
Static pressure.....(IN.WC)	-0.62	-0.62	-0.62
Cross sectional area (SQ.FT)	36.23	36.23	36.23
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	248.0	266.0	261.0
desiccant.....(GRAMS)	12.0	11.0	13.0
total.....(GRAMS)	260.0	277.0	274.0
Total particulate material..			
.....collected(grams)	0.0168	0.0079	0.0074
Gas meter coefficient.....	1.0004	1.0004	1.0004
Barometric pressure..(IN.HG)	28.48	28.48	28.48
Avg. orif.pres.drop..(IN.WC)	1.61	1.59	1.57
Avg. gas meter temp..(DEF-F)	65.6	68.9	73.1
Volume through gas meter....			
at meter conditions...(CF)	44.50	44.31	44.47
standard conditions.(DSCF)	42.73	42.28	42.09
Total sampling time....(MIN)	64.00	64.00	64.00
Nozzle diameter.....(IN)	.247	.247	.247
Avg.stack gas temp ..(DEG-F)	258	263	257
Volumetric flow rate.....			
actual.....(ACFM)	132569	133714	133572
dry standard.....(DSCFM)	71993	70905	71496
Isokinetic variation.....(%)	101.0	101.5	100.2
Particulate concentration...			
actual.....(GR/ACF)	0.00329	0.00153	0.00145
dry standard.....(GR/DSCF)	0.00607	0.00288	0.00271
Particle mass rate...(LB/HR)	3.744	1.752	1.662

Test No. 9
Press Vent RTO Stack

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	02-21-96	02-21-96	02-21-96
Time run start/end.....(HRS)	1215/1316	1400/1501	1535/1636
Static pressure.....(IN.WC)	-0.48	-0.48	-0.48
Cross sectional area (SQ.FT)	31.09	31.09	31.09
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	8.0	7.0	8.0
desiccant.....(GRAMS)	11.0	10.0	12.0
total.....(GRAMS)	19.0	17.0	20.0
Total particulate material..			
.....collected(grams)	0.0190	0.0130	0.0113
Gas meter coefficient.....	1.0051	1.0051	1.0051
Barometric pressure..(IN.HG)	29.24	29.24	29.24
Avg. orif.pres.drop..(IN.WC)	2.23	2.32	2.30
Avg. gas meter temp..(DEF-F)	84.1	86.9	88.9
Volume through gas meter....			
at meter conditions...(CF)	50.70	51.82	51.70
standard conditions.(DSCF)	48.58	49.41	49.11
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.250	.250	.250
Avg.stack gas temp ..(DEG-F)	242	249	243
Volumetric flow rate.....			
actual.....(ACFM)	102862	105533	103860
dry standard.....(DSCFM)	74155	75440	74754
Isokinetic variation.....(%)	99.6	99.6	99.9
Particulate concentration...			
actual.....(GR/ACF)	0.00435	0.00290	0.00255
dry standard.....(GR/DSCF)	0.00603	0.00406	0.00355
Particle mass rate...(LB/HR)	3.836	2.625	2.275

Test No. 17
Line 1 Thermal Oil Heater Stack

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3	
Date of run	02-21-96	02-21-96	02-21-96	
Time run start/end.....(HRS)	1535/1651	1725/1829	1900/2004	
Static pressure.....(IN.WC)	-0.21	-0.21	-0.21	
Cross sectional area (SQ.FT)	14.75	14.75	14.75	
Pitot tube coefficient.....	.840	.840	.840	
Water in sample gas				
condenser.....(ML)	0.0	0.0	0.0	
impingers.....(GRAMS)	93.0	120.0	97.0	
desiccant.....(GRAMS)	25.0	13.0	13.0	
total.....(GRAMS)	118.0	133.0	110.0	
Total particulate material..				
.....collected(grams)	0.5755	0.5829	0.4603	
Gas meter coefficient.....	0.9997	0.9997	0.9997	
Barometric pressure..(IN.HG)	29.24	29.24	29.24	
Avg. orif.pres.drop..(IN.WC)	2.75	2.80	2.77	
Avg. gas meter temp..(DEF-F)	75.9	77.5	74.2	
Volume through gas meter....				
at meter conditions...(CF)	56.15	56.65	55.99	
standard conditions.(DSCF)	54.40	54.73	54.42	
Total sampling time....(MIN)	60.00	60.00	60.00	
Nozzle diameter.....(IN)	.453	.453	.453	
Avg.stack gas temp ..(DEG-F)	384	383	375	
Volumetric flow rate.....				
actual.....(ACFM)	21684	21755	21474	
dry standard.....(DSCFM)	12014	11940	12113	
Isokinetic variation.....(%)	99.5	100.7	98.7	
Particulate concentration...				
actual.....(GR/ACF)	0.09040	0.09016	0.07359	.084
dry standard.....(GR/DSCF)	0.16323	0.16434	0.13051	.1527
Particle mass rate...(LB/HR)	16.810	16.820	13.550	15.73
F-factor .....(DSCF/MMBTU)	< 9600	9600	9600	
Emission factor...(LB/MMBTU)	0.767	0.620	0.613	.667

15.73/.667 = F

3.3 Results of Oxides of Nitrogen Determinations

Test No. 6
Dryer RTO Stack

Results of Oxides of Nitrogen Determinations——————————Method7E

	Run 1	Run 2	Run 3
Date of run	2-20-96	2-20-96	2-20-96
Time run start/end (HRS)	0950-1057	1140-1248	1320-1430
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	22.29	23.60	23.48
Oxygen content (%V/V)	16.2	16.9	16.3
Volumetric flow rate (DSCFM)	71990	70905	71495
NO_x concentration (ppm,d)	20.7	18.1	20.2
NO_x emission rate (LB/HR)	10.7	9.2	10.3

Test No. 7
Line 1 Core Dryer Duct

Results of Oxides of Nitrogen Determinations——————————Method7E

	Run 1	Run 2	Run 3
Date of run	2-20-96	2-20-96	2-20-96
Time run start/end (HRS)	0950-1050	1140-1240	1320-1420
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	28	29	29
Oxygen content (%V/V)	16.4	16.2	16.0
Volumetric flow rate (DSCFM)	22252	23520	22216
NO_x concentration (ppm,d)	35.3	37.9	35.7
NO_x emission rate (LB/HR)	5.6	6.4	5.7

Test No. 8
Line 1 Surface Dryer Duct

Results of Oxides of Nitrogen Determinations——————————Method7E

	Run 1	Run 2	Run 3
Date of run	2-20-96	2-20-96	2-20-96
Time run start/end (HRS)	0950-1050	1140-1240	1320-1420
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	30.8	30.9	31.0
Oxygen content (%V/V)	5.2	5.3	5.5
Volumetric flow rate (DSCFM)	21479	22195	21107
NO_x concentration (ppm,d)	20.6	68.3	74.0
NO_x emission rate (LB/HR)	3.2	10.9	11.2

Test No. 10
Press Vent RTO Stack

Results of Oxides of Nitrogen Determinations——————————Method7E

	Run 1	Run 2	Run 3
Date of run	2-21-96	2-21-96	2-21-96
Time run start/end (HRS)	1215-1316	1400-1501	1535-1636
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	1.81	1.60	1.88
Oxygen content (%V/V)	20.9	20.9	20.9
Volumetric flow rate (DSCFM)	74155	75440	74754
NO_x concentration (ppm,d)	24.4	24.1	23.6
NO_x emission rate (LB/HR)	13.0	13.0	12.6

Test No. 13
Line 1 Press RTO Inlet

Results of Oxides of Nitrogen Determinations——————————Method7E

	Run 1	Run 2	Run 3
Date of run	2-21-96	2-21-96	2-21-96
Time run start/end (HRS)	1215-1315	1400-1500	1535-1635
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	1.26	1.25	1.28
Oxygen content (%V/V)	20.9	20.9	20.9
Volumetric flow rate (DSCFM)	74064	74787	74063
NO_x concentration (ppm,d)	11.4	4.9	3.3
NO_x emission rate (LB/HR)	6.0	2.6	1.8

Test No. 18
Line 1 Thermal Oil Heater Stack

Results of Oxides of Nitrogen Determinations——————————Method7E

	Run 1	Run 2	Run 3
Date of run	2-22-96	2-22-96	2-22-96
Time run start/end (HRS)	0900-1005	1053-1157	1303-1403
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	9.34	12.12	11.34
Oxygen content (%V/V)	14.2	11.8	13.0
Volumetric flow rate (DSCFM)	12735	11660	11910
NO_x concentration (ppm,d)	89.9	97.5	89.3
NO_x emission rate (LB/HR)	8.2	8.1	7.6

3.4 Results of Opacity Observations

Test No. 1
Line 1 Dryer RTO Stack

Results of Opacity Observations ---------- EPA Method 9

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	100.00
5	0.0223	0.00
10	0.0458	0.00
15	0.0706	0.00
20	0.0969	0.00
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00

Avg Opac 0.00 Avg OD 0.0000 Time average

Observer: Sheryl Bergeron
Cert. Date: 10-04-95
Date of Observation: 02-20-96
Time of Observation: 0950/1050

Test No. 9
Line 1 Press Vent Stack

Results of Opacity Observations ---------- EPA Method 9

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	100.00
5	0.0223	0.00
10	0.0458	0.00
15	0.0706	0.00
20	0.0969	0.00
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00

Avg Opac 0.00 Avg OD 0.0000 Time average

Observer: Sheryl Bergeron
Cert. Date: 10-04-95
Date of Observation: 02-21-96
Time of Observation: 1215/1315

Test No. 17
Line 1 Thermal Oil Heater Stack

Results of Opacity Observations ---------- EPA Method 9

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	0.00
5	0.0223	91.70
10	0.0458	8.30
15	0.0706	0.00
20	0.0969	0.00
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00
Avg Opac 5.42	Avg OD 0.0243	Time average

Observer: Sheryl Bergeron
Cert. Date: 10-04-95
Date of Observation: 02-21-96
Time of Observation: 1535/1651

3.5 Results of Carbon Monoxide Determinations

Test No. 6
Dryer RTO Stack

Results of CO Determinations ----------Method 10

	Run 1	Run 2	Run 3
Date of run	2-20-96	2-20-96	2-20-96
Time run start/end.....(HRS)	0950-1057	1140-1248	1320-1430
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	22.29	23.60	23.48
O2 Concentration.....(%V/V)	16.20	16.90	16.30
Volumetric flow rate (DSCFM)	71990	70905	71495
CO concentration.....			
(GR/DSCF).....	0.0911	0.1145	0.1033
(MG/DSCM).....	208.53	262.13	236.50
(PPM-WET).....	139.10	171.90	155.34
(PPM-DRY).....	179.00	225.00	203.00
(PPM-DRY @ 7% O2).....	522.08	768.29	604.68
CO emission rate.....(LB/HR)	56.201	69.579	63.298

CO = Carbon monoxide

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 7
Line 1 Core Dryer Duct

Results of CO Determinations ----------Method 10

	Run 1	Run 2	Run 3
Date of run	2-20-96	2-20-96	2-20-96
Time run start/end.....(HRS)	0950-1050	1140-1240	1320-1420
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	28.00	29.00	29.00
O2 Concentration.....(%V/V)	16.40	16.20	16.00
Volumetric flow rate (DSCFM)	22252	23520	22216
CO concentration.....			
(GR/DSCF).....	0.3403	0.4630	0.3957
(MG/DSCM).....	779.04	1059.	905.90
(PPM-WET).....	481.46	645.96	552.10
(PPM-DRY).....	668.70	909.80	777.60
(PPM-DRY @ 7% O2).....	2035.17	2653.	2177.
CO emission rate.....(LB/HR)	64.897	93.326	75.343

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CO = Carbon monoxide

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 8
Line 1 Surface Dryer Duct

Results of CO Determinations ----------Method 10

	Run 1	Run 2	Run 3
Date of run	2-20-96	2-20-96	2-20-96
Time run start/end.....(HRS)	0950-1050	1140-1240	1320-1420
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	30.84	30.87	31.01
O2 Concentration.....(%V/V)	5.20	5.30	5.50
Volumetric flow rate (DSCFM)	21479	22195	21107
CO concentration.....			
(GR/DSCF).....	0.5004	0.7247	0.6833
(MG/DSCM).....	1145.	1659.	1564.
(PPM-WET).....	680.12	984.55	926.40
(PPM-DRY).....	983.40	1424.	1342.
(PPM-DRY @ 7% O2).....	871.37	1269.	1212.
CO emission rate.....(LB/HR)	92.122	137.863	123.612

CO = Carbon monoxide

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 10
Press Vent RTO Stack

Results of CO Determinations ----------Method 10

	Run 1	Run 2	Run 3
Date of run	2-21-96	2-21-96	2-21-96
Time run start/end.....(HRS)	1215-1316	1400-1501	1535-1636
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	1.81	1.60	1.88
O2 Concentration.....(%V/V)	20.90	20.90	20.90
Volumetric flow rate (DSCFM)	74155	75440	74754
CO concentration.....			
(GR/DSCF).....	0.0079	0.0124	0.0158
(MG/DSCM).....	18.06	28.43	36.23
(PPM-WET).....	15.22	24.01	30.52
(PPM-DRY).....	15.50	24.40	31.10
CO emission rate.....(LB/HR)	5.013	8.028	10.139

CO = Carbon monoxide

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 13
Line 1 Press RTO Inlet

Results of CO Determinations ----------Method 10

	Run 1	Run 2	Run 3
Date of run	2-21-96	2-21-96	2-21-96
Time run start/end.....(HRS)	1215-1315	1400-1500	1535-1635
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	1.26	1.25	1.28
O2 Concentration.....(%V/V)	20.90	20.90	20.90
Volumetric flow rate (DSCFM)	74064	74787	74063
CO concentration.....			
(GR/DSCF).....	0.0052	0.0039	0.0015
(MG/DSCM).....	11.88	8.85	3.50
(PPM-WET).....	10.07	7.50	2.96
(PPM-DRY).....	10.20	7.60	3.00
CO emission rate.....(LB/HR)	3.295	2.479	0.969

CO = Carbon monoxide

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 14
Line 1 Thermal Oil Heater Stack

Results of CO Determinations ----------Method 10

	Run 1	Run 2	Run 3
Date of run	02-20-96	02-21-96	02-21-96
Time run start/end.....(HRS)	1550/1905	0835/1130	1329/1618
Total sampling time....(MIN)	160.0	160.0	160.0
Moisture content.....(%V/V)	9.68	9.21	8.48
O2 Concentration.....(%V/V)	12.40	14.20	14.00
Volumetric flow rate (DSCFM)	10862	11696	11836
CO concentration.....			
(GR/DSCF).....	0.3888	0.0641	0.0438
(MG/DSCM).....	890.06	146.79	100.19
(PPM-WET).....	690.04	114.40	78.71
(PPM-DRY).....	764.00	126.00	86.00
(PPM-DRY @ 7% O2).....	1243.	259.41	172.00
CO emission rate.....(LB/HR)	36.193	6.427	4.439

CO = Carbon monoxide

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 17
Line 1 Thermal Oil Heater Stack

Results of CO Determinations ----------Method 10

	Run 1	Run 2	Run 3
Date of run	02-21-96	02-21-96	02-21-96
Time run start/end.....(HRS)	1535/1651	1725/1829	1900/2004
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	9.28	10.28	8.70
O2 Concentration.....(%V/V)	14.80	13.30	14.80
Volumetric flow rate (DSCFM)	12014	11940	12113
CO concentration.....			
(GR/DSCF).....	0.0611	0.3028	0.1379
(MG/DSCM).....	139.80	693.18	315.72
(PPM-WET).....	108.86	533.83	247.42
(PPM-DRY).....	120.00	595.00	271.00
(PPM-DRY @ 7% O2).....	270.97	1081.	611.94
CO emission rate.....(LB/HR)	6.288	30.984	14.317

CO = Carbon monoxide

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 18
Line 1 Thermal Oil Heater Stack

Results of CO Determinations ----------Method 10

	Run 1	Run 2	Run 3
Date of run	2-22-96	2-22-96	2-22-96
Time run start/end.....(HRS)	0900-1005	1053-1157	1303-1403
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	9.34	12.12	11.34
O2 Concentration.....(%V/V)	14.20	11.80	13.00
Volumetric flow rate (DSCFM)	12735	11660	11910
CO concentration.....			
(GR/DSCF).....	0.0901	0.1261	0.0581
(MG/DSCM).....	206.20	288.69	133.04
(PPM-WET).....	160.47	217.77	101.25
(PPM-DRY).....	177.00	247.80	114.20
(PPM-DRY @ 7% O2).....	364.41	377.09	199.85
CO emission rate.....(LB/HR)	9.831	12.601	5.932

CO = Carbon monoxide

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

3.6 Results of Total Hydrocarbons Determinations

Test No. 6
Dryer RTO Stack

Results of Total Hydrocarbons Determinations——————————Method25A

	Run 1	Run 2	Run 3
Date of run	2-20-96	2-20-96	2-20-96
Time run start/end (HRS)	0950-1057	1140-1248	1320-1430
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	22.29	23.60	23.48
Oxygen content (%V/V)	16.2	16.9	16.3
Volumetric flow rate (DSCFM)	71993	70905	71496
THC concentration (ppmC,w)	8.7	12.3	14.0
THC emission rate (LB/HR)	1.51	2.13	2.44

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Test No. 7
Line 1 Core Dryer Duct

Results of Total Hydrocarbons Determinations——————————Method25A

	Run 1	Run 2	Run 3
Date of run	2-20-96	2-20-96	2-20-96
Time run start/end (HRS)	0950-1050	1140-1240	1320-1420
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	28	29	29
Oxygen content (%V/V)	16.4	16.2	16.0
Volumetric flow rate (DSCFM)	22252	23520	22216
THC concentration (ppmC,w)	312	399	375
THC emission rate (LB/HR)	18.0	22.4	21.6

Test No. 8
Line 1 Surface Dryer Duct

Results of Total Hydrocarbons Determinations——————————Method25A

	Run 1	Run 2	Run 3
Date of run	2-20-96	2-20-96	2-20-96
Time run start/end (HRS)	0950-1050	1140-1240	1320-1420
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	30.8	30.9	31.0
Oxygen content (%V/V)	5.2	5.3	5.5
Volumetric flow rate (DSCFM)	21479	22195	21107
THC concentration (ppmC,w)	740	541	560
THC emission rate (LB/HR)	42.9	32.5	32.0

Interpoll Labs Report No. 6-7318
Louisiana Pacific Corporation
Hayward, Wisconsin

Test No. 10
Press Vent RTO Stack

Results of Total Hydrocarbons Determinations——————————Method25A

	Run 1	Run 2	Run 3
Date of run	2-21-96	2-21-96	2-21-96
Time run start/end (HRS)	1215-1316	1400-1501	1535-1636
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	1.81	1.60	1.88
Oxygen content (%V/V)	20.9	20.9	20.9
Volumetric flow rate (DSCFM)	74155	75440	74754
THC concentration (ppmC,w)	< 1	< 1	< 1
THC emission rate (LB/HR)	< 0.14	< 0.14	< 0.14

Interpoll Labs Report No. 6-7318
Louisiana Pacific Corporation
Hayward, Wisconsin

Test No. 13
Line 1 Press RTO Inlet

Results of Total Hydrocarbons Determinations——————————Method25A

	Run 1	Run 2	Run 3
Date of run	2-21-96	2-21-96	2-21-96
Time run start/end (HRS)	1215-1315	1400-1500	1535-1635
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	1.26	1.25	1.28
Oxygen content (%V/V)	20.9	20.9	20.9
Volumetric flow rate (DSCFM)	74064	74787	74063
THC concentration (ppmC,w)	23.4	29.4	38.7
THC emission rate (LB/HR)	3.28	4.16	5.43

3.7 Results of Formaldehyde Determinations

Test No. 2
Dryer RTO Stack

Results of Formaldehyde Tests ---------- EPA Method 0011

	Run 1	Run 2	Run 3
Date of run	02-21-96	02-21-96	02-21-96
Time run start/end.....(HRS)	830/ 938	1020/1127	1205/1310
Static pressure.....(IN.WC)	-0.72	-0.72	-0.72
Cross sectional area (SQ.FT)	36.23	36.23	36.23
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	316.0	309.0	305.0
desiccant.....(GRAMS)	13.0	13.0	14.0
total.....(GRAMS)	329.0	322.0	319.0
Formaldehyde in sample..(uG)	11000	12000	14000
Gas meter coefficient.....	1.0004	1.0004	1.0004
Barometric pressure..(IN.HG)	29.24	29.24	29.24
Avg. orif.pres.drop..(IN.WC)	2.42	2.51	2.53
Avg. gas meter temp..(DEF-F)	61.4	73.9	72.5
Volume through gas meter....			
at meter conditions...(CF)	53.71	55.20	55.48
standard conditions.(DSCF)	53.48	53.69	54.10
Total sampling time....(MIN)	64.00	64.00	64.00
Nozzle diameter.....(IN)	.275	.275	.275
Avg.stack gas temp ..(DEG-F)	257	258	265
Volumetric flow rate.....			
actual.....(ACFM)	132800	133593	133908
dry standard.....(DSCFM)	73922	74682	74407
Isokinetic variation.....(%)	99.3	98.7	99.8
CH2O concentration.....			
(MG/DSCM).....	7.31	7.95	9.20
(PPM-DRY).....	5.86	6.36	7.37
(PPM-WET).....	4.54	4.96	5.77
CH2O emission rate...(LB/HR)	2.02246	2.22083	2.56166

CH2O = Formaldehyde

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 12
Press Vent RTO Stack

Results of Formaldehyde Tests ---------- EPA Method 0011

	Run 1	Run 2	Run 3
Date of run	02-22-96	02-22-96	02-22-96
Time run start/end.....(HRS)	1335/1436	1450/1551	1608/1708
Static pressure.....(IN.WC)	-0.49	-0.49	-0.49
Cross sectional area (SQ.FT)	31.09	31.09	31.09
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	-6.0	10.0	6.0
desiccant.....(GRAMS)	13.0	2.0	5.0
total.....(GRAMS)	7.0	12.0	11.0
Formaldehyde in sample..(uG)	690	560	670
Gas meter coefficient.....	1.0051	1.0051	1.0051
Barometric pressure..(IN.HG)	28.91	28.91	28.91
Avg. orif.pres.drop..(IN.WC)	2.30	2.44	2.43
Avg. gas meter temp..(DEF-F)	88.5	94.9	95.4
Volume through gas meter....			
at meter conditions...(CF)	52.04	53.80	53.96
standard conditions.(DSCF)	48.92	50.00	50.11
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.250	.250	.250
Avg.stack gas temp ..(DEG-F)	239	240	240
Volumetric flow rate.....			
actual.....(ACFM)	103837	105677	105664
dry standard.....(DSCFM)	75191	76107	76165
Isokinetic variation.....(%)	98.9	99.9	100.1
CH2O concentration.....			
(MG/DSCM).....	0.50	0.40	0.48
(PPM-DRY).....	0.40	0.32	0.38
(PPM-WET).....	0.40	0.32	0.38
CH2O emission rate...(LB/HR)	0.14104	0.11338	0.13547

CH2O = Formaldehyde

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Test No. 16
Line 1 Thermal Oil Heater Stack

Results of Formaldehyde Tests ---------- EPA Method 0011

	Run 1	Run 2	Run 3
Date of run	02-22-96	02-22-96	02-22-96
Time run start/end.....(HRS)	900/1003	1053/1157	1303/1406
Static pressure.....(IN.WC)	-0.21	-0.21	-0.21
Cross sectional area (SQ.FT)	14.75	14.75	14.75
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	95.0	127.0	119.0
desiccant.....(GRAMS)	20.0	18.0	18.0
total.....(GRAMS)	115.0	145.0	137.0
Formaldehyde in sample..(uG)	130	150	130
Gas meter coefficient.....	1.0054	1.0054	1.0054
Barometric pressure..(IN.HG)	29.01	29.01	29.01
Avg. orif.pres.drop..(IN.WC)	2.66	2.45	2.49
Avg. gas meter temp..(DEF-F)	64.2	80.0	74.2
Volume through gas meter....			
at meter conditions...(CF)	53.28	51.72	52.10
standard conditions.(DSCF)	52.65	49.58	50.49
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.434	.434	.434
Avg.stack gas temp ..(DEG-F)	378	383	380
Volumetric flow rate.....			
actual.....(ACFM)	22996	21863	22056
dry standard.....(DSCFM)	12735	11663	11906
Isokinetic variation.....(%)	99.0	101.8	101.5
CH2O concentration.....			
(MG/DSCM).....	0.09	0.11	0.09
(PPM-DRY).....	0.07	0.09	0.07
(PPM-WET).....	0.06	0.08	0.06
CH2O emission rate...(LB/HR)	0.00419	0.00469	0.00408

CH2O = Formaldehyde

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

3.8 Results of Phenol Determinations

Test No. 3
Dryer RTO Stack

Results of Phenol Determinations ----------

	Run 1	Run 2	Run 3
Date of run	02-20-96	02-20-96	02-20-96
Time run start/end.....(HRS)	1520/1620	1635/1735	1750/1850
Barometric pressure..(IN.HG)	28.68	28.68	28.68
Meter temperature....(DEG-F)	69.95	72.70	72.75
Meter correction coefficient	1.0004	1.0004	1.0004
Volume through gas meter....			
at meter conditions...(CF)	45.850	45.700	45.950
standard conditions (DSCF)	44.024	43.654	43.889
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	23.69	24.02	23.80
Volumetric flow rate (DSCFM)	69019	68433	69057
Phenol in sample.....(uG)	840.00<	840.00<	840.00<
Phenol concentration.....			
(GR/10^3DSCF).....	0.2944<	0.2969<	0.2953<
(uG/DSCM).....	674.30<	680.02<	676.39<
(PPB-DRY).....	172.31<	173.77<	172.84<
(PPB-WET).....	131.49<	132.03<	131.71<
Phenol emis. rate(10^{-3}LB/HR)	174.161<	174.148<	174.797<

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Analysis performed according to NIOSH Method 3502

Test No. 19
Line 1 Thermal Oil Heater Stack

Results of Phenol Determinations ----------

	Run 1	Run 2	Run 3
Date of run	02-21-96	02-21-96	02-21-96
Time run start/end.....(HRS)	0934/1038	1056/1158	1341/1441
Barometric pressure..(IN.HG)	29.24	29.24	29.24
Meter temperature....(DEG-F)	63.62	72.00	66.88
Meter correction coefficient	0.9997	0.9997	0.9997
Volume through gas meter....			
at meter conditions...(CF)	45.470	45.500	45.630
standard conditions (DSCF)	44.997	44.318	44.876
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	9.34	12.12	11.34
Volumetric flow rate (DSCFM)	12735	11663	11906
Phenol in sample.....(uG)	840.00<	840.00<	840.00<
Phenol concentration.....			
(GR/10^{3}DSCF).....	0.2880<	0.2925<	0.2888<
(uG/DSCM).....	659.72<	669.83<	661.50<
(PPB-DRY).....	168.58<	171.17<	169.04<
(PPB-WET).....	152.84<	150.42<	149.87<
Phenol emis. rate(10^{-3}LB/HR)	31.440<	29.235<	29.473<

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Analysis performed according to NIOSH Method 3502

3.9 Results of Benzene Determinations

Test No. 5
Dryer RTO Stack

Results of Benzene Determinations——————————Method18

	Run 1	Run 2	Run 3
Date of run	2-20-96	2-20-96	2-20-96
Time run start/end (HRS)	0950-1050	1149-1249	1320-1420
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	22.29	23.60	23.48
Oxygen content (%V/V)	16.2	16.9	16.3
Volumetric flow rate (DSCFM)	71993	70905	71496
Benzene concentration (ppm,d)	0.074	0.084	0.086
Benzene emission rate (LB/HR)	0.065	0.072	0.075

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Hayward, Wisconsin

Test No. 15
Line 1 Thermal Oil Heater Stack

Results of Benzene Determinations——————————————Method18

	Run 1	Run 2	Run 3
Date of run	2-22-96	2-22-96	2-22-96
Time run start/end (HRS)	0900-1005	1053-1157	1303-1406
Total sampling time (MIN)	60	60	60
Moisture content (%V/V)	9.34	12.12	11.34
Oxygen content (%V/V)	14.6	12.1	12.6
Volumetric flow rate (DSCFM)	12735	11663	11906
Benzene concentration (ppm,d)	< 0.012	< 0.011	< 0.012
Benzene emission rate (LB/HR)	< 0.0019	< 0.0015	< 0.0017

3.10 PAH Sampling Data

Test No. 4
Dryer RTO Stack

Sampling Data for PAH Determinations-------SW846 Method 0010

	Run 1	Run 2	Run 3
Date of run	02-21-96	02-22-96	02-22-96
Time run start/end.....(HRS)	1730/2037	800/1102	1300/1556
Static pressure.....(IN.WC)	-0.72	-0.72	-0.72
Cross sectional area (SQ.FT)	36.23	36.23	36.23
Pitot tube coefficient.....	0.840	0.840	0.840
Water in sample gas			
condenser.....(ML)	661.0	660.0	699.0
impingers.....(GRAMS)	0.0	0.0	0.0
desiccant.....(GRAMS)	37.0	28.0	37.0
total.....(GRAMS)	698.0	688.0	736.0
Gas meter coefficient.....	1.0004	1.0004	1.0004
Barometric pressure..(IN.HG)	29.03	29.01	29.01
Avg. orif.pres.drop..(IN.WC)	1.59	1.62	1.65
Avg. gas meter temp..(DEF-F)	61.6	74.4	76.5
Volume through gas meter....			
at meter conditions...(CF)	114.85	117.34	118.39
standard conditions.(DSCF)	113.26	112.87	113.44
standard conditions..(NM^3)	3.207	3.196	3.212
Total sampling time....(MIN)	168.00	168.00	168.00
Nozzle diameter.....(IN)	.247	.247	.247
Avg.stack gas temp ..(DEG-F)	255	259	258
Volumetric flow rate.....			
actual.....(ACFM)	132019	132044	133239
dry standard.....(DSCFM)	73160	72971	72600
Isokinetic variation.....(%)	100.4	100.3	101.3

Test No. 14
Line 1 Thermal Oil Heater Stack

Sampling Data for PAH Determinations-------SW846 Method 0010

	Run 1	Run 2	Run 3
Date of run	02-20-96	02-21-96	02-21-96
Time run start/end.....(HRS)	1550/1905	835/1130	1329/1618
Static pressure.....(IN.WC)	-0.21	-0.21	-0.21
Cross sectional area (SQ.FT)	14.75	14.75	14.75
Pitot tube coefficient.....	0.840	0.840	0.840
Water in sample gas			
condenser.....(ML)	261.0	228.0	198.0
impingers.....(GRAMS)	0.0	0.0	0.0
desiccant.....(GRAMS)	43.0	49.0	57.0
total.....(GRAMS)	304.0	277.0	255.0
Gas meter coefficient.....	0.9985	1.0054	1.0054
Barometric pressure..(IN.HG)	28.48	29.24	29.24
Avg. orif.pres.drop..(IN.WC)	2.28	2.20	2.28
Avg. gas meter temp..(DEF-F)	66.9	64.0	72.5
Volume through gas meter....			
at meter conditions...(CF)	139.45	129.25	132.36
standard conditions.(DSCF)	133.54	128.62	129.64
standard conditions..(NM^3)	3.782	3.642	3.671
Total sampling time....(MIN)	160.00	160.00	160.00
Nozzle diameter.....(IN)	.453	.434	.434
Avg.stack gas temp ..(DEG-F)	349	359	378
Volumetric flow rate.....			
actual.....(ACFM)	19376	20449	21001
dry standard.....(DSCFM)	10862	11696	11836
Isokinetic variation.....(%)	101.3	98.7	98.3

3.11 Results of MDI Determinations

Test No. 11
Press Vent RTO Stack

Results of MDI Determinations

	Run 1	Run 2	Run 3
Date of run	2-22-96	2-22-96	2-22-96
Time run start/end . . . . . (HRS)	0800-0913	0940-1052	1117-1229
Static Pressure . . . . . (IN.WC)	-0.49	-0.49	-0.49
Cross Sectional area . . . . . (SQ.FT)	31.09	31.09	31.09
Pitot tube coefficient	0.840	0.840	0.840
Water in sample gas			
condenser . . . . . (ML)	0.0	39.0	41.0
impingers . . . . . (GRAMS)	-37.0	-39.0	-39.0
desiccant . . . . . (GRAMS)	63.0	11.0	13.0
total . . . . . (GRAMS)	26.0	11.0	15.0
MDI in sample . . . . . (ug)	< 6.2	< 6.2	< 6.2
Gas meter coefficient	1.0051	1.0051	1.0051
Barometric pressure . . . . . (IN.HG)	28.91	28.91	28.91
Avg. orif.pres.drop . . . . . (IN.WC)	0.73	0.70	0.75
Avg. gas meter temp . . . . . (DEG-F)	75.1	87.2	93.6
Volume through gas meter			
at meter conditions . . . . . (CF)	33.88	33.80	34.91
standard conditions . . . . . (DSCF)	32.51	31.72	32.38
Total sampling time . . . . . (MIN)	70.00	70.00	70.00
Nozzle diameter . . . . . (IN)	0.187	0.187	0.187
Avg.stack gas temp . . . . . (DEG-F)	234	233	234
Volumetric flow rate			
actual . . . . . (ACFM)	105479	103456	104584
dry standard . . . . . (DSCFM)	74678	74857	75110
Isokinetic variation . . . . . (%)	101.4	98.7	100.5
MDI Concentration . . . . . (ppm,d)	< 0.00065	< 0.00066	< 0.00065
MDI Emission Rate . . . . . (LB/HR)	< 0.0019	< 0.0019	< 0.0019

APPENDIX A

RESULTS OF VOLUMETRIC FLOW RATE DETERMINATIONS

Test No. 1
Dryer RTO Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	02-20-96
Time of Determination.....(HRS)	806
Barometric pressure.....(IN.HG)	28.48
Pitot tube coefficient.....	.84
Number of sampling ports.....	1
Total number of points.....	8
Shape of duct.....	Round
Stack diameter.....(IN)	81.5
Duct area.....(SQ.FT)	36.23
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.62
Avg. gas temp.....(DEG-F)	242
Moisture content.....(% V/V)	23.00
Avg. linear velocity.....(FT/SEC)	60.0
Gas density.....(LB/ACF)	.04959
Molecular weight.....(LB/LBMOLE)	29.32
Mass flow of gas.....(LB/HR)	388023
Volumetric flow rate.....	
actual.....(ACFM)	130405
dry standard.....(DSCFM)	71774

Test No. 3
Dryer RTO Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	02-20-96
Time of Determination.....(HRS)	1532
Barometric pressure.....(IN.HG)	28.68
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	16
Shape of duct.....	Round
Stack diameter.....(IN)	81.5
Duct area.....(SQ.FT)	36.23
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.81
Avg. gas temp.....(DEG-F)	260
Moisture content.....(% V/V)	23.69
Avg. linear velocity.....(FT/SEC)	59.3
Gas density.....(LB/ACF)	.04854
Molecular weight.....(LB/LBMOLE)	29.33
Mass flow of gas.....(LB/HR)	375533
Volumetric flow rate.....	
actual.....(ACFM)	128935
dry standard.....(DSCFM)	69019

Test No. 3
Dryer RTO Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	02-20-96
Time of Determination.....(HRS)	1753
Barometric pressure.....(IN.HG)	28.68
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	16
Shape of duct.....	Round
Stack diameter.....(IN)	81.5
Duct area.....(SQ.FT)	36.23
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.84
Avg. gas temp.....(DEG-F)	260
Moisture content.....(% V/V)	23.80
Avg. linear velocity.....(FT/SEC)	59.4
Gas density.....(LB/ACF)	.04853
Molecular weight.....(LB/LBMOLE)	29.34
Mass flow of gas.....(LB/HR)	376235
Volumetric flow rate.....	
actual.....(ACFM)	129203
dry standard.....(DSCFM)	69057

Test No. 7
Line 1 Core Dryer Duct

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	02-20-96
Time of Determination.....(HRS)	950
Barometric pressure.....(IN.HG)	28.48
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	12
Shape of duct.....	Round
Stack diameter.....(IN)	42
Duct area.....(SQ.FT)	9.62
Direction of flow.....	UP
Static pressure.....(IN.WC)	-8
Avg. gas temp.....(DEG-F)	216
Moisture content.....(% V/V)	27.75
Avg. linear velocity.....(FT/SEC)	73.3
Gas density.....(LB/ACF)	.04958
Molecular weight.....(LB/LBMOLE)	29.38
Mass flow of gas.....(LB/HR)	125834
Volumetric flow rate.....	
actual.....(ACFM)	42299
dry standard.....(DSCFM)	22252

Test No. 7
Line 1 Core Dryer Duct

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	02-20-96
Time of Determination.....(HRS)	1140
Barometric pressure.....(IN.HG)	28.48
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	12
Shape of duct.....	Round
Stack diameter.....(IN)	42
Duct area.....(SQ.FT)	9.62
Direction of flow.....	UP
Static pressure.....(IN.WC)	-8.7
Avg. gas temp.....(DEG-F)	223
Moisture content.....(% V/V)	21.64
Avg. linear velocity.....(FT/SEC)	72.3
Gas density.....(LB/ACF)	.05030
Molecular weight.....(LB/LBMOLE)	29.39
Mass flow of gas.....(LB/HR)	125932
Volumetric flow rate.....	
actual.....(ACFM)	41727
dry standard.....(DSCFM)	23520

Test No. 7
Line 1 Core Dryer Duct

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	02-20-96
Time of Determination.....(HRS)	1320
Barometric pressure.....(IN.HG)	28.48
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	12
Shape of duct.....	Round
Stack diameter.....(IN)	42
Duct area.....(SQ.FT)	9.62
Direction of flow.....	UP
Static pressure.....(IN.WC)	-9
Avg. gas temp.....(DEG-F)	250
Moisture content.....(% V/V)	28.00
Avg. linear velocity.....(FT/SEC)	77.3
Gas density.....(LB/ACF)	.04707
Molecular weight.....(LB/LBMOLE)	29.41
Mass flow of gas.....(LB/HR)	126023
Volumetric flow rate.....	
actual.....(ACFM)	44627
dry standard.....(DSCFM)	22216

Test No. 8
Line 1 Surface Dryer Duct

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	02-20-96
Time of Determination.....(HRS)	950
Barometric pressure.....(IN.HG)	28.48
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	12
Shape of duct.....	Round
Stack diameter.....(IN)	42
Duct area.....(SQ.FT)	9.62
Direction of flow.....	UP
Static pressure.....(IN.WC)	-9.5
Avg. gas temp.....(DEG-F)	210
Moisture content.....(% V/V)	30.84
Avg. linear velocity.....(FT/SEC)	73.5
Gas density.....(LB/ACF)	.04916
Molecular weight.....(LB/LBMOLE)	29.38
Mass flow of gas.....(LB/HR)	125186
Volumetric flow rate.....	
actual.....(ACFM)	42442
dry standard.....(DSCFM)	21479

Test No. 8
Line 1 Surface Dryer Duct

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	02-20-96
Time of Determination.....(HRS)	1140
Barometric pressure.....(IN.HG)	28.48
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	12
Shape of duct.....	Round
Stack diameter.....(IN)	42
Duct area.....(SQ.FT)	9.62
Direction of flow.....	UP
Static pressure.....(IN.WC)	-9.5
Avg. gas temp.....(DEG-F)	224
Moisture content.....(% V/V)	30.87
Avg. linear velocity.....(FT/SEC)	77.6
Gas density.....(LB/ACF)	.04816
Molecular weight.....(LB/LBMOLE)	29.39
Mass flow of gas.....(LB/HR)	129444
Volumetric flow rate.....	
actual.....(ACFM)	44793
dry standard.....(DSCFM)	22195

Test No. 8
Line 1 Surface Dryer Duct

Results of Volumetric Flow Rate Determination--------Method 2

Date of Determination.....	02-20-96
Time of Determination.....(HRS)	1320
Barometric pressure.....(IN.HG)	28.48
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	12
Shape of duct.....	Round
Stack diameter.....(IN)	42
Duct area.....(SQ.FT)	9.62
Direction of flow.....	UP
Static pressure.....(IN.WC)	-9.5
Avg. gas temp.....(DEG-F)	232
Moisture content.....(% V/V)	31.01
Avg. linear velocity.....(FT/SEC)	74.8
Gas density.....(LB/ACF)	.04759
Molecular weight.....(LB/LBMOLE)	29.41
Mass flow of gas.....(LB/HR)	123320
Volumetric flow rate.....	
actual.....(ACFM)	43184
dry standard.....(DSCFM)	21107

Test No. 9
Press Vent RTO Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	02-21-96
Time of Determination.....(HRS)	800
Barometric pressure.....(IN.HG)	29.24
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	20
Shape of duct.....	Round
Stack diameter.....(IN)	75.5
Duct area.....(SQ.FT)	31.09
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.48
Avg. gas temp.....(DEG-F)	245
Moisture content.....(% V/V)	1.81
Avg. linear velocity.....(FT/SEC)	53.9
Gas density.....(LB/ACF)	.05438
Molecular weight.....(LB/LBMOLE)	28.84
Mass flow of gas.....(LB/HR)	327849
Volumetric flow rate.....	
actual.....(ACFM)	100483
dry standard.....(DSCFM)	72126

Test No. 13
Line 1 Press RTO Inlet

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	02-21-96
Time of Determination.....(HRS)	1215
Barometric pressure.....(IN.HG)	29.24
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	53.125
Duct area.....(SQ.FT)	15.39
Direction of flow.....	UP
Static pressure.....(IN.WC)	-6
Avg. gas temp.....(DEG-F)	115
Moisture content.....(% V/V)	1.26
Avg. linear velocity.....(FT/SEC)	91.9
Gas density.....(LB/ACF)	.06593
Molecular weight.....(LB/LBMOLE)	28.86
Mass flow of gas.....(LB/HR)	335699
Volumetric flow rate.....	
actual.....(ACFM)	84866
dry standard.....(DSCFM)	74064

Test No. 13
Line 1 Press RTO Inlet

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	02-21-96
Time of Determination.....(HRS)	1400
Barometric pressure.....(IN.HG)	29.24
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	53.125
Duct area.....(SQ.FT)	15.39
Direction of flow.....	UP
Static pressure.....(IN.WC)	-6
Avg. gas temp.....(DEG-F)	113
Moisture content.....(% V/V)	1.25
Avg. linear velocity.....(FT/SEC)	92.5
Gas density.....(LB/ACF)	.06617
Molecular weight.....(LB/LBMOLE)	28.86
Mass flow of gas.....(LB/HR)	339001
Volumetric flow rate.....	
actual.....(ACFM)	85388
dry standard.....(DSCFM)	74787

Test No. 13
Line 1 Press RTO Inlet

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	02-21-96
Time of Determination.....(HRS)	1535
Barometric pressure.....(IN.HG)	29.24
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	53.125
Duct area.....(SQ.FT)	15.39
Direction of flow.....	UP
Static pressure.....(IN.WC)	-6.5
Avg. gas temp.....(DEG-F)	111
Moisture content.....(% V/V)	1.28
Avg. linear velocity.....(FT/SEC)	91.4
Gas density.....(LB/ACF)	.06632
Molecular weight.....(LB/LBMOLE)	28.87
Mass flow of gas.....(LB/HR)	335830
Volumetric flow rate.....	
actual.....(ACFM)	84400
dry standard.....(DSCFM)	74063

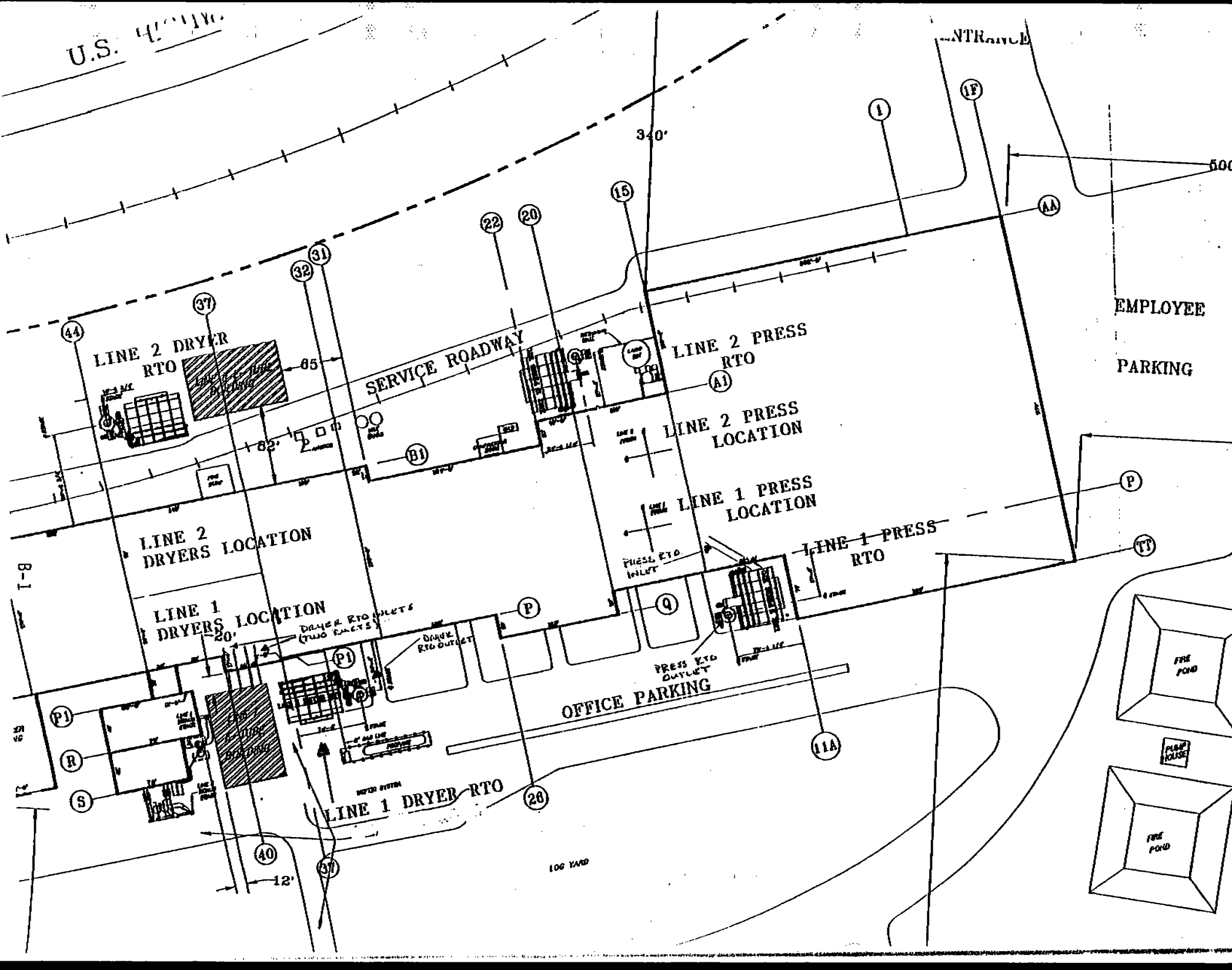
Test No. 14
Line 1 Thermal Oil Heater Stack

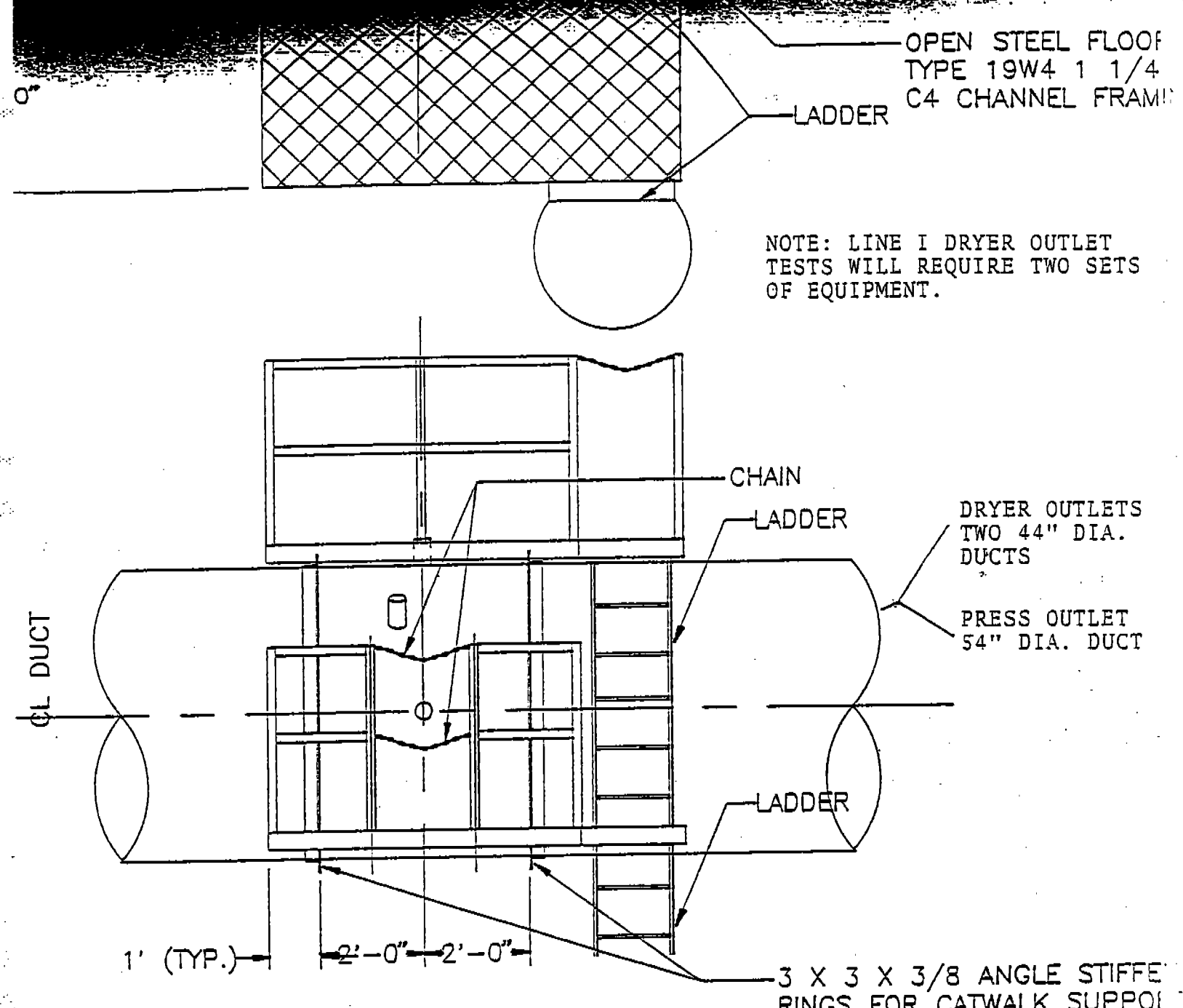
Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	02-20-96
Time of Determination.....(HRS)	1545
Barometric pressure.....(IN.HG)	29.24
Pitot tube coefficient.....	.84
Number of sampling ports.....	1
Total number of points.....	10
Shape of duct.....	Round
Stack diameter.....(IN)	52
Duct area.....(SQ.FT)	14.75
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.21
Avg. gas temp.....(DEG-F)	349
Moisture content.....(% V/V)	9.70
Avg. linear velocity.....(FT/SEC)	22.3
Gas density.....(LB/ACF)	.04745
Molecular weight.....(LB/LBMOLE)	29.81
Mass flow of gas.....(LB/HR)	56140
Volumetric flow rate.....	
actual.....(ACFM)	19719
dry standard.....(DSCFM)	11351

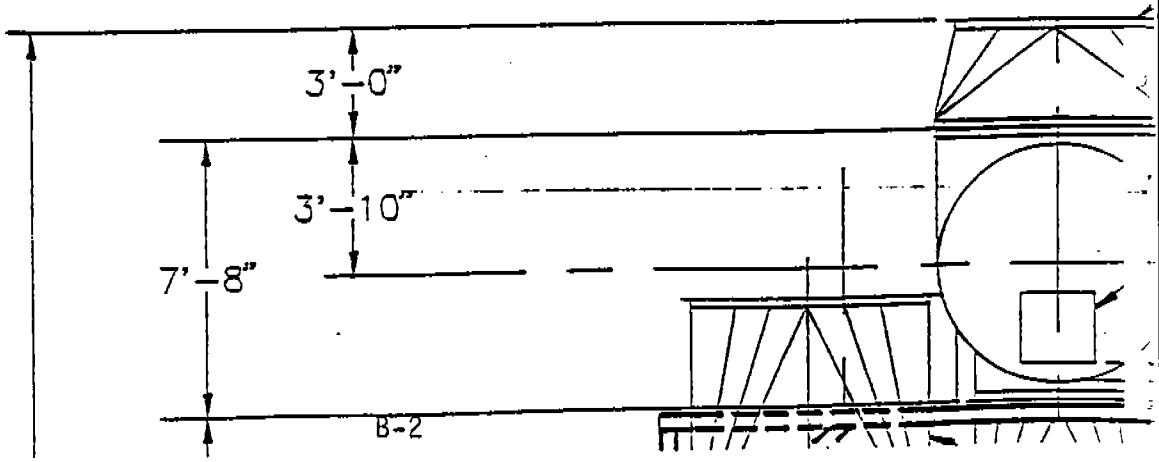
APPENDIX B

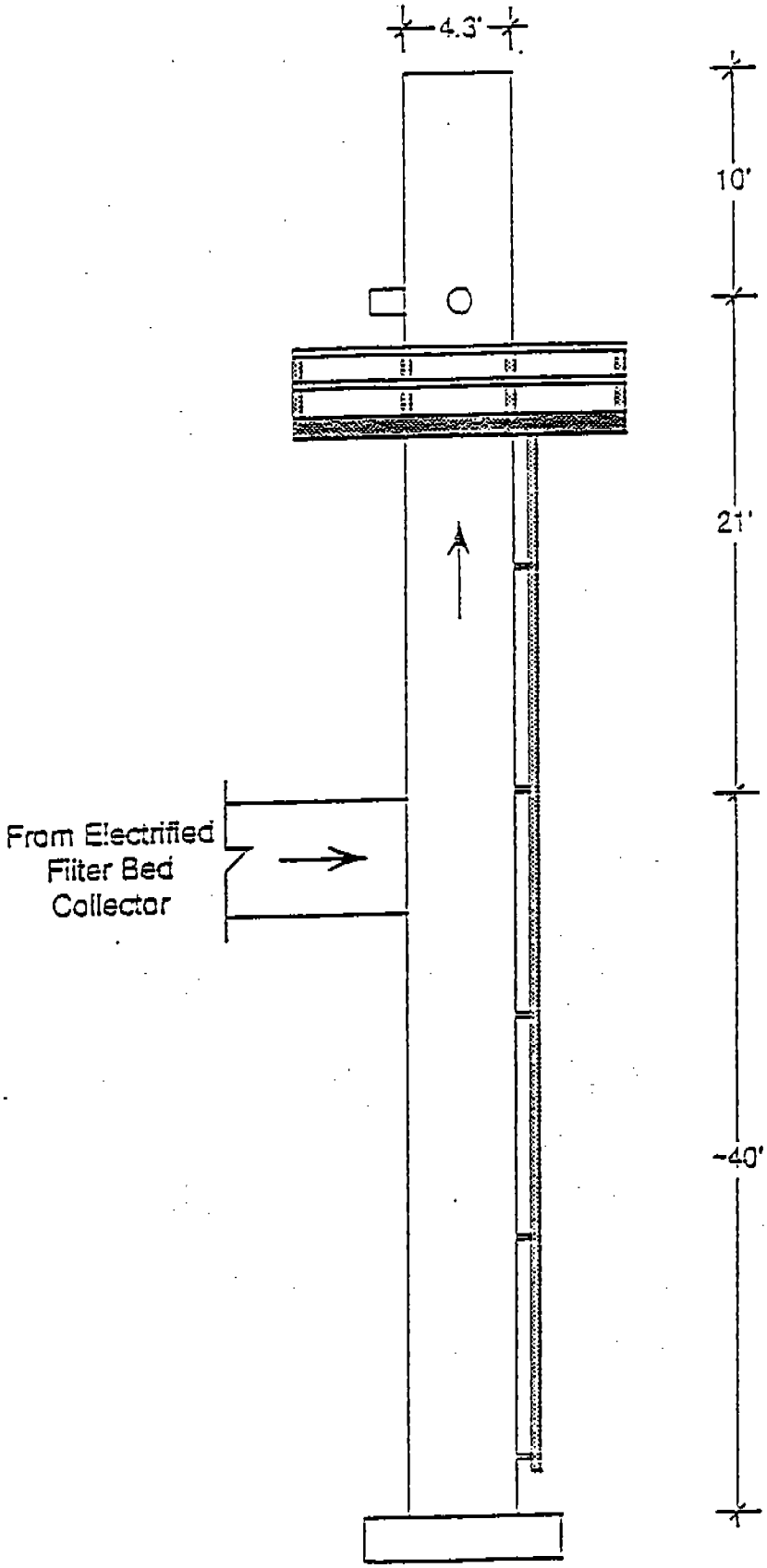
LOCATION OF TEST PORTS


U.S.
ENTRANCE
340'
500
1F
1
15
AA
22
20
31
32
37
44
LINE 2 DRYER RTO
65'
SERVICE ROADWAY
LINE 2 PRESS RTO
A1
EMPLOYEE PARKING
82'
B1
LINE 2 PRESS LOCATION
LINE 1 PRESS LOCATION
P
LINE 2 DRYERS LOCATION
LINE 1 PRESS RTO
TT
PRESS RTO INLET
LINE 1 DRYERS LOCATION
20'
DRYER RTO OUTLETS (TWO FACETS)
P1
DRYER RTO OUTLET
Q
PRESS RTO OUTLET
OFFICE PARKING
R
S
11A
LINE 1 DRYER RTO
26
40
37
12'
LOG YARD
FIRE POND
PUMP HOUSE
FIRE POND
B-1

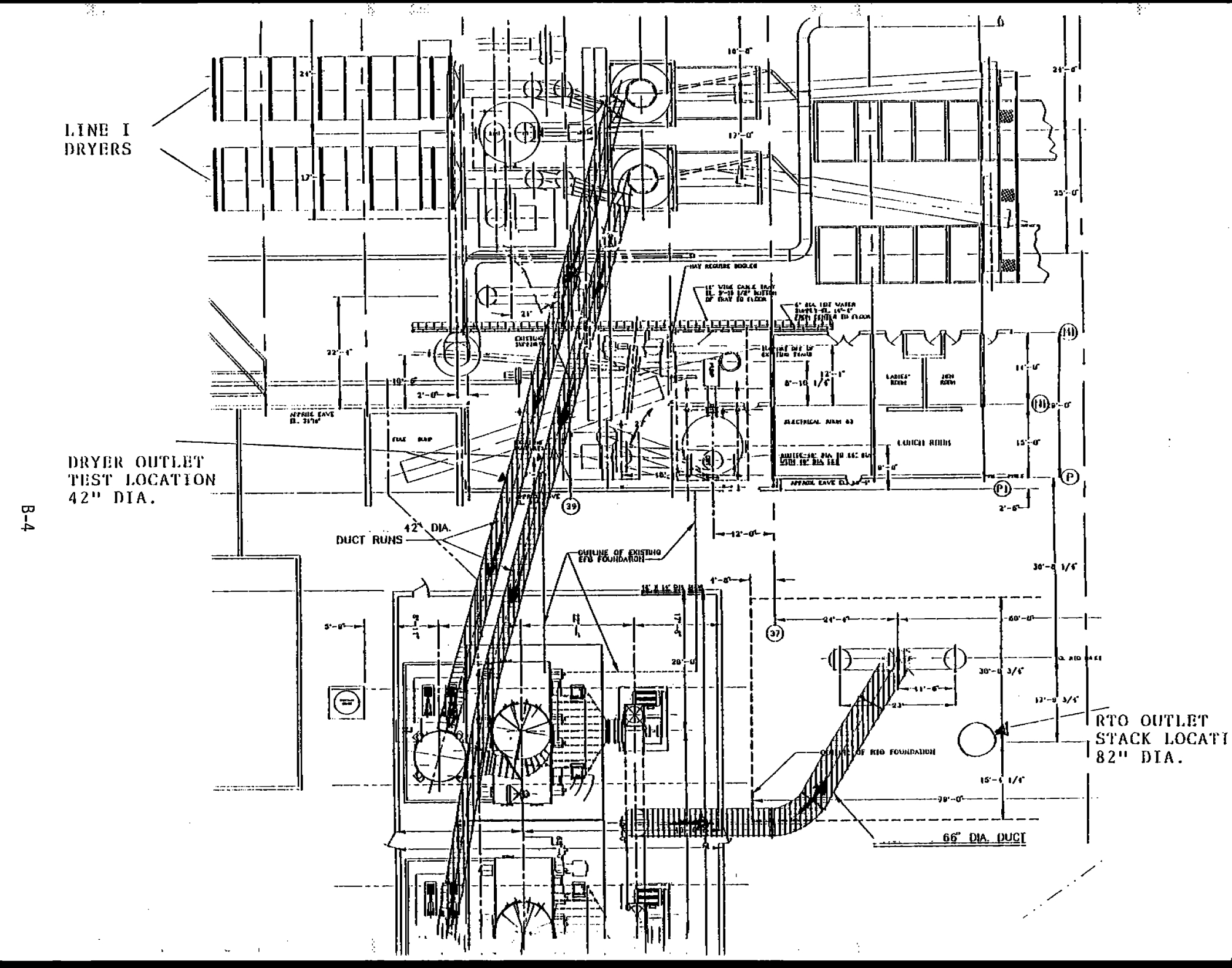


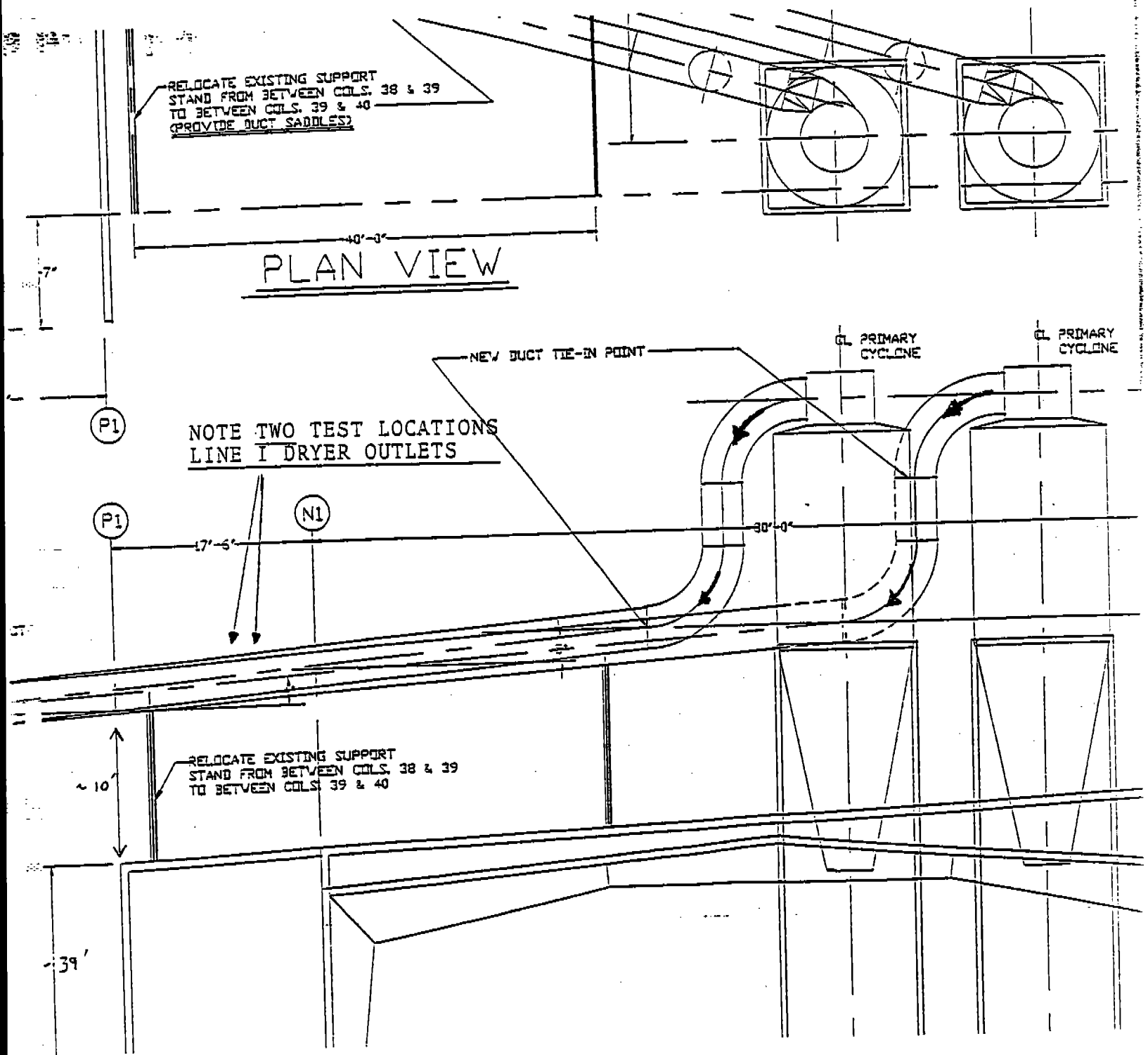
TYPICAL TEST PORT PLATFORM

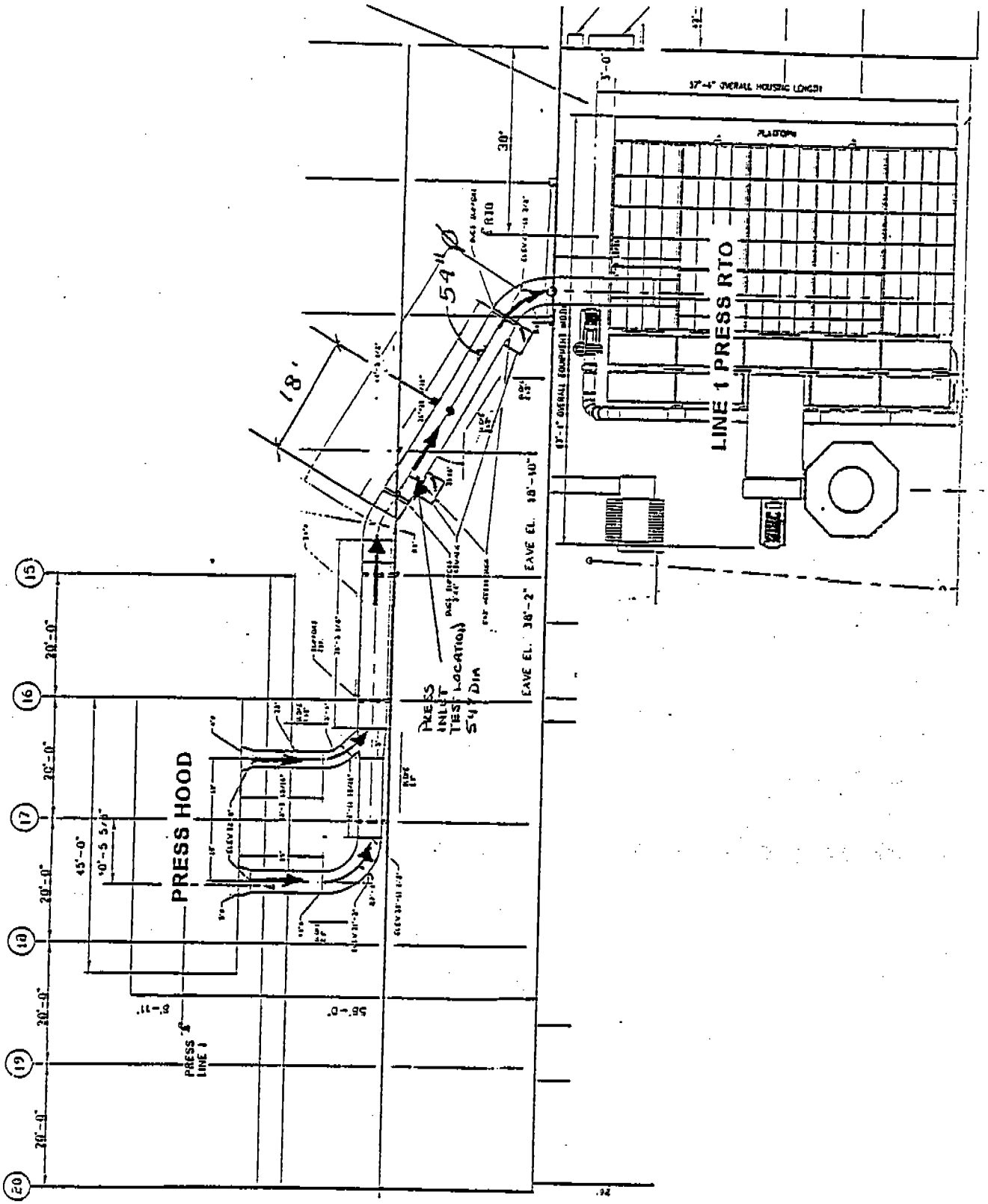




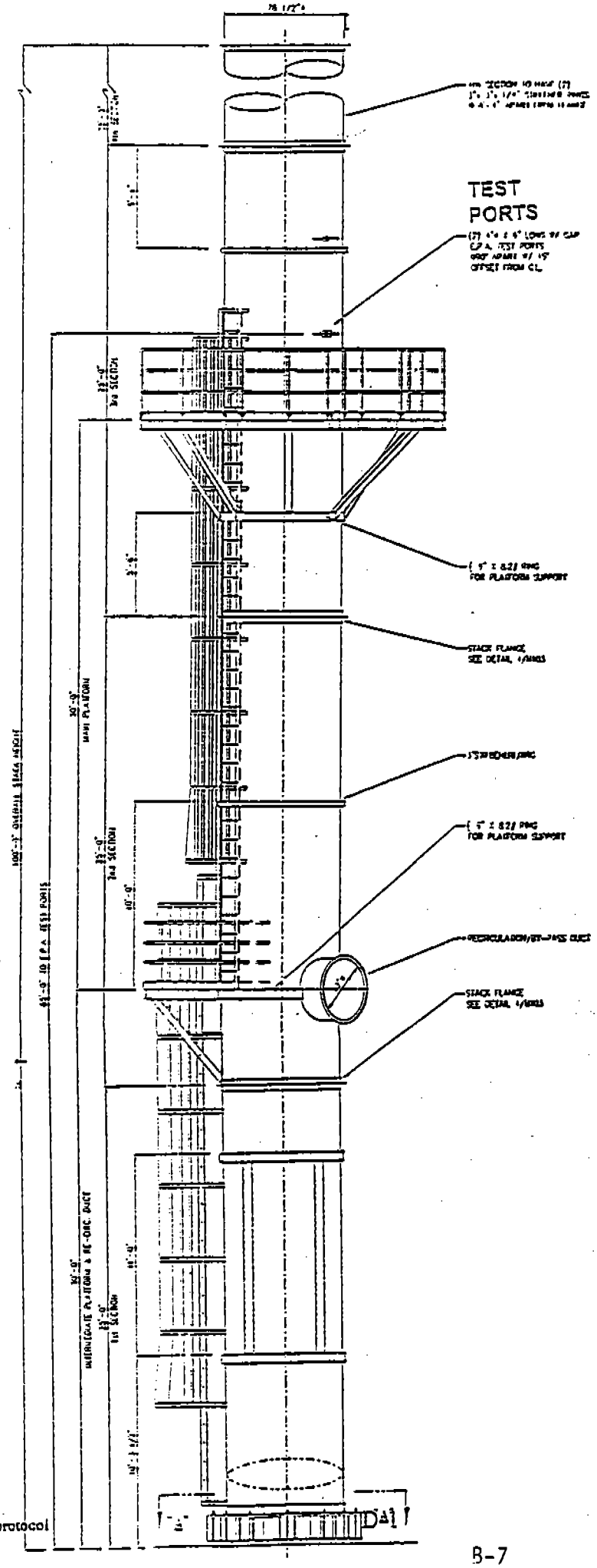
HAYWARD, WI
DRAWING 10
LINE 1
THERMAL OIL HEATER
STACK
ELEVATION


LINE I
DRYERS
DRYER OUTLET
TEST LOCATION
42" DIA.
42" DIA.
DUCT RUNS
OUTLINE OF EXISTING
EFB FOUNDATION
OUTLINE OF RTO FOUNDATION
66" DIA. DUCT
RTO OUTLET
STACK LOCATI
82" DIA.

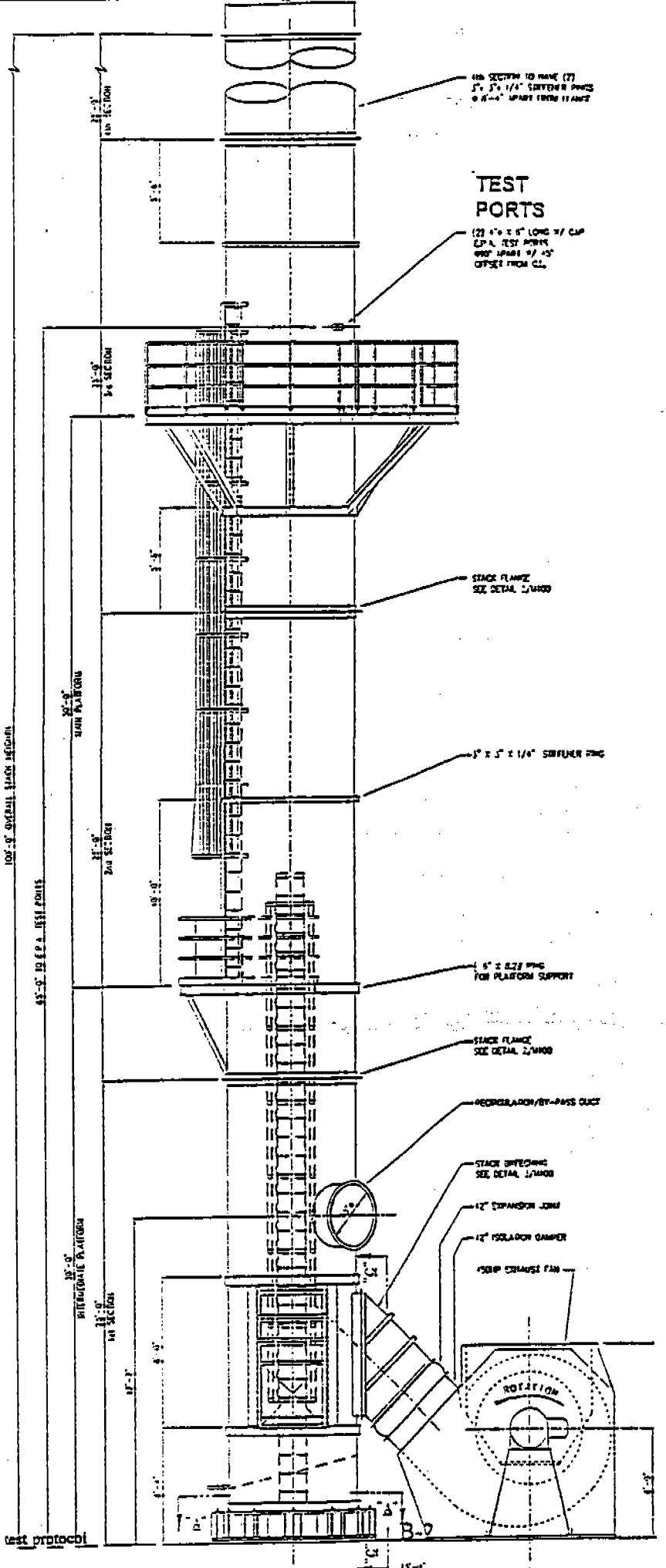

RELOCATE EXISTING SUPPORT
STAND FROM BETWEEN COLS. 38 & 39
TO BETWEEN COLS. 39 & 40
(PROVIDE DUCT SADDLES)
40'-0"
PLAN VIEW
7'
P1
NOTE TWO TEST LOCATIONS
LINE 1 DRYER OUTLETS
P1
N1
17'-6"
30'-0"
NEW DUCT TIE-IN POINT
℄ PRIMARY CYCLONE
℄ PRIMARY CYCLONE
RELOCATE EXISTING SUPPORT
STAND FROM BETWEEN COLS. 38 & 39
TO BETWEEN COLS. 39 & 40
~ 10'
39'



HAYWARD, DRAWING 8
GAS FLOW FRO
LINE 1 PRESS
TO RTO
PLAN



HAYWARD, WI
DRAWING 7
PRESS RTO STACK
TYPICAL FOR BOTH LINES
ELEVATION



Hayward test protocol

HAYWARD, WI
DRAWING 2
DRYER RTO STACK
(TYPICAL FOR BOTH LINES)
ELEVATION

APPENDIX C

FIELD DATA SHEETS

TABLE OF CONTENTS

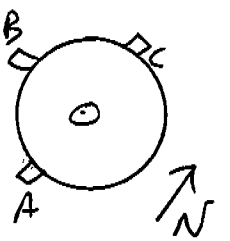
Dryer RTO Stack 1
Line 1 Core Dryer Duct 38
Line 1 Surface Dryer Duct 44
Press Vent RTO Stack 50
Line 1 Press RTO Inlet 72
Line 1 Thermal Oil Heater Stack 78
VE Observer Certification Sheet 112

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: L.P. Hayward
Source: Dryer RTO / Stack
Test: 1 Run: 0 Date: 2-20-96
Stack Dimen.: 81.5 IN.
Dry Bulb: ____ °F Wet bulb: ____ °F
Manometer: ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 28.48 IN.HG
Static Pressure: -.62 IN.WC
Operators: E. Jurs + J Lorenz
Pitot No.: 29V-8 C_p: .840

Drawing of Test Site

Cross-section View	Elevation View
	

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 6.25 IN.		Time Start: 0806 HRS	
A 1	.072	2.61	8.85	.62	
2	.105	3.56	14.8	.77	
3	.194	15.81	22.06	.78	
4	.323	26.32	32.51	.77	
5	.677	55.17	61.42	.76	
6	.806	65.68	71.93	.79	
7	.895	72.94	79.19	.79	
8	.968	78.89	85.14	.77	242
B 1					
2					
3					
4					
5					
6					
7					
8					

Temp. Meas. Device & S/N: PDT 42
Time End: 0810 HRS

R or nothing = reg. manometer; S = expanded; E = electronic

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. /Hayward
Source Dryer RTO /stack
Method 5 Filter holder: Glass

Date 2-20-96 Test 1 Run 1
No. of traverse points 16
Filter type: 4" 6F Filter

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 8 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used: 2352

Recovery solvent(s)
☑ Acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: EJ

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	744	496	248
Impinger No. 3			
Condenser			
Desiccant	1481	1469	12
Total			260

Integrated Gas Sampling Data:

Bag Pump No. 29A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 0950
Sampling rate: 400

Box No. 5 Bag No. 1
Size: 44 L
cc/min at 22 IN.HG
(HRS) Time end: 1057 (HRS)
cc/min Operator: EJ

S/N of O_2 Analyzer used to monitor train outlet: 36A

052394-C:\STACK\WP\FORMS\S-0046RR

EPA Method 5 Field Data Sheet

Job: L.P. / Hayward
Source: Dryer RTO / Stack
Date: 2-20-96 Test: 1 Run: 1

Operators: ES JL
Meter Box No.: 10 ΔH@: 1.95 in.WC
Gasmeter Coeff.: 1.0004

Nozzle No.: 3-4
Nozzle Dia.: .247 in.
Bar. Press.: 28.48 in.Hg

Pitot No.: 445-B
C_p: .840
H_2O: 21 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	(0950)	(704.80)											
A 8	4	707.49	.73	1.50	7.44	5	257	274	259	39	47	47	17.5
7	8	710.11	.79	1.63	0.19	5	248				57	53	17.0
6	12	712.93	.81	1.71	3.02	6	245	264	261	43	64	63	17.5
5	16	715.65	.73	1.51	5.71	5	261				67	53	17.7
4	20	718.40	.78	1.63	8.49	5	258	260	266	47	70	54	17.6
3	24	721.17	.77	1.61	1.26	5	261				71	55	17.6
2	28	723.96	.78	1.62	4.04	5	267	272	257	50	74	56	17.9
1	32	726.59	.68	1.43	6.67	5	259				75	57	17.5
B 8	36	729.39	.79	1.66	9.50	5	260	268	255	47	73	58	17.6
7	40	732.33	.85	1.79	2.43	6	261				77	58	17.7
6	44	735.31	.84	1.75	5.34	6	268	232	235	49	80	63	17.6
5	48	738.25	.81	1.71	8.22	6	265				80	62	17.8
4	52	740.05	.74	1.57	0.98	5	262	231	225	46	81	64	17.9
3	56	743.89	.77	1.66	3.83	5	251				82	65	17.9
2	60	746.61	.72	1.55	6.58	5	256	235	226	47	84	66	17.8
1	64	749.30	.67	1.46	9.25	5	249				86	68	
	(1057)												
	0-64	V_m = 44.50		1.61 ΔH =							Avg. = 65.6		

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Hayward
Source Dryer RTO /Stack
Method 5 Filter holder: Glass

Date 2-20-96 Test 1 Run 2
No. of traverse points 16
Filter type: 4" G.F

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 10 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used: 8353

Recovery solvent(s)
☒ Acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: EJ

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	766	500	266
Impinger No. 3			
Condenser			
Desiccant	1461	1450	11
Total			277

Integrated Gas Sampling Data:

Bag Pump No. 29 A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1140
Sampling rate: 400

Box No. 5 Bag No. 2
Size: 44 L
cc/min at 22 IN.HG
(HRS) Time end: 1248 (HRS)
cc/min Operator: EJ

S/N of O_2 Analyzer used to monitor train outlet: 36A

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(312) [illegible]-602

EPA Method 5 [illegible]ld Data Sheet

Job: L.P. Hayward
Source: DRyer RTO / Stack
Date: 2-20-96 Test 1 Run 2

Operators: EJ JL
Meter Box No. 10 ΔH@ 1.95 in.WC
Gasmeter Coeff.: 1.0004

Nozzle No. 3-4
Nozzle Dia. .247 in.
Bar. Press. 28.48 in.Hg

Pitot No. AMS-2
C_p .840
H_2O 22 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	(1140)	(750.50											
B 8	4	753.30	.79	1.61	3.28	5	268	230	228	44	65	65	18.0
7	8	756.08	.80	1.65	6.09	5	258				67	63	18.0
6	12	758.84	.80	1.64	8.90	5	262	238	231	45	69	61	18.0
5	16	761.59	.77	1.58	1.65	5	264				78	61	17.9
4	20	764.33	.73	1.50	4.34	5	263	242	229	49	72	60	17.8
3	24	767.06	.74	1.53	7.06	5	256				75	62	18.0
2	28	769.73	.70	1.43	9.69	5	272	240	227	46	75	61	18.4
1	32	772.28	.65	1.33	2.22	4.5	271				76	61	18.9
A 8	36	775.16	.82	1.70	5.09	5	261	242	229	45	72	61	18.8
7	40	778.03	.85	1.79	8.02	6	247				77	61	18.6
6	44	780.88	.79	1.64	0.84	5	258	271	231	49	79	63	18.8
5	48	783.68	.80	1.64	3.67	5	269				79	63	18.9
4	52	786.47	.79	1.61	6.46	5	275	273	238	51	81	64	18.8
3	56	789.31	.81	1.68	9.32	5	265				81	64	18.8
2	60	792.14	.75	1.57	2.09	5	260	270	231	51	82	65	18.9
1	64	794.81	.70	1.47	4.77	5	258				83	66	19.0
	(1148)												
	0 - 64	V_m = 44.30		ΔH = 1.59							Avg. = 68.9		

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job C.P. Hayward
Source Dryer RTO /Stack
Method 5 Filter holder: Glass

Date 2-20-96 Test 1 Run 3
No. of traverse points 16
Filter type: 4" GFF

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 7 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used:

8354

Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: EJ

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	757	496	261
Impinger No. 3			
Condenser			
Desiccant	1494	1481	13
Total			274

Integrated Gas Sampling Data:

Bag Pump No. 29A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1320
Sampling rate: 400

Box No. 5 Bag No. 3
Size: 44 L
cc/min at 22 IN.HG
(HRS) Time end: 1430 (HRS)
cc/min Operator: EJ

S/N of O_2 Analyzer used to monitor train outlet: 36A

052394-G:\STACK\WP\FORMS\S-0046RR

(612) 460-2...

EPA Method 5 ..eld Data Sheet

Job: C.P. Hayward
Source: Dryer RTO/ stack
Date: 2-20-96 Test: 1 Run: 3

Operators: EJ JL
Meter Box No.: 10 ΔH@ 1.95 in.WC
Gasmeter Coeff.: 1.0004

Nozzle No.: 3-4
Nozzle Dia.: .247 in.
Bar. Press.: 28.48 in.Hg

Pitot No.: 945-8
C_p: .840
H_2O: 23.5 %

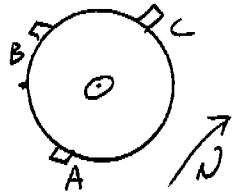
Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	(1320)	(795.10)											
8	4	797.81	.75	1.50	7.79	5	263	232	229	45	66	66	18.9
7	8	800.55	.82	1.58	0.55	5	284				69	65	19.2
6	12	803.35	.84	1.66	3.38	5	269	254	236	50	73	64	19.2
5	16	806.18	.81	1.71	6.25	5	251				76	65	19.3
4	20	808.91	.78	1.56	9.00	5	265	272	227	49	77	66	19.0
3	24	811.64	.79	1.60	1.80	5	256				78	66	19.2
2	28	814.51	.81	1.66	4.63	6	251	269	231	50	78	65	19.3
1	32	817.26	.75	1.53	7.37	5	251				80	65	19.1
8	36	820.19	.81	1.65	0.20	5.5	265	271	239	49	78	67	19.2
7	40	823.03	.82	1.65	3.03	6	265				83	68	19.1
6	44	825.83	.81	1.66	5.88	6	298	237	244	46	83	68	19.3
5	48	828.67	.79	1.64	8.72	6	244				84	68	
4	52	831.44	.70	1.45	1.38	5	247	247	230	47	85	69	
3	56	834.15	.73	1.50	4.10	5	252				85	70	
2	60	836.85	.73	1.49	6.81	5	259	249	236	46	86	70	
1	64	839.57	.63	1.31	9.35	5	249				87	71	
	(1430)												
	θ = 64	V_m = 44.47		1.57 ΔH =							Avg. = 73.1		

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: L.P. Hayward
Source: Dryer RTO / Stack
Test: 2 Run: 0 Date: 2-21-96
Stack Dimen.: 81.5 IN.
Dry Bulb: ____ °F Wet bulb: ____ °F
Manometer: ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 29.24 IN.HG
Static Pressure: -.72 IN.WC
Operators: E. Juers + J. Lorenz
Pitot No.: rins V-S C_p .840

Drawing of Test Site

Cross-section View	Elevation View
	

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 6.25 IN.		Time Start:	HRS
A 1	.072	2.61	8.85		
2	.105	8.56	14.8		
3	.194	15.81	22.06		
4	.323	2632	3251		
5	.677	55.17	61.42		
6	.806	65.68	71.93		
7	.895	72.94	79.19		
8	.968	7889	85.14		
B 1					
2					
3					
4					
5					
6					
7					
8					

Temp. Meas. Device & S/N: PBT 42 + 47
Time End: H.

R or nothing = reg. manometer; S = expanded; E = electronic

032594-G:\STACK\WP\FORMS\S-392.1

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Hayward
Source Dryer RTO / Stack
Method 0011 Filter holder: —

Date 2-21-96 Test 2 Run 1
No. of traverse points 16
Filter type: —

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 9 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used: —

Recovery solvent(s)
☐ acetone
☑ other(s) MeCl2

No. of probe wash bottles:
Sample recovered by:

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	785	469	316
Impinger No. 3			
Condenser			
Desiccant	1417	1404	13
Total			329

Integrated Gas Sampling Data:

Bag Pump No. 29A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 0830
Sampling rate: 400

Box No. 7 Bag No. 1
Size: 44 L
cc/min at 22 IN.HG
(HRS) Time end: 0938 (HRS)
cc/min Operator: EJ

S/N of O_2 Analyzer used to monitor train outlet: 36A

052394-C:\STACK\WP\FORMS\S-0046RR

(612) 786-6020

EPA Method 5 Field Data Sheet

Job C.P. Hayward
Source Dryer RTO / Stack
Date 7-21-96 Test 2 Run 1

Operators EJ JL
Meter Box No. 10 ΔH@ 1.95 in.WC
Gasmeter Coeff. 1.0004

Nozzle No. Glass
Nozzle Dia. .275 in.
Bar. Press. 29.24 in.Hg

Pitot No. mms1-S
C_p .840
H_2O 23 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	(0830)	(988.00)			1.36	5	250	273	231	39	47	40	17.2
A 8	4	991.32	.82	2.50	4.70	6	250	273	231	36	54	39	17.6
7	8	994.60	.83	2.50	8.10	7	251				57	41	17.9
6	12	998.04	.85	2.57	1.41	6	254	268	239	39	63	43	18.2
5	16	1001.36	.80	2.42	4.70	6	254				65	43	17.8
4	20	1004.74	.78	2.38	8.03	6	265	261	234	43	67	44	17.9
3	24	1008.12	.81	2.43	1.34	6	263				70	46	18.2
2	28	1011.46	.79	2.39	4.59	5.5	259	250	234	47	74	49	18.1
1	32	1014.70	.74	2.28	8.04	6	260				73	54	18.3
B 8	36	1018.17	.85	2.59	1.55	6.5	253	272	231	49	78	54	18.1
7	40	1021.66	.85	2.65	5.04	7	258				80	56	18.0
6	44	1025.16	.84	2.61	8.49	6.5	254	272	229	50	83	59	18.0
5	48	1028.66	.81	2.54	1.78	6	266				83	60	18.3
4	52	1031.96	.74	2.30	5.08	C	255	273	242	49	85	63	18.4
3	56	1035.24	.73	2.30	8.34	6	268				85	63	18.0
2	60	1038.50	.72	2.24	1.49	5	256	272	234	50	85	64	18.0
1	64	1041.71	.68	2.09									
	(0938)												
				2.42									
	θ = 64	V_m = 53.71		ΔTT =							Avg. = 61.4		

INTERPOLL LABORATORIES, INC.
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Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job C.P. Hayward
Source Dryer RTO / stack
Method 0011 Filter holder: —

Date 2-21-96 Test 2 Run 2
No. of traverse points 16
Filter type: —

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 6 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used: —

Recovery solvent(s)
☐ acetone
☒ other(s) meCl2

No. of probe wash bottles: 1 RW., 1 Imp. Rinse
Sample recovered by: EJ

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	785	476	309
Impinger No. 3			
Condenser			
Desiccant	1468	1455	13
Total			322

Integrated Gas Sampling Data:

Bag Pump No. 29A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1020
Sampling rate: 400

Box No. 7 Bag No. 2
Size: 44 L
cc/min at 22 IN.HG
(HRS) Time end: 1127 (HRS)
cc/min Operator: EJ

S/N of O_2 Analyzer used to monitor train outlet: —

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(612) 786-6020

EPA Method 5 Field Data Sheet

Job: LP. Hayward
Source: Dryer RTO /Stack
Date: 2-21-96 Test: 2 Run: 2

Operators: EJ JL
Meter Box No.: 10 ΔH@ 1.95 in.WC
Gasmeter Coeff.: 1.0004

Nozzle No.: Glass
Nozzle Dia.: .275 in.
Bar. Press.: 29.24 in.Hg

Pitot No.: ams-K-8
C_p: .840
H_2O: 23 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	(1020)	(40.60)			6.09	6	254	225	227	49	68	66	18.2
B 8	4	46.06	.85	2.63	9.61	6	262				72	65	18.4
7	8	49.55	.86	2.66	3.18	6.5	250	257	227	47	75	65	18.5
6	12	53.14	.86	2.71	6.72	6.5	249				78	65	18.1
5	16	56.68	.84	2.66	0.05	6	259	271	240	48	79	64	18.3
4	20	60.05	.75	2.35	3.35	6	256				79	64	
3	24	63.39	.73	2.30	6.62	6	259	272	238	49	81	65	
2	28	66.69	.72	2.26	9.79	5	255				82	66	
A 1	32	69.87	.67	2.12	3.32	6	255	262	229	46	78	65	
A 8	36	73.37	.83	2.63	6.78	6	260				81	65	
7	40	76.89	.81	2.53	0.32	6.5	263	270	234	49	84	68	
6	44	80.43	.85	2.66	3.92	7	266				86	69	
5	48	83.99	.87	2.72	7.40	6	259	273	229	50	88	70	
4	52	87.52	.80	2.54	0.92	6	265				88	71	
3	56	90.98	.82	2.58	4.41	6	260	270	231	50	88	72	
2	60	94.44	.80	2.54	7.72	5	260				88	72	
1	64	97.80	.72	2.29									
	(127)												
	0 - 64	V_m - 55.2		2.51 ΔH -							Avg. - 73.9		

O_2 Analyzer cell current bad

INTERPOLL LABORATORIES, INC.
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Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Hayward
Source Dryer RTO/stack
Method 0011 Filter holder: —

Date 2-21-96 Test 2 Run 3
No. of traverse points 16
Filter type: —

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 8 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used: —

Recovery solvent(s)
☐ acetone
☒ other(s) MeCl2

No. of probe wash bottles: 1 P.W, 1 Imp. Rinse
Sample recovered by: EJ JL

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	784	479	305
Impinger No. 3			
Condenser			
Desiccant	1384	1370	14
Total			319

Integrated Gas Sampling Data:

Bag Pump No. 29A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1206
Sampling rate: 400

Box No. 7 Bag No. 3
Size: 44 L
cc/min at 22 IN.HG
(HRS) Time end: 1310 (HRS)
cc/min Operator: EJ

S/N of O_2 Analyzer used to monitor train outlet: 36A

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EPA Method 5 Field Data Sheet

Job: L.P. Hayward
Source: Dryer RTO / stack
Date: 2-21-96 Test: 2 Run: 3

Operators: EJ JL
Meter Box No.: 10 ΔH@ 1.95 in.WC
Gasmeter Coeff.: 1.0004

Nozzle No.: Glass
Nozzle Dia.: .275 in.
Bar. Press.: 29.24 in.Hg

Pitot No.: mms v-8
C_p: .840
H_2O: 22 %

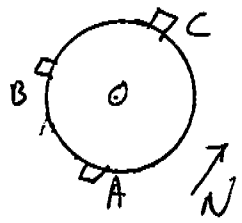
Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	(1205	(98.10			1.64	5	272	260	228	47	67	67	
A 8	4	101.55	.84	2.65			273				68	66	
7	8	105.04	.83	2.58	5.12	6	271	272	232	48	72	66	
6	12	108.54	.82	2.56	8.58	6	256				75	65	
5	16	112.10	.82	2.62	2.09	6	256	256	234	48	76	66	
4	20	115.60	.80	2.56	5.57	6	260				79	68	
3	24	119.11	.81	2.59	9.07	6	266	273	235	52	79	66	
2	28	122.62	.82	2.61	2.59	6	268				79	65	
1	32	125.96	.75	2.38	5.94	5.5	265	267	229	54	80	66	
B 8	36	129.58	.86	2.73	9.53	6.5	261				80	67	
7	40	133.25	.87	2.78	3.16	7	262	270	232	51	81	66	
6	44	136.89	.87	2.76	6.79	7	271				82	67	
5	48	140.35	.78	2.47	0.21	6	265	271	236	51	83	68	
4	52	143.79	.75	2.40	3.59	6	265				84	68	
3	56	148.16	.74	2.37	6.94	6	267	268	226	51	84	68	
2	60	150.43	.71	2.27	0.23	5.5	268				84	69	
1	64	153.58	.66	2.11	3.40	5							
	(1310												
	0 - 64	V_m - 55.48		2.53 ΔH -							Avg. - 72.5		

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INTERPOLL LABORATORIES, INC.
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EPA Method 2 Field Data Sheet

Drawing of Test Site

Cross-section View	Elevation View
	

Source: L.P. Hayward
Test: Dryer RTO / Stack
Stack Dimen.: 3 Run 1 Date 2-20-96
Dry Bulb: 81.5 IN. °F Wet bulb °F
Manometer: ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 28.68 IN.HG
Static Pressure: -.81 IN.WC
Operators: E. Jurs & J Lorenz
Pitot No.: 29V8 C_p .840

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 6.25 IN.		Time Start: 1532 HRS	
1	.4 m	15.75	22		
2	1.2 m	47.25	53.50		
3	2 m	78.75	85		
		↑Pheno Probe↑			
		Flow Probe			
E 1	.072	2.61	8.85	.68	
2	.105	8.56	14.8	.70	
3	.194	15.81	22.06	.74	
4	.323	26.32	32.51	.74	
5	.677	55.17	61.42	.73	
6	.806	65.68	71.93	.75	
7	.895	72.94	79.19	.69	
8	.968	78.89	85.14	.68	
B 1				.67	260
2				.69	
3				.72	
4				.72	
5				.76	
6				.77	
7				.79	
8				.74	

Temp. Meas. Device & S/N: PIT 42 & 47
Time End: 1540 HRS

R or nothing = reg. manometer; S = expanded; E = electronic

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Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. /Hayward Date 2-20-96 Test 3 Run 1
Source Dryer RTO /stack No. of traverse points 3
Method 5270 Filter holder: Glass Filter type: 4" GFF/HAC

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 9 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used: —

Recovery solvent(s)

☐acetone —
☐other(s) —

No. of probe wash bottles: —
Sample recovered by: —

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1 A	434	281	153
Impinger No. 2 A	242	175	67
Impinger No. 3 B	335	279	56
Condenser			
Desiccant	1414	1400	14
Total			290

Integrated Gas Sampling Data:

Bag Pump No. 29A Box No. 19 Bag No. 1
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 22 IN.HG
Time start: 1520 (HRS) Time end: 1620 (HRS)
Sampling rate: 400 cc/min Operator: EJ

S/N of O_2 Analyzer used to monitor train outlet: —

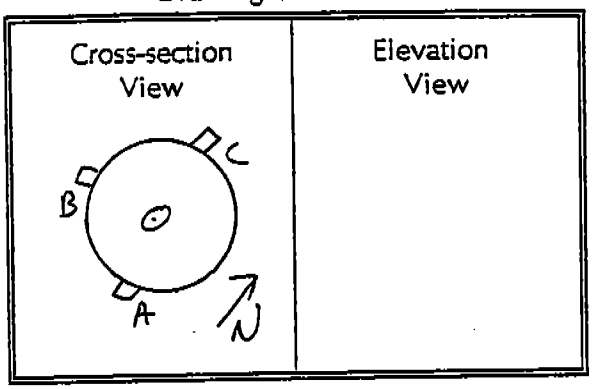
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EPA Method 2 Field Data Sheet

Job: U.P. Hayward
Source: Dryer RTO stack
Test: 3 Run 2 Date 2-20-96
Stack Dimen.: 81.5 IN.
Dry Bulb: — °F Wet bulb: — °F
Manometer: ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 28.68 IN.HG
Static Pressure: -.81 IN.WC
Operators: E. Sours & J Lorenz.
Pitot No.: 29V-8 C_p .840

Drawing of Test Site



Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 6.25 IN.		Time Start: 1642 HRS	
B 1				.66	
2				.70	
3				.70	
4				.72	
5				.74	
6				.77	
7				.77	
8				.74	
C 1				.68	
2				.70	
3				.74	
4				.72	
5				.72	
6				.72	
7				.71	
8				.67	

Temp. Meas. Device & S/N: PDT 42 & 47
Time End: 1649 HRS

R or nothing = reg. manometer; S = expanded; E = electronic

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Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Hayward Date 2-20-96 Test 3 Run 2
Source Dryer RTO /stack No. of traverse points 3
Method 5270 Filter holder: Glass Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 11 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used:

Recovery solvent(s)

☐ acetone
☐ other(s)

No. of probe wash bottles:
Sample recovered by:

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1 A	448	281	167
Impinger No. 2 A	246	189	57
Impinger No. 3 B	335	279	56
Condenser			
Desiccant	1500	1487	13
Total			293

Integrated Gas Sampling Data:

Bag Pump No. 29A Box No. 19 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 22 IN.HG
Time start: 1635 (HRS) Time end: 1735 (HRS)
Sampling rate: 900 cc/min Operator: EJ

S/N of O_2 Analyzer used to monitor train outlet:

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INTERPOLL LABORATORIES, INC.
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EPA Method 2 Field Data Sheet

Job: C.P. Hayward
Source: Dryer/RTO/Stack
Test: 3 Run 3 Date 2-20-96
Stack Dimen.: 81.5 IN.
Dry Bulb: ____ °F Wet bulb: ____ °F
Manometer: ~~Reg.~~ ☐ Exp ☐ Elec.
Barometric Pressure: 28.68 IN.HG
Static Pressure: -.84 IN.WC
Operators: E. Juers & J Lomnz
Pitot No.: 29V-6 C_p .840

Drawing of Test Site

Cross-section View	Elevation View
	

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 6.25 IN.		Time Start: 1753 HRS	
C 1				.68	
2				.70	
3				.74	
4				.72	
5				.72	
6				.75	
7				.73	
8				.72	
B 1				.64	260
2				.68	
3				.70	
4				.72	
5				.74	
6				.81	
7				.83	
8				.74	
Temp. Meas. Device & S/N: PDT 42 + 47				Time End: 1803 HRS	

R or nothing = reg. manometer; S = expanded; E = electronic

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Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP/Hayward
Source Dryer RTO/stack
Method 3270 Filter holder: Glass

Date 2-20-96 Test 3 Run 3
No. of traverse points 3
Filter type: 4" G.F.F.

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 11 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used:

Recovery solvent(s)

☐acetone
☐other(s)

No. of probe wash bottles:
Sample recovered by:

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1 A	343	281	62
Impinger No. 2 A	338	184	154
Impinger No. 3 B	341	278	63
Condenser			
Desiccant	1460	1448	12
Total			291

Integrated Gas Sampling Data:

Bag Pump No. 29 A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1750
Sampling rate: 400

Box No. 19 Bag No. 3
Size: 44 L
cc/min at 27 IN.HG
(HRS) Time end: 1850 (HRS)
cc/min Operator: EJ

S/N of O_2 Analyzer used to monitor train outlet: —

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INTERPOLL LABORATORIES, INC.
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EPA Method 4 and 6 Field Data Sheet

Job: LP Hayward
Site: Dryer RTO / Stack
Date: 2-20-96 Test 3 Run 1
Wet Bulb:
Dry Bulb:
* M-8270 Phenol *

Operator(s): EJ JL
Meter Box No. 10 Gasmeter Coef. 1.000
ΔH@ 1.95 in.WC Bar.Press 28.68 in.Hg
Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in.WC ☒
Post Test: 0 cfm at 9 in.WC ☒

Trav. Point No.	Sample Time (min)	Sample Volume (cf)	Orif. Meter (in.WC)	Vac. in.Hg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/ In	Gas/ Out	O_2 (%v/v)
	(1520)	(839.90)									
3	5	843.70	1.95	6	257	232	228	44	66	66	
	10	847.51	1.95	6	—	240	236	45	65	64	
	15	851.31	1.95	6	260	244	235	45	70	63	
	20	855.16	1.95	6	254	249	229	47	72	63	
2	25	858.97	1.95	6	256	227	230	49	75	62	
	30	862.78	1.95	6	249	230	229	51	76	63	
	35	866.60	1.95	6	251	232	227	53	78	63	
	40	870.43	1.95	6	271	226	231	53	80	65	
1	45	874.28	1.95	6	—	229	233	51	82	67	
	50	878.08	1.95	6	252	237	236	50	81	68	
	55	881.90	1.95	6	255	240	232	46	80	66	
	60	885.75	1.95	6	245	227	228	52	79	65	
	(1620)										
	θ = 60	V_m = 45.85	ΔH = 1.95		$\bar{t}_s$ = 255				$\bar{t}_m$ = 69.95		

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impingers A	434	281	153
~~Condenser~~ A	242	175	67
B	335	279	56
Desiccant	1414	1400	14
		Total	290

Preliminary Results of SO_2 Concentration Determination

V_{sd} =	43.98	DSCF
Moisture Gravimetric =	23.69	%v/v
Moisture Psychrometric =		%v/v
SO_2, DRY =		PPM
SO_2, WET =		PPM
LB/MMBtu =		

INTERPOLL LABORATORIES, INC.
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EPA Method 4 and 6 Field Data Sheet

Job CP Hayward
Source Dryer RTO / Stack
Date 2-20-96 Test 3 Run 3
Wet Bulb
Dry Bulb
* M-8270 Phenol *

Operator(s) EJ JL
Meter Box No. 10 Gasmeter Coef. 1.0001
ΔH@ 1.95 in.WC Bar.Press 28.68 in.H
Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in.WC ☒
Post Test: 0 cfm at 11 in.WC ☒

Trav. Point No.	Sample Time (min)	Sample Volume (cf)	Orif. Meter (in.WC)	Vac. in.Hg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/ In	Gas/ Out	O_2 (%v/v)
	(1635)	(886.00)									
3	5	889.81	1.95	6	260	225	228	54	69	66	
	10	893.58	1.95	6	264	226	231	51	76	65	
	15	897.41	1.95	6	261	230	236	50	77	65	
	20	901.21	1.95	6	263	234	228	47	80	67	
2	25	905.04	1.95	6	256	229	228	52	80	67	
	30	908.85	1.95	6	265	228	234	49	80	66	
	35	912.67	1.95	6	259	229	228	50	80	67	
	40	916.45	1.95	6	248	238	228	50	82	69	
1	45	920.30	1.95	6	251	237	229	49	81	68	
	50	924.10	1.95	6	260	239	231	50	79	67	
	55	927.92	1.95	6	263	236	229	51	80	67	
	60	931.71	1.95	6	271	249	226	51	80	67	
	(1735)										
	θ = 60	V_m = 45.71	ΔH = 1.95		$\bar{t}_s$ = 260.0				$\bar{t}_m$ = 72.7		

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impingers A	448	281	167
Condenser A	246	189	57
B	335	279	56
Desiccant	1500	1487	13
		Total	293

Preliminary Results of SO_2 Concentration Determination		
V_{std} =	43.166	DSCF
Moisture Gravimetric =	24.02	%v/v
Moisture Psychrometric =		%v/v
SO_2, DRY =		PPM
SO_2, WET =		PPM
LB/MMBtu =		

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EPA Method 4 and 6 Field Data Sheet

Job: C.P. / Hayward
Source: Dryer RTO / Stack
Date: 2-20-96 Test 3 Run 3
Wet Bulb
Dry Bulb
M-8270 Phenol

Operator(s) EJ JL
Meter Box No. 10 Gasmeter Coef. 1.0004
ΔH@ 1.95 in.WC Bar.Press 28.68 in.Hg
Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in.WC ☒
Post Test: 0 cfm at 11 in.WC ☒

Trav. Point No.	Sample Time (min)	Sample Volume (cf)	Orif. Meter (in.WC)	Vac. in.Hg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/ In	Gas/ Out	O_2 (%v/v)
	(1750)	(932.10)									
3	5	935.97	1.95	6	249	231	228	47	69	68	
	10	939.75	1.95	6	260	245	230	46	73	66	
	15	943.59	1.96	6	247	246	228	48	76	66	
	20	947.45	1.95	6	248	246	226	49	77	66	
2	25	951.25	1.95	6	272	242	233	49	78	66	
	30	955.08	1.95	6	268	—	—	—	80	67	
	35	958.89	1.95	6	260	242	226	48	80	67	
	40	962.75	1.95	6	252	242	230	49	80	68	
1	45	966.58	1.95	6	262	249	239	49	81	68	
	50	970.40	1.95	6	264	246	234	49	80	68	
	55	974.22	1.95	6	255	251	232	51	81	68	
	60	978.05	1.95	6	251	247	234	51	83	70	
	(1850)										
	θ = 60	V_m = 45.95	ΔH = 1.95		$\bar{t}_s$ = 247.3				$\bar{t}_m$ = 72.7		

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impingers A	343	281	62
Condenser A	338	184	154
B	341	278	63
Desiccant	1460	1448	12
		Total	291

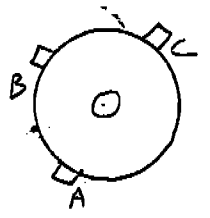
Preliminary Results of SO_2 Concentration Determination		
V_{std} =	43.889	DSCF
Moisture Gravimetric =	23.80	%v/v
Moisture Psychrometric =		%v/v
SO_2, DRY =		PPM
SO_2, WET =		PPM
LB/MMBtu =		

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job C.P. Hayward
Source Dryer RTO / Stack
Test 4 Run O Date 2-21-96
Stack Dimen. 81.5 IN.
Dry Bulb ____ °F Wet bulb ____ °F
Manometer ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure 29.03 IN.HG
Static Pressure -.72 IN.WC
Operators E. Jnes & D. Lorenz
Pitot No. 22V-8 C_p .840

Drawing of Test Site

Cross-section View	Elevation View
	

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 6.25 IN.		Time Start:	HRS
A 1	.072	2.61	8.85		
2	.105	8.56	14.8		
3	.194	15.81	22.06		
4	.323	26.32	32.51		
5	.677	55.15	61.42		
6	.806	65.68	71.93		
7	.895	72.94	79.19		
8	.968	78.89	85.14		
B 1					
2					
3					
4					
5					
6					
7					
8					

Temp. Meas. Device & S/N: PDT 42
Time End: HRS

R or nothing = reg. manometer; S = expanded; E = electronic

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Modified Method 5 Sample Log Sheet

Job L.P. Hayward
Source Dryer RTO Stack
Cyclone ☐ Yes ☒ No
Analytes PAH's
Field Recovery Spike Added

Date 2-21-96
No. Of Traverse Points 16 x 3
Filter Holder MM5
XAD - 2 Resin __ g
☒ Yes ☐ No

Test 4 Run 1
Filter Type 4" Glass Fiber
Batch No.
Ref. EPA SW-846 Method 0010

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 16 IN.HG (vac) ☒

Semivolatile Catch Data:

No. of filters used: 690

Recovery solvent(s)
☒ $MeCl_2$ * MeOH (50:50 v/v)
☒ Other(s) Acetone

No. of bottles for condensate trap catch 2
Samples recovered by EJ

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Condensate Trap	758	266	492
Condensate Trap	435	266	169
Condensate Trap			
Impingers			
Desiccant	1514	1477	37
Total			698

Integrated Gas Sampling Data:

Bag Pump No. 291A
Bag Material: 4-layer Aluminized Tedlar
Pretest Leak Check: 0 cc/min at
Time Start: 1730 (HRS)
Sampling Rate: 150 cc/min

Box No. 15

Bag No. 1
Size: 44 L
22 INHG
Time End: 2037 (HRS)
O_2 Analyzer S/N 4

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Modified Method 5 Field Data Sheet

Job: C.P. Hayward
Source: Dryer RTO / Stack
Date: 2-21-96 Test 4 Run 1

Operators: EJ JL
Meter Box No. 10 ΔH@ 1.95 in.WC
Gasmeter Coeff. 1.0004

Nozzle No. 3-4
Nozzle Dia. .247 in.
Bar. Pres. 29.03 in.Hg

Pitot No. 22V-8
C_p .840
H_2O 22 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F)							Oxygen (% v/v)
							Stack	Probe	Oven	XAD-2	Imp.	Meter (In/Out)		
	(1730)	(154.20												
B 8	3.5	156.60	.82	1.67	6.64	10	260	227	225	38	37	38	38	16.2
8	7	158.95	.82	1.61	8.99	11	254					40	37	16.3
8	10.5	161.30	.80	1.59	1.32	12	250	232	226	36	36	42	37	16.2
7	14	163.65	.83	1.64	3.69	13	254					45	37	16.6
7	17.5	166.05	.84	1.65	6.08	13	259	236	230	38	37	47	37	15.0
7	21	168.46	.84	1.68	8.49	13	247					49	38	16.7
6	24.5	170.54	.83	1.66	0.88	13	252	235	227	38	37	51	37	16.4
6	28	173.31	.84	1.67	3.29	13	255					51	35	17.6
6	31.5	175.71	.82	1.64	5.67	13	249	240	225	38	36	54	36	17.1
5	35	178.07	.80	1.58	8.01	13	262					56	38	16.9
5	38.5	180.43	.80	1.59	0.36	13	261	233	226	37	35	59	39	16.9
5	42	182.78	.78	1.55	2.69	13	262					60	40	17.0
4	45.5	185.09	.73	1.49	4.98	13	245	237	230	38	36	62	42	16.8
4	49	187.40	.74	1.50	7.28	13	252			3	35	63	43	17.0
4	52.5	189.73	.75	1.52	9.60	13	255	252	230	36	35	62	43	16.8
3	56	192.03	.73	1.47	1.87	13	257					67	46	16.7
3	59.5	194.31	.72	1.47	4.16	13	256	238	226	36	35	69	49	16.3
3	63	196.66	.72	1.48	6.46	13	252					70	50	15.8
2	66.5	198.91	.73	1.50	8.77	13	255	241	234	37	34	71	52	15.8
2	70	201.17	.70	1.44	1.04	12.5	256					72	53	16.3
2	73.5	203.45	.69	1.45	3.32	12.5	243	232	231	36	35	73	54	16.1
1	77	205.65	.65	1.35	5.53	12	253					73	57	15.9
1	80.5	207.93	.66	1.37	7.75	12	255	237	229	37	35	74	59	16.0
1	84	210.13	.63	1.31	9.93	12	252					74	59	16.0
over														
	θ = —	V_m = —		ΔH = —			—					Avg. = —		

Page 1 of 2

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INTERPOLL LAB \TORIES, INC.
(612) 7bo-6020

EPA Modified Method 5 Field Data Sheet

Job C.P. Hayward
Source Dryer RTO/Stack
Date 2-2-96 Test 4 Run 1

Operators EJ JL
Meter Box No. 10 ΔH@ 1.95 in.WC
Gasmeter Coeff. 1.000 Y

Nozzle No. 3-4
Nozzle Dia. .247 in.
Bar. Pres. 29.03 in.Hg

Pitot No. 22V-8
C_p .840
H_2O 22 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	XAD-2	Imp.	Meter (In/Out)		Oxygen (% v/v)
	(cont-)	(cont-)												
A 8	87.5	212.50	.77	1.60	2.34	13	255	241	232	36	34	67	56	16.8
8	91	214.80	.81	1.66	4.78	14	258					72	57	16.4
8	94.5	217.25	.80	1.64	7.21	14	261	240	232	38	37	73	58	16.2
7	98	219.70	.82	1.70	9.69	14	256					75	60	16.5
7	101.5	222.15	.80	1.65	2.14	14	260	252	229	38	37	74	59	16.7
7	105	224.64	.82	1.68	4.60	15	265					76	61	16.1
6	108.5	227.15	.82	1.70	7.09	15	259	244	233	39	38	77	63	16.2
6	112	229.61	.80	1.68	9.56	15	253					78	66	15.7
6	115.5	232.11	.82	1.72	2.07	15	255	256	226	39	37	78	67	15.7
5	119	234.60	.81	1.69	4.56	15	259					78	67	15.8
5	122.5	237.10	.79	1.65	7.02	15	260	249	234	38	37	77	67	16.3
5	126	239.58	.80	1.69	9.50	15	251					77	67	16.0
4	129.5	242.40	.77	1.62	1.94	14	252	254	231	34	33	73	69	16.8
4	133	244.83	.76	1.60	4.35	14	253					76	69	16.7
4	136.5	247.28	.78	1.64	6.80	14	255	242	230	38	36	79	70	16.5
3	140	249.69	.80	1.67	9.28	14	261					79	70	16.5
3	143.5	252.14	.81	1.70	1.78	14	260	262	235	37	35	80	71	16.5
3	147	254.60	.80	1.69	4.27	15	257					80	72	16.5
2	150.5	257.10	.80	1.70	6.78	15	250	264	231	36	35	79	71	16.7
2	154	259.59	.79	1.68	9.26	15	251					79	71	16.7
2	157.5	262.07	.79	1.67	1.74	15	254	260	235	37	35	79	71	16.9
1	161	264.54	.74	1.56	4.14	15	254					78	70	16.8
1	164.5	266.98	.72	1.51	6.49	15	257	249	231	39	36	79	71	17.0
1	168	269.44	.74	1.55	8.88	14	260					80	72	16.7
	(20.37)	-3= 269.05												
	θ = 168	V_m = 114.85		ΔH = 1.59								Avg. = 61.6		

C-27
Not R
* → Bottom 1941
Stop
1956 start

* Emptied Condensate Trap
Leak check - 0 cfm at 15 in Hg
Volume - 39 = (239.97)

(Page 2 OF 2)

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Modified Method 5 Sample Log Sheet

Job C.P. Hayward
Source Dryer RTO / stack
Cyclone ☐ Yes ☒ No
Analytes PAH's
Field Recovery Spike Added

Date 2-22-96
No. Of Traverse Points 16
Filter Holder MM5
XAD - 2 Resin __ g
☒ Yes ☐ No

Test 4 Run 2
Filter Type 4" Glass Fiber
Batch No. _____
Ref. EPA SW-846 Method 0010

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 14 IN.HG (vac) ☒

Semivolatile Catch Data:

No. of filters used: 693

Recovery solvent(s)
☒ $MeCl_2$ * MeOH (50:50 v/v)
☒ Other(s) Acetone?

No. of bottles for condensate trap catch: 2
Samples recovered by: EJ

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Condensate Trap	591	266	325
Condensate Trap	602	267	335
Condensate Trap			
Impingers			
Desiccant	1445	1417	28
Total			688

Integrated Gas Sampling Data:

Bag Pump No. 29A
Bag Material: 4-layer Aluminized Tedlar
Pretest Leak Check: 0 cc/min at
Time Start: 0900 (HRS)
Sampling Rate: 150 cc/min

Box No. 15

Bag No. 2
Size: 44 L
22 IN.HG
Time End: 1102 (HRS)
O_2 Analyzer S/N 4

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INTERPOLL LAB \TORIES, INC.
(612) 786-6020

EPA Modified Method 5 Field Data Sheet

Job L.P. Hayward
Source Dryer RTO / Stack
Date 2-22-96 Test 4 Run 2

Operators EJ JL
Meter Box No. 10 ΔH@ 1.95 in.WC
Gasmeter Coeff. 1.0004

Nozzle No. ~~S~~ 3-4
Nozzle Dia. .247 in.
Bar. Pres. 29.01 in.Hg

Pitot No. 22V-6
C_p .840
H_2O 22 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	XAD-2	Imp.	Meter (In/Out)		Oxygen (% v/v)
	(0800)	(280.80)												
A 8	3.5	283.08	.76	1.55	3.15	8	260	234	231	34	32	42	34	17.4
8	7	285.34	.79	1.54	5.44	8	263					50	34	17.1
8	10.5	287.69	.78	1.52	7.74	9	267	232	227	37	36	54	37	16.7
7	14	290.10	.82	1.62	0.11	9	264					60	40	16.3
7	17.5	292.41	.84	1.67	2.52	9	266	233	227	38	37	64	42	16.4
7	21	294.79	.81	1.63	4.92	9.5	261					66	42	17.0
6	24.5	297.21	.80	1.62	7.31	10	256	233	230	38	36	68	45	16.8
6	28	299.60	.81	1.62	9.71	10	267					69	46	17.1
6	31.5	302.04	.80	1.61	2.11	10	264	229	232	37	37	71	48	17.2
5	35	304.40	.77	1.57	4.48	10	257					72	49	16.7
5	38.5	306.75	.78	1.59	6.87	10	260	234	234	37	36	75	~~53~~	16.5
5	42	309.23	.79	1.61	9.28	10	265					76	~~54~~	16.2
4	45.5	311.63	.77	1.60	1.69	10	252	238	237	36	35	76	54	16.3
4	49	314.06	.77	1.60	4.09	10	255					77	55	16.6
4	52.5	316.48	.79	1.64	6.52	10	254	237	236	35	35	79	58	16.6
3	56	318.89	.77	1.58	8.92	10	269					81	59	16.6
3	59.5	321.30	.81	1.66	1.38	10	268	233	237	38	37	81	60	16.6
3	63	323.72	.80	1.66	3.84	10	262					82	61	17.0
2	66.5	326.13	.77	1.60	6.26	10	261	234	229	38	37	84	63	16.5
2	70	328.55	.77	1.60	8.69	10	264					84	64	16.6
2	73.5	330.96	.74	1.56	1.08	10	266	237	231	37	36	85	65	16.4
1	77	333.34	.72	1.52	3.45	10	254					85	66	17.0
1	80.5	335.77	.75	1.59	5.86	10	255	230	233	38	37	86	67	16.7
1	84	338.15	.72	1.53	8.24	10	253					87	68	16.9
	—	Cont-												
	θ = —	V_m = —		ΔH =								Avg. = —		

Stop gas sample 0936

~~S~~ Emptied Condensate Impinger

Leak check — CFM at — in Hg

C-29

Pg. 2 of 2

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Modified Method 5 Field Data Sheet

Job: L.P. Hayward
Source: Dryer RTO/Stack
Date: 2-22-96 Test 4 Run 2

Operators: ES JL
Meter Box No. 10 ΔH@ 1.95 in.WC
Gasmeter Coeff. 1.0004

Nozzle No. 3-4
Nozzle Dia. .247 in.
Bar. Pres. 29.01 in.Hg

Pitot No. 22V-8
C_p .840
H_2O 22 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	XAD-2	Imp.	Meter (In/Out)		Oxygen (% v/v)
	(—)	(—)												
B 8	87.5	340.98	.83	1.76	0.79	10	256	242	234	36	34	79	73	16.9
8	91	343.36	.84	1.77	3.34	11	257					84	72	16.9
8	94.5	345.95	.83	1.75	5.88	11	261	237	236	37	36	87	73	16.8
7	98	348.51	.85	1.82	8.48	11.5	253					89	77	16.6
7	101.5	351.18	.85	1.82	1.09	11.5	256	258	235	37	36	89	77	16.7
7	105	353.79	.85	1.83	3.70	11.5	252					91	78	16.6
6	108.5	356.41	.83	1.78	6.28	11	256	263	250	38	36	90	78	16.5
6	112	358.03	.82	1.76	8.85	11	255					92	79	16.7
6	115.5	361.69	.83	1.79	1.44	11	252	261	252	39	38	91	79	16.7
5	119	364.21	.81	1.74	4.00	11	255					91	80	16.5
5	122.5	366.71	.79	1.70	6.52	11	257	261	256	38	37	93	80	16.7
5	126	369.34	.78	1.66	9.03	11	258					92	80	16.8
4	129.5	371.71	.73	1.56	1.45	10.5	262	255	250	38	37	93	81	16.3
4	133	374.35	.75	1.60	3.90	10.5	264					94	83	16.6
4	136.5	376.85	.74	1.59	6.35	10.5	260	252	251	37	35	94	82	16.8
3	140	379.35	.74	1.59	8.80	10.5	258					94	83	16.5
3	143.5	381.82	.74	1.60	1.26	10	255	256	242	38	37	94	83	16.7
3	147	384.27	.73	1.58	3.70	10	255					95	84	16.4
2	150.5	386.67	.72	1.57	6.14	10	253	245	248	39	38	95	84	16.3
2	154	388.98	.69	1.51	8.52	10	251					96	86	16.3
2	157.5	391.52	.69	1.49	0.90	10	260	242	250	37	36	95	85	16.4
1	161	393.83	.65	1.42	3.22	9	252					95	84	16.4
1	164.5	396.15	.64	1.39	5.51	9	255	245	244	38	37	94	84	16.8
1	168	398.37	.63	1.37	7.78	9	253					94	84	16.5
	(1102)	-.23 398.14												
	θ = 168	V_m = 117.34		ΔH = 1.62								Avg. = 74.4		

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Modified Method 5 Sample Log Sheet

Job C.P. Hayward
Source Dryer RTO / Stack
Cyclone ☐ Yes ☒ No
Analytes PAH's
Field Recovery Spike Added

Date 2-22-96
No. Of Traverse Points 16
Filter Holder MM5
XAD - 2 Resin ___ g
☒ Yes ☐ No

Test 4 Run 3
Filter Type 4" Glass Fiber
Batch No. ___
Ref. EPA SW-846 Method 0010

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 13 IN.HG (vac) ☒

Semivolatile Catch Data:

No. of filters used: 6 9 4

Recovery solvent(s)
☒ CH_2Cl_2 * MeOH (50:50 v/v)
☒ Other(s) Acetone

No. of bottles for condensate trap catch: 2
Samples recovered by: ES

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Condensate Trap	603	266	337
Condensate Trap	626	264	362
Condensate Trap			
Impingers			
Desiccant	1523	1486	37
Total			736

Integrated Gas Sampling Data:

Bag Pump No. 29A
Bag Material: 4-layer Aluminized Tedlar
Pretest Leak Check: 0 cc/min at ___ IN.HG
Time Start: 1300 (HRS)
Sampling Rate: 150 cc/min

Box No. 15
Bag No. 3
Size: 44 L
Time End: 1556 (HRS)
O_2 Analyzer S/N 4

032194-G:\STACK\WP\FORMS\S-393

Pg 1 of 2

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Modified Method 5 Field Data Sheet

Job: L.P. Hayward
Source: Dryer RTO / Stack
Date: 2-22-96 Test 4 Run 3

Operators: EJ JL
Meter Box No. 10 ΔH@ 1.95 in.WC
Gasmeter Coeff. 1.0004

Nozzle No. 3-4
Nozzle Dia. .247 in.
Bar. Pres. 29.01 in.Hg

Pitot No. 22V-8
C_p .840
H_2O 22 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	XAD-2	Imp.	Meter (In/Out)		Oxygen (% v/v)
	(1300)	(398.70)												
B 8	3.5	401.25	.84	1.77	1.24	8	257	247	241	34	34	62	62	16.8
8	7	403.71	.85	1.76	3.76	8	251					59	59	17.0
8	10.5	406.18	.84	1.72	6.23	8	257	252	240	36	35	62	58	17.1
7	14	408.69	.86	1.76	8.74	9	256					65	58	16.9
7	17.5	411.24	.85	1.75	1.25	9	254	244	232	36	35	68	58	16.7
7	21	413.74	.86	1.75	3.76	9	265					70	58	16.8
6	24.5	416.26	.83	1.70	6.23	9	261	237	227	35	34	71	58	16.8
6	28	418.71	.80	1.64	8.67	9	260					71	57	17.0
6	31.5	421.14	.80	1.63	1.09	8	265	238	230	36	35	74	60	16.4
5	35	423.60	.80	1.67	3.56	8	252					76	61	16.8
5	38.5	426.05	.81	1.69	6.03	8	255	236	240	38	37	78	62	16.5
5	42	428.53	.81	1.70	8.52	8	252					79	62	16.9
4	45.5	430.93	.74	1.56	0.91	8	251	236	230	37	36	79	62	16.4
4	49	433.29	.73	1.52	3.27	8	258					81	64	16.9
4	52.5	435.71	.75	1.56	5.66	8	262	244	231	37	36	80	65	16.6
3	56	438.08	.73	1.51	8.01	8	266					80	62	16.4
3	59.5	440.46	.74	1.52	0.37	8	268	245	231	37	36	84	64	16.5
3	63	442.79	.72	1.52	2.73	8	254					85	67	15.9
2	66.5	445.13	.70	1.47	5.07	8	259	235	228	36	35	86	69	16.0
2	70	447.46	.72	1.51	7.43	8	263					87	69	15.6
2	73.5	449.78	.72	1.53	9.81	8	254	241	227	39	37	87	70	16.0
1	77	452.07	.67	1.43	2.11	8	254					87	70	15.9
1	80.5	454.40	.68	1.44	4.42	8	256	232	236	38	37	87	71	16.0
1	84	456.64	.66	1.41	6.70	8	254					88	71	15.9
	θ = —	V_m = —		ΔH = —								Avg. = —		

Emptied condensate
Leak rate = 0 cfm at 12 in. Hg
Volume Filled to Check = 456...

Pg. 2 of 2

INTERPOLL LABC TORIES, INC.
(612) 786-6020

EPA Modified Method 5 Field Data Sheet

Job: L.P. Hayward
Source: Dryer RTO / Stack
Date: 2-21-96 Test 4 Run 3

Operators: ES JL
Meter Box No. 10 ΔH@ 1.95 in.WC
Gasmeter Coeff. 1.0004

Nozzle No. S-4
Nozzle Dia. .247 in.
Bar. Pres. 29.01 in.Hg

Pitot No. 22V-8
C_p .840
H_2O 22 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	XAD-2	Imp.	Meter (In/Out)		Oxygen (% v/v)
	(cont-)	(cont-)												
A 8	87.5	459.46	.79	1.67	9.19	10	260	234	236	35	33	79	73	16.3
8	91	461.92	.78	1.64	1.66	8.5	258					86	73	16.2
8	94.5	464.35	.77	1.64	4.12	8.5	255	238	229	37	36	87	73	15.9
7	98	466.83	.81	1.73	6.65	8.5	255					89	74	16.2
7	101.5	469.33	.82	1.75	9.20	9	258	239	226	37	36	89	74	15.9
7	105	471.84	.80	1.69	1.71	9	264					90	74	16.1
6	108.5	474.39	.85	1.80	4.30	10	263	245	251	37	36	90	75	16.1
6	112	476.98	.85	1.81	6.90	10	257					90	76	16.2
6	115.5	479.65	.87	1.83	9.52	10	267	237	242	38	36	90	76	16.3
5	119	482.21	.81	1.72	2.05	10	262					90	76	16.3
5	122.5	484.82	.82	1.74	4.60	9.5	261	236	226	38	37	90	77	16.3
5	126	487.36	.80	1.72	7.13	9.5	255					90	77	16.6
4	129.5	489.94	.80	1.73	9.67	9.5	251	235	232	37	36	90	77	16.7
4	133	492.50	.80	1.71	2.20	9.5	257					90	77	16.7
4	136.5	494.99	.77	1.64	4.68	9	260	241	234	36	34	91	77	16.6
3	140	497.59	.79	1.70	7.20	9	253					91	77	16.7
3	143.5	499.50 13	.78	1.68	9.71	9	251	236	226	39	37	91	78	16.5
3	147	502.68	.79	1.69	2.23	9	258					92	78	16.5
2	150.5	505.21	.78	1.65	4.71	9	268	232	227	37	37	92	79	16.4
2	154	507.70	.79	1.67	7.22	9	267					92	78	16.7
2	157.5	510.19	.79	1.70	9.74	9	254	228	231	38	37	92	79	16.9
1	161	512.57	.72	1.53	2.14	8	266					91	79	16.5
1	164.5	514.90	.75	1.60	4.58	8.5	260	230	231	38	37	91	78	16.7
1	168	517.28	.76	1.63	7.05	8.5	258					92	78	16.8
	(1556)	-1.9 515.09												
	θ = 168	V_m = 118.39		ΔH = 1.65								Avg. = 76.5		

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INTERPOLL LABORATORIES

Benzene - 18 Field Data Sheet

Job C.P. Hayward
Source Dryer RTO / Stack
Date 2-20-96 Test 5 Run 1

Operator(s) E. Jurs & J. Lorenz
Meter Box No. 65 Meter coef. 1.0036
Barometric Pressure 28.48 in.Hg

Sample Train Leak Check:
Pretest: 0 cc/min at 15 in.Hg
Posttest: 0 cc/min at 15 in.Hg

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Sample Rate (cc/min)	VAC. (inHg)	Temperature (oF)		
					Stack	Probe	Gasmeter
	(0950)	(466.403)					
	5	466.584	1000	3	257	—	58
	10	466.755	1000	3	247	—	58
	15	466.930	1000	3	245	—	58
	20	467.100	1000	4	261	—	59
	25	467.302	1000	5	258	—	60
	30	467.499	1000	7	262	—	60
	35	467.695	1000	7	259	—	61
	40	467.897	1000	7.5	260	—	62
	45	468.091	1000	8	268	—	68
	50	468.292	1000	8	265	—	69
	55	468.487	1000	8	265	—	70
	60	468.683	1000	8	255	—	72
	θ=60	Vm= 2.28					tm= 63

(1050)

V_{std} = 2.20

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INTERPOLL LABORATORIES

Benzene-18 Field Data Sheet

Job G.P. Hayward
Source Dryer RTO / Stack
Date 2-20-96 Test 5 Run 2

Operator(s) EJ JL
Meter Box No. 65 Meter coef. 1.0036
Barometric Pressure 28.48 in.Hg

Sample Train Leak Check:
Pretest: 0 cc/min at 15 in.Hg
Posttest: 0 cc/min at 15 in.Hg

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Sample Rate (cc/min)	VAC. (inHg)	Temperature (oF)		
					Stack	Probe	Gasmeter
	(1149)	(462.712)					
	5	468.910	1000	3	262	—	69
	10	469.100	1000	5	264	—	69
	15	469.291	1000	7	256	—	69
	20	469.483	1000	8	272	—	69
	25	469.675	1000	9	272	—	69
	30	469.870	1000	9	261	—	70
	35	470.064	1000	9	247	—	70
	40	470.261	1000	9	258	—	71
	45	470.459	1000	9.5	269	—	71
	50	470657	1000	10	268	—	72
	55	470.845	1000	10	269	—	76
	60	471.040	1000	10	260	—	78
	θ= 60	Vm= 2.328					tm= 71

(1249)

V_{STD} = 2.21

S-476

INTERPOLL LABORATORIES

Benzene - 18 Field Data Sheet

Job CP. Hayward
Source Dryer RTO / Stack
Date 2-20-96 Test 5 Run 3

Operator(s) EJ JL
Meter Box No. 6S Meter coef. 1.0036
Barometric Pressure 28.48 in.Hg

Sample Train Leak Check:
Pretest: 0 cc/min at 15 in.Hg
Posttest: 0 cc/min at 15 in.Hg

Trav. Point No.	Samp. Time (min)	Sample Volume (cf)	Sample Rate (cc/min)	VAC. (inHg)	Temperature (oF)		
					Stack	Probe	Gasmeter
	(1320)	(471.071)					
	5	471.265	1000	4	263	—	80
	10	471.456	1000	5	284	—	80
	15	471.642	1000	7	269	—	79
	20	471.828	1000	9	265	—	80
	25	472.026	1000	11	256	—	80
	30	472.225	1000	12	251	—	80
	35	472.420	1010	12	262	—	80
	40	472.615	1000	12	269	—	80
	45	472.801	1000	12	265	—	80
	50	472.990	1000	12	256	—	83
	55	473.185	1000	12	247	—	86
	60	473.379	1000	12	252	—	86
	θ = 60	Vm = 2.308					tm = 81.16

(1420)

$V_{STD} = 2.15$

S-476

Interpoll Laboratories
(612)786-6020

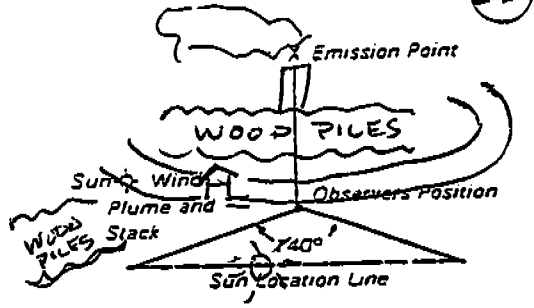
Test 1

Visible Emissions Form

SOURCE NAME: Louisiana-Pacific Corp	OBSERVATION DATE: Feb. 20, 1996	START TIME: 0950
ADDRESS: Hwy 63		STOP TIME: 1050
CITY: Hayward	STATE: WI	ZIP:
PHONE:	SOURCE ID NUMBER:	
PROCESS EQUIPMENT: Line 1 Dryer Stack	OPERATING MODE:	
CONTROL EQUIPMENT: RTO	OPERATING MODE:	
DESCRIBE EMISSION POINT: START Round metal stack STOP Same		
HEIGHT ABOVE GROUND LEVEL: START ~100' STOP Same	HEIGHT RELATIVE TO OBSERVER: START ~100' STOP Same	
DISTANCE FROM OBSERVER: START ~300' STOP Same	DIRECTION FROM OBSERVER: START W STOP W	
DESCRIBE EMISSIONS: START none STOP none		
EMISSION COLOR: START NA STOP NA	PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT: NO ☐ YES ☒	IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☒	
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: START Stack exit STOP Same		
DESCRIBE BACKGROUND: START Sky STOP Same		
BACKGROUND COLOR: START blue STOP Same	SKY CONDITIONS: START clear STOP Same	
WIND SPEED: START ~10 mph STOP Same	WIND DIRECTION: START E/NW STOP E/NW	
AMBIENT TEMP: START 30°F STOP 31°F	WET BULB TEMP: *	RH,percent: *

SEC / MIN	0	15	30	45	MIN	0	15	30	45
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

Source Layout Sketch — Draw North Arrow



AVERAGE OPACITY FOR HIGHEST PERIOD: 0	NUMBER OF READINGS ABOVE % WERE
RANGE OF OPACITY READINGS MINIMUM: 0	MAXIMUM: 0
OBSERVER'S NAME (PRINT): Sheryl Bergeron	
OBSERVER'S SIGNATURE: Sheryl A. Bergeron	DATE: 2/20/96
ORGANIZATION: Interpoll labs	
CERTIFIED BY: ETA	DATE: 10/4/95
VERIFIED BY	DATE

COMMENTS: w/ sling psychrom.
* Not determined due to low temps

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE
TITLE
DATE

S-0079R

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job LP/HAYWARD
Source LINE 1 COLD DRUM
Test 7 Run 1 Date
Stack Dimen. 42" IN.
Dry Bulb °F Wet bulb °F
Manometer ☐ Reg. ☐ Exp ☐ Elec.
Barometric Pressure 28.48 IN.HG
Static Pressure -8.0 IN.WC
Operators ET - LH
Pitot No. V29-6 C_p .84

Drawing of Test Site

Cross-section View	Elevation View

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length:	IN.	Time Start: 0950	HRS
1				1.10	
2				1.30	
3				1.25	216
4				1.25	
5				1.20	
6				1.05	
1				.45	
2				1.30	
3				1.10	
4				1.20	216
5				1.30	
6				1.20	
Temp. Meas. Device & S/N:				Time End:	HRS

R or nothing = reg. manometer; S = expanded; E = electronic

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job LP/HAYWARD
Source LINE 1 CORE DRYER
Test 7 Run 2 Date 2-20-96
Stack Dimen. _____ IN.
Dry Bulb _____ °F Wet bulb _____ °F
Manometer ☐ Reg. ☐ Exp ☐ Elec.
Barometric Pressure 29.48 IN.HG
Static Pressure -9.7 IN.WC
Operators ET - SK
Pitot No. V29-6 C_p 1.84

Drawing of Test Site

Cross-section View	Elevation View

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length:	IN.	Time Start: 1140	HRS
1				1.10	
2				1.30	
3				1.30	
4				1.25	223
5				1.20	
6				1.10	
1				1.0	
2				.60	
3				1.10	
4				1.20	223
5				1.20	
6				1.10	
Temp. Meas. Device & S/N:				Time End:	HRS

R or nothing = reg. manometer; S = expanded; E = electronic

032594-G:\STACK\WP\FORMS\S-392.1

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job
Source LINE 1 CORE DRYER
Test 7 Run 3 Date 2-20-96
Stack Dimen. _____ IN.
Dry Bulb _____ °F Wet bulb _____ °F
Manometer ☐ Reg. ☐ Exp ☐ Elec.
Barometric Pressure _____ IN.HG
Static Pressure -5.0 IN.WC
Operators ET
Pitot No. V-29-6 C_p .84

Drawing of Test Site

Cross-section View	Elevation View

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length:	IN.	Time Start: 1320	HRS
1				.90	
2				1.40	
3				1.30	250
4				1.20	
5				1.30	
6				1.25	
1				1.6	
2				1.50	
3				.70	250
4				.90	
5				1.2	
6				1.2	

Temp. Meas. Device & S/N:

Time End: HRS

R or nothing = reg. manometer; S = expanded; E = electronic

032594-G:\STACK\WP\FORMS\S-392.1

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 4 and 6 Field Data Sheet

Job LP/HAYWARD
Source LINE No.1 CORE DRYER OUTLET
Date 2-20-96 Test 2 Run 1
Wet Bulb
Dry Bulb

Operator(s) J.BATINVILLE L.HANSON
Meter Box No. Gasmeter Coef. .9976
ΔH@ — in.WC Bar.Press 28.48 in.Hg
Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in.WC ☒
Post Test: 0 cfm at 15 in.WC ☒

Trav. Point No.	Sample Time (min)	Sample Volume (cf)	Orif. Meter ~~(in.WC)~~ cc/min	Vac. in.Hg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/ In	Gas/ Out	O_2 (%v/v)
	950	932.823	1								
	5	933.002	1000	2	224				68		
	10	933.179	1000	2							
	15	933.356	1000	2							
	20	933.533	1000	2							
	25	933.710	1000	2							
	30	933.888	1000	2	216						
	35	934.065	1000	2	218						
	40	934.242	1000	2							
	45	934.419	1000	2							
	50	934.588	1000	2							
	55	934.765	1000	2							
	60	934.945	1000	2	223						
	θ = 60	V_m = 2.122	~~Δ H~~ cc/min 1000		220.25 $\bar{t}$ =				$\bar{t}_m$ = 68		

Condensate Data:

	Item	Weight (g) Final	Tare	Difference
	Impingers			
	Condenser			
4	Desiccant	71.0082	71.0082	0
6	Desiccant	86.8053	70.3725	16.4310
			Total	16.4310

Preliminary Results of SO_2 Concentration Determination		
V_{sd} =	2.015	DSCF
Moisture Gravimetric =	27.75	%v/v
Moisture Psychrometric =		%v/v
SO_2, DRY =		PPM
SO_2, WET =		PPM
LB/MMBtu =		

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 4 and 6 Field Data Sheet

Job LP / HAYWARD
Source LINE NO 1 COAL DRYER OUTLET
Date 2-20-96 Test 7 Run 2
Wet Bulb _____
Dry Bulb _____

Operator(s) J. BAINVILLE L. HANSON
Meter Box No. _____ Gasmeter Coef. .9976
ΔH@ — in.WC Bar.Press 28.48
Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in.WC ☒
Post Test: 0 cfm at 15 in.WC ☒

Trav. Point No.	Sample Time (min)	Sample Volume (cf)	Orif. Meter ~~(in.WC)~~ 1000cc/min	Vac. in.Hg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/ In	Gas/ Out	O_2 (%v/v)
	1140	934.086									
	5	934.365	1000	2	220				68		
	10	935.373	1000	2							
	15	935.555	1000	2							
	20	935.737	1000	2							
	25	935.919	1000	2							
	30	936.101	1000	2	223						
	35	936.282	1000	2	222						
	40	936.466	1000	2							
	45	936.646	1000	2							
	50	936.828	1000	2							
	55	937.010	1000	2							
	60	937.192	1000	2	215						
	θ =	V_m = 3.106	~~cc/min~~ 1000		220 $\bar{t}$ =				$\bar{t}_m$ = 68		

Condensate Data:

	Item	Weight (g) Final	Tare	Difference
	Impingers			
	Condenser			
2	Desiccant	93.0524	75.8008	17.2516
3	Desiccant	74.1679	74.1319	.0360
			Total	17.2876

Preliminary Results of SO_2 Concentration Determination		
V_{std} =	2.95	DSCF
Moisture Gravimetric =	21.64	%v/v
Moisture Psychrometric =		%v/v
SO_2, DRY =		PPM
SO_2, WET =		PPM
LB/MMBtu =		

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 4 and 6 Field Data Sheet

Job LP / HAYWARD
Source LINE NO 1 CONC DRYER OUTLET
Date 2-20-96 Test 7 Run 3
Wet Bulb
Dry Bulb

Operator(s) S-BAINVILLE L. HANSON
Meter Box No. Gasmeter Coef. .9976
ΔH@ — in.WC Bar.Press 28.40 in.Hg

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in.WC ☒
Post Test: 0 cfm at 15 in.WC ☒

Trav. Point No.	Sample Time (min)	Sample Volume (cf)	Orif. Meter ~~(in.WC)~~ CC/MIN	Vac. in.Hg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/ In	Gas/ Out	O_2 (%v/v)
	1320	937.225									
	5	937.402	1000	2	223				68		
	10	937.582	1000	2							
	15	937.762	1000	2							
	20	937.942	1000	2							
	25	938.122	1000	2							
	30	938.302	1000	2	222						
	35	938.482	1000	2	220						
	40	938.662	1000	2							
	45	938.842	1000	2							
	50	939.022	1000	2							
	55	939.202	1000	2							
	60	939.382	1000	2	214						
	θ = 60	V_m = 2.157	CC/MIN ΔH 1000		$\bar{t}$ = 219.75				$\bar{t}_m$ = 68		

Condensate Data:

	Item	Weight (g) Final	Tare	Difference
	Impingers			
	Condenser			
5		88.6913	71.8411	16.8502
10	Desiccant	78.0267	77.9678	.0589
			Total	16.9091

Preliminary Results of SO_2 Concentration Determination		
V_{std} =	2.048	DSCF
Moisture Gravimetric =	28.00	%v/v
Moisture Psychrometric =		%v/v
SO_2, DRY =		PPM
SO_2, WET =		PPM
LB/MMBtu =		

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job LP/HAYWARD
Source LINE 1 SURFACE DRYER
Test S Run 1 Date 2-28-96
Stack Dimen. 42" IN.
Dry Bulb ____ °F Wet bulb ____ °F
Manometer ☐ Reg. ☐ Exp ☐ Elec.
Barometric Pressure 28.48 IN.HG
Static Pressure -9.5 IN.WC
Operators ET-
Pitot No. U29-6 C_p .84

Drawing of Test Site

Cross-section View	Elevation View

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 6.5" IN.		Time Start: 0950 HRS	
A 1				1.60	
2				1.40	
3				1.30	210
4				1.82	
5				1.55	
6				1.10	
1				0.85	
2				1.20	
3				1.25	210
4				1.30	
5				1.30	
6				1.05	

Temp. Meas. Device & S/N: Time End: HRS

R or nothing = reg. manometer; S = expanded; E = electronic

INTERPOLL LABORATORIES, INC.
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EPA Method 2 Field Data Sheet

Job: L P/HAYWARD
Source: KILN 1 SURFACE DRYER
Test: 8 Run 2 Date 2-20-96
Stack Dimen. _____ IN.
Dry Bulb _____ °F Wet bulb _____ °F
Manometer ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure 29.48 IN.HG
Static Pressure -9.5 IN.WC
Operators ET
Pitot No. V29-6 C_p .84

Drawing of Test Site

Cross-section View	Elevation View

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length:	IN.	Time Start: 1140	HRS
1				1.30	
2				1.20	
3				1.50	
4				1.30	224
5				1.30	
6				1.10	
1				.97	
2				1.3	
3				1.3	
4				1.2	224
5				1.25	
6				1.05	

INTERPOLL LABORATORIES, INC.
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EPA Method 2 Field Data Sheet

Job
Source LINE 1 SURFACE DRYER
Test 8 Run 3 Date 2-20-96
Stack Dimen. _____ IN.
Dry Bulb _____ °F Wet bulb _____ °F
Manometer ☐ Reg. ☐ Exp ☐ Elec.
Barometric Pressure 28.48 IN.HG
Static Pressure -9.5 IN.WC
Operators ET - LH
Pitot No. V29-6 C_p .84

Drawing of Test Site

Cross-section View	Elevation View

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length:	IN.	Time Start: 1320	HRS
1				1.2	
2				1.4	
3				1.3	
4				1.4	232
5				1.3	
6				1.3	
1				1.49	
2				1.0	
3				.90	
4				1.0	232
5				1.05	
6				1.20	

Temp. Meas. Device & S/N: —— Time End: HRS

R or nothing = reg. manometer; S = expanded; E = electronic

INTERPOLL LABORATORIES, INC.
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EPA Method 4 and 6 Field Data Sheet

Job: LP/HAYWARD
Source: WEST LINE 1 SURFACE DRYER
Date: 2-20-96 Test # 8 Run # 1
Wet Bulb: _____
Dry Bulb: _____

Operator(s): ET-SK-LH
Meter Box No.: 6 Gasmeter Coef.: 1.0054
ΔH@ 1.85 in.WC Bar.Press: 28.98 in.Hg
Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in.WC ☒
Post Test: 0 cfm at 5 in.WC ☒

Trav. Point No.	Sample Time (min)	Sample Volume (cf)	Orif. Meter (in.WC)	Vac. in.Hg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/ In	Gas/ Out	O_2 (%v/v)
	0950	997.00									
	5	1000.70	1.89	3	210				45	44	
	10	1004.40	1.89	3					54	44	
	15	1008.10	1.89	3					55	44	
	20	1011.80	1.89	3					60	45	
	25	1015.50	1.87	3					57	45	
	30	1019.30	1.87	3					58	45	
	35	1023.03	1.87	3					58	45	
	40	1026.84	1.87	3					58	46	
	45	1030.64	1.87	3					59	46	
	50	1034.40	1.87	3					60	46	
	55	1038.15	1.87	3					61	47	
	60	1041.85	1.87	3					61	47	
	(1050)										
	θ - 60	V_m - 44.85	ΔH - 1.87		ξ -				$\bar{t}_m$ - 50.8		

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impingers			
Condenser			352
Desiccant	1477	1407	70
		Total	422

Preliminary Results of SO_2 Concentration Determination		
V_{sm} =	44.58	DSCF
Moisture Gravimetric =	30.84	%v/v
Moisture Psychrometric =		%v/v
SO_2, DRY =		PPM
SO_2, WET =		PPM
LB/MMBtu =		

INTERPOLL LABORATORIES, INC.
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EPA Method 4 and 6 Field Data Sheet

Job LP/HAYWARD
Source LINE 1 SURFACE DRYER
Date 2-20-96 Test 8 Run 2
Wet Bulb
Dry Bulb

Operator(s) ET
Meter Box No. 6 Gasmeter Coef. 1.005 Y
ΔH@ 1.89 in.WC Bar.Press 28.48 in.
Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in.WC
Post Test: 0 cfm at 5 in.WC

Trav. Point No.	Sample Time (min)	Sample Volume (cf)	Orif. Meter (in.WC)	Vac. in.Hg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/ In	Gas/ Out	O_2 (%v/v)
	1140	42.00									
	5	45.80	1.87	3					51	45	
	10		1.89	3					54	45	
	15	53.00	1.89	3					57	46	
	20	56.75	1.89	3					60	45	
	25	60.60	1.89	3.5					60	45	
	30		1.89	3.5					60	45	
	35		1.89	3.5					60	45	
	40	71.70	1.89	3.5					60	45	
	45	75.30	1.89	3.8					60	45	
	50	79.05	1.89	3.8					60	45	
	55	82.84	1.89	3.8					60	45	
	60	86.65	1.89	3.8					60	45	
	(1240)										
	θ = 60	V_m = 44.65	ΔH = 1.89		$\bar{t}_s$ =				$\bar{t}_m$ = 51.8		

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impingers			
Condenser			356
Desiccant	1538	1474	64
		Total	420

Preliminary Results of SO_2 Concentration Determination		
V_{std} =	44.30	DSCF
Moisture Gravimetric =	30.87	%v/v
Moisture Psychrometric =		%v/v
SO_2, DRY =		PPM
SO_2, WET =		PPM
LB/MMBtu =		

INTERPOLL LABORATORIES, INC.
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EPA Method 4 and 6 Field Data Sheet

Job LP/HAYWARD
Source 4 NO 1 SURFACE DRYER
Date 2-20-96 Test 8 Run 3
Wet Bulb
Dry Bulb

Operator(s) ET
Meter Box No. 6 Gasmeter Coef. 1.0052
ΔH@ 1.89 in.WC Bar.Press 26.49 in.Hg
Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in.WC ☒
Post Test: 0 cfm at 5 in.WC ☒

Trav. Point No.	Sample Time (min)	Sample Volume (cf)	Orif. Meter (in.WC)	Vac. in.Hg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/ In	Gas/ Out	O_2 (%v/v)
	1320	86.80									
	5	90.60	1.89	3					49	45	
	10		1.89	3					53	45	
	15	98.05	1.89	3.2					57	46	
	20	101.50	1.89	3.2					59	47	
	25	105.32	1.89	3.6					60	47	
	30	109.10	1.89	3.7					60	47	
	35	112.90	1.89	3.7					61	47	
	40	116.67	1.89	3.8					61	48	
	45	120.50	1.89	4.0					61	49	
	50	124.20	1.89	4.0					62	49	
	55	128.00	1.89	4.0					62	49	
	60	131.70	1.89	4.0					62	49	
	(1420)										
	θ = 60	V_m = 44.90	ΔH = 1.89		$\bar{t}$ =				$\bar{t}_m$ = 53.1		

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impingers			
Condenser			350
Desiccant	1582	1508	74
		Total	424

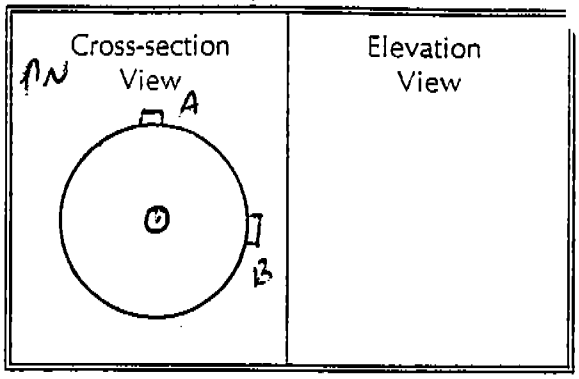
Preliminary Results of SO_2 Concentration Determination		
V_{std} =	44.43	DSCF
Moisture Gravimetric =	31.01	%v/v
Moisture Psychrometric =		%v/v
SO_2, DRY =		PPM
SO_2, WET =		PPM
LB/MMBtu =		

INTERPOLL LABORATORIES, INC.
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EPA Method 2 Field Data Sheet

Job L.P. / Hayward, WI
Source Press RTO / Stack
Test 4 Run 1 Date 2-21-96
Stack Dimen. 25.5 IN.
Dry Bulb 245 °F Wet bulb 110 °F
Manometer ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure 29.24 IN.HG
Static Pressure -.46 IN.WC
Operators M. Kuehler & L. Hansen
Pitot No. 22L-B C_p .84

Drawing of Test Site



Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 6.25 IN.		Time Start: 0900 HRS	
A-1	.026	1.96	8.21	.55	
2	.092	6.19	12.44	.53	
3	.146	11.02	17.27	.56	
4	.226	17.06	23.31	.53	
5	.342	25.82	32.07	.60	
6	.658	49.68	55.93	.65	
7	.774	58.44	64.69	.73	
8	.854	64.48	70.73	.78	↑
9	.918	69.31	75.56	.85	
10	.974	73.54	79.79	.94	245
B-1				.53	↓
2				.68	
3				.84	
4				.78	
5				.75	
6				.64	
7				.65	
8				.64	
9				.59	
10				.55	

Temp. Meas. Device & S/N: PDT-45 / TC
Time End: 0907 HRS

R or nothing = reg. manometer; S = expanded; E = electronic

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INTERPOLL LABORATORIES, INC.
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Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. / Hayward, WI
Source Process Pro / Stack
Method 5 Filter holder: Glass

Date 2-21-96 Test 9 Run 1
No. of traverse points 20
Filter type: 4" G/F

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0.02 cfm at 8 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used: 9326

Recovery solvent(s)

☒acetone
☐other(s)

No. of probe wash bottles: 1
Sample recovered by: M. Kuehlen & H. Hanson

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	504	496	8
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1442	1431	11
Total			19

Integrated Gas Sampling Data:

Bag Pump No. 36B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1215
Sampling rate: 400 cc/min

Box No. 9 Bag No. 1
Size: 44 L
15 IN.HG
(HRS) Time end: 1316 (HRS)
cc/min Operator: M. Kuehlen

S/N of O_2 Analyzer used to monitor train outlet: 7

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job L.P. / Hayward, WI
Source Precis 1.70 / Stack
Date 2-21-96 Test 9 Run 1

Operators M. Kachler & L. Hansen
Meter Box No. 1B ΔH@ 1.81 in.WC
Gasmeter Coeff. 1.0051

Nozzle No. 2-Y
Nozzle Dia. .250 in.
Bar. Press. 29.24 in.Hg

Pitot No. 22U-B
C_p .84
H_2O 2 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	1215	266.50											
A-10	3	269.67	.98	3.06	9.47	6	245	233	140	39	77	76	19.7
9	6	272.49	.94	2.93	2.36	6	240				77	76	19.7
8	839	275.38	.95	2.96	5.27	6	238	237	237	39	79	76	19.6
7	1512	278.15	.86	2.67	8.04	6	243				81	76	20.0
6	1815	280.63	.68	2.12	0.51	6	241	236	243	38	84	77	19.8
5	2118	282.95	.61	1.92	2.86	5	238				84	77	19.7
4	2421	285.27	.58	1.82	5.16	5	241	240	246	39	85	77	20.0
3	2724	287.38	.54	1.69	7.37	4	244				86	77	20.0
2	3027	289.44	.49	1.56	9.49	3.5	233	241	244	41	87	77	19.7
1	3330	291.91	.54	1.87	1.82	4.5	234				88	77	19.8
B-10	3633	294.07	.58	1.82	4.12	4.5	245	234	240	41	89	79	19.9
9	36	296.54	.68	2.13	6.61	5	245				90	79	20.0
8	39	299.00	.68	2.13	9.09	5	247	240	244	40	92	80	19.8
7	42	301.48	.67	2.11	1.57	5	246				94	81	19.8
6	45	304.02	.65	2.08	4.04	5	237	237	249	40	96	82	20.0
5	48	306.65	.77	2.46	6.72	5	238				97	83	19.8
4	51	309.35	.78	2.47	9.42	5	245	241	245	42	98	83	19.7
3	54	312.24	.89	2.82	2.29	5.5	246				98	84	19.8
2	57	314.96	.75	2.37	4.93	5	248	238	240	42	99	85	19.9
1	60	317.70	.53	1.69	7.17	4	245				99	86	19.9
	(1316)												
	θ - 60	V_m - 50.70		2.23 ΔH -							Avg. - 84.1		

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. / Hayward, WI
Source Press RTO / Stack
Method 5 Filter holder: Glass

Date 2-21-96 Test 9 Run 2
No. of traverse points 20
Filter type: 4" G/F

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☑
Post test: <0.006 cfm at 8 IN. HG (vac) ☑

Particulate Catch Data:

No. of filters used: 0327

Recovery solvent(s)

☑ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: M. Kaehler & L. Hansen

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	514	507	7
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1435	1425	10
Total			17

Integrated Gas Sampling Data:

Bag Pump No. 36B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: C
Time start: 1400
Sampling rate: 400

Box No. 9 Bag No. 2
Size: 44 L
cc/min at 15 IN.HG
(HRS) Time end: 1501 (HRS)
cc/min Operator: M. Kaehler

S/N of O_2 Analyzer used to monitor train outlet:)

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job: I.P. / Hayward, WI — Operators: M. Knehlben, T.L. Hanson — Nozzle No.: 2-4 — Pitot No.: 22 V-B
Source: Press AIR / Stack — Meter Box No.: 1B ΔH@ 1.81 in.WC — Nozzle Dia.: .250 in. — C_p: .84
Date: 2-11-96 Test: 4 Run: 2 — Gasmeter Coeff.: 1.0051 — Bar. Press.: 29.24 in.Hg — H_2O: 1.8 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	1400	317.60											
B-10	3	319.99	.61	1.92	9.96	4	246	239	240	44	86	86	19.5
9	6	322.53	.69	2.14	2.45	4.5	259				84	85	19.7
8	9	324.93	.64	2.01	4.87	4	246	240	235	42	85	85	19.9
7	12	327.40	.67	2.10	7.35	4.5	248				86	85	19.5
6	15	329.85	.68	2.12	9.84	4.5	253	246	241	42	87	84	19.8
5	18	332.46	.72	2.28	2.41	5	244				88	84	19.6
4	21	335.05	.73	2.31	5.00	5	245	241	247	43	87	83	19.6
3	24	337.63	.72	2.23	7.55	5	259				87	82	19.8
2	27	340.13	.69	2.16	0.05	5	253	240	241	43	88	81	19.5
1	30	342.71	.74	2.30	2.64	5	250				89	81	19.5
A-10	33	345.54	.89	2.77	5.48	6	254	236	244	43	89	81	19.9
9	36	348.44	.94	2.98	8.42	6	240				91	82	19.6
8	39	351.45	1.00	3.17	1.46	6.5	241	240	241	45	92	82	19.7
7	42	354.40	.93	2.94	4.38	6	245				93	82	19.8
6	45	357.21	.90	2.81	7.25	6	259	237	247	45	94	83	19.7
5	48	359.73	.63	2.00	9.67	4.5	246				95	84	19.6
4	51	362.30	.68	2.15	2.18	5	248	241	244	45	96	84	19.6
3	54	364.62	.63	1.99	4.60	4	251				96	85	19.7
2	57	367.05	.62	1.96	7.00	4	250	237	249	44	96	95	19.7
1	60	369.42	.63	1.99	9.42	4	252				97	86	19.6
	(150)												
	0 - 60	V_m - 51.82		2.32 ΔH -							Avg. -	86.9	

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. / Hayward, WI
Source Press NG / Stack
Method 5 Filter holder: Glass

Date 2-21-96 Test 9 Run 3
No. of traverse points 20
Filter type: 4" Gelman

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac)
Post test: 0.01 cfm at 8 IN. HG (vac)

Particulate Catch Data:
No. of filters used: 9328

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: M. Kaehler & L. Hansen

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	512	504	8
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1554	1542	12
Total			20

Integrated Gas Sampling Data:

Bag Pump No. 36B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1535
Sampling rate: 400

Box No. 9 Bag No. 3
Size: 44 L
cc/min at 15 IN.HG
(HRS) Time end: 1636 (HRS)
cc/min Operator: M. Kaehler

S/N of O_2 Analyzer used to monitor train outlet: 7

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job L.P. / Hayward, WI
Source Press RTO
Date 2-21-96 Test 9 Run 3

Operators M. Kaehler + L. Hansen
Meter Box No. 18 ΔH@ 1.81 in.WC
Gasmeter Coeff. 1.0051

Nozzle No. 2-4
Nozzle Dia. .250 in.
Bar. Press. 29.24 in.Hg

Pitot No. 220-B
C_p .84
H_2O 1.8 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Impr.	Gas/In	Gas/Out	Oxygen (% v/v)
	1535	370.00											
A-10	3	372.99	.95	2.97	2.93	5	250	234	251	47	86	85	19.7
9	6	376.05	1.02	3.24	6.00	6	240				86	85	19.8
8	9	378.99	.98	3.09	8.99	6	244	239	246	47	87	84	19.5
7	12	381.96	.92	2.90	1.90	5.5	244				89	84	19.8
6	15	384.64	.77	2.42	4.56	5	249	245	241	48	90	84	19.8
5	18	386.97	.61	1.94	6.94	4	241				91	84	19.6
4	21	389.45	.63	2.00	9.36	4	245	249	247	45	91	83	19.6
3	24	391.84	.62	1.96	1.75	4	245				93	84	19.6
2	27	394.15	.60	1.91	4.12	4	243	250	253	44	94	84	19.7
1	30	396.65	.65	2.07	6.58	4	243				94	84	19.7
B-10	33	398.95	.58	1.84	8.90	3	247	243	250	44	93	84	19.8
9	36	401.34	.60	1.93	1.28	4	235				94	84	19.9
8	39	403.87	.68	2.18	3.81	4.5	238	247	245	46	95	85	19.8
7	42	406.42	.68	2.19	6.35	4.5	239				95	85	19.7
6	45	408.99	.75	2.38	8.99	5	247	243	251	45	96	86	19.8
5	48	411.58	.70	2.23	1.55	4.5	247				96	86	19.9
4	51	413.95	.60	1.93	3.93	4	239	237	248	45	97	86	19.9
3	54	416.63	.74	2.38	6.58	5	239				97	87	19.9
2	57	419.35	.74	2.38	9.23	5	240	234	245	45	97	87	19.8
1	60	421.20	.61	1.97	1.64	4	237				98	87	19.8
	1636												
	0 - 60	V_m - 51.20		2.30 ΔH -							Avg. - 88.9		

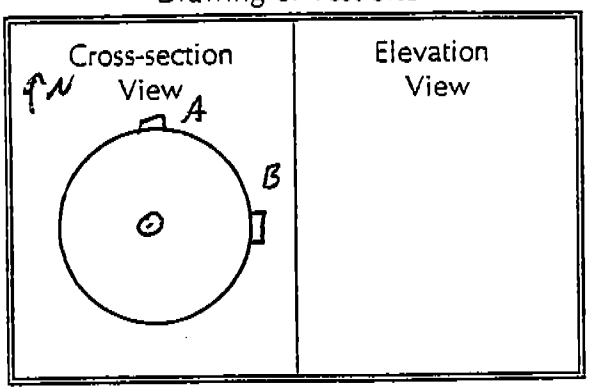
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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: L.P. / Hayward, WI
Source: Press RTO / Stack
Test: 11 Run: 0 Date: 2-22-96
Stack Dimen.: 75.5 IN.
Dry Bulb: 245 °F Wet bulb: 108 °F
Manometer: ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 28.91 IN.HG
Static Pressure: -.49 IN.WC
Operators: M. Kuehlhan & H. Hemsen
Pitot No.: M1 5-B C_p: .84

Drawing of Test Site



Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 6.25 IN.		Time Start:	HRS
		Refer to Test No. 9			
		for pts and flows			

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. / Hayward, Calif Date 2-27-96 Test 11 Run 1
Source Press MD / Stack No. of traverse points 20
Method MD1 Filter holder: NA Filter type: NA

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0.02 cfm at 5 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used: NA

Recovery solvent(s)

☐ acetone
☒ other(s) Toluene + Acetonitrile

No. of probe wash bottles: Combined with Impingers
Sample recovered by: M. Koehler + L. Hansen

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	497	577	(80)
Impinger No. 2	516	473	43
Impinger No. 3			
~~Condenser~~ Charcoal	1541	1491	50
Desiccant	1454	1454	—
Charcoal	1453	1440	13
Total			26

Integrated Gas Sampling Data:

Bag Pump No. 31 B Box No. 19 Bag No. 1
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 15 IN.HG
Time start: 0800 (HRS) Time end: 0913 (HRS)
Sampling rate: 400 cc/min Operator: M. Koehler

S/N of O_2 Analyzer used to monitor train outlet: 7

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EPA Method 5 Field Data Sheet

Job L.P. / Hayward, WI
Source Press RTO / Stack
Date 2-22-96 Test 11 Run 1

Operators M. Koehler / L. Hansen
Meter Box No. 1B ΔH@ 1.81 in.WC
Gasmeter Coeff. 1.0051

Nozzle No. Glass-3
Nozzle Dia. .187 in.
Bar. Press. 28.91 in.Hg

Pitot No. MMS-B
C_p .84
H_2O 1.8 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	0900	431.50											
A-10	3.5	433.10	.65	.62	3.05	3.5	243	231	234	35	66	63	19.8
9	7	434.73	.72	.70	4.70	3.5	226				68	63	19.7
8	10.5	436.47	.69	.67	6.32	3.5	228	238	242	36	69	63	19.7
7	14	438.11	.73	.71	7.98	3.5	228				71	64	19.8
6	17.5	439.65	.71	.69	9.63	3.5	229	242	237	36	73	65	19.8
5	21	441.34	.74	.72	1.31	4	232				75	65	19.8
4	24.5	443.20	.90	.87	3.17	4	236	245	241	36	77	66	19.7
3	28	444.98	.81	.79	4.93	4	237				79	67	19.7
2	31.5	446.74	.78	.77	6.67	4	233	241	245	37	80	68	19.9
1	35	448.24	.51	.50	8.07	3	235				81	69	19.9
B-10	38.5	449.99	.87	.85	9.91	4	235	236	242	37	80	71	19.7
9	42	451.83	.96	.94	1.85	4	237				83	71	19.8
8	45.5	453.92	1.03	1.02	3.85	4.5	235	233	246	38	84	72	19.8
7	49	455.81	.93	.92	5.77	4	235				86	73	19.6
6	52.5	457.67	.84	.83	7.59	4	234	238	250	37	87	75	19.7
5	56	459.31	.68	.68	9.24	4	234				87	75	19.7
4	59.5	460.84	.57	.57	0.75	3	235	240	251	39	88	77	19.8
3	63	462.41	.62	.61	2.32	3.5	240				89	78	19.8
2	66.5	463.97	.63	.63	3.91	3.5	229	243	254	39	89	79	19.7
1	70	465.38	.48	.48	5.31	3	230				90	79	19.7
	(0913)												
	0-70	V_m - 33.88		ΔH - .73							Avg. - 251		

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. / Hayward, AV — Date 2-22-96 Test 11 Run 1
Source Press RTO / Stack — No. of traverse points 20
Method MDI Filter holder: NA — Filter type: NA

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0.01 cfm at 8 IN. HG (vac) ☒

Particulate Catch Data:

No. of filters used: NA

Recovery solvent(s)

☐ acetone
☒ other(s) Toluene + Acetonitrile

No. of probe wash bottles: Added to Impinger
Sample recovered by: M. Koehler + H. Hansen

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	522	573	(51)
Impinger No. 2	480	468	12
Impinger No. 3			
Condenser	1492	1453	39
Desiccant	1455	1454	1
	1510	1500	10
Total			11

Integrated Gas Sampling Data:

Bag Pump No. 31 B — Box No. 19 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar — Size: 44 L
Pretest leak check: 0 — cc/min at 15 IN.HG
Time start: 0940 — (HRS) Time end: 1052 (HRS)
Sampling rate: 400 — cc/min Operator: M. Koehler

S/N of O_2 Analyzer used to monitor train outlet: 7

052394-G:\STACK\WP\FORMS\S-0046RR

(612) -6020

EPA Method 5 Field Data Sheet

Job L.P. / Hayward, WI
Source Basin 1&2 / Stack
Date 2-22-96 Test 11 Run 2

Operators M. Kaehler & H. Hansen
Meter Box No. 18 ΔH@ 1.81 in.WC
Gasmeter Coeff. 1.0051

Nozzle No. Glass - 3
Nozzle Dia. .187 in.
Bar. Press. 29.91 in.Hg

Pitot No. MMS - B
C_p .84
H_2O 3.6 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	0440	465.70			2.54	4	231	243	255	40	82	81	19.7
B-10	3.5	467.59	.90	.86	9.49	4	240				83	81	19.8
9	7	469.58	.99	.95	1.45	4	240	236	255	38	85	81	19.8
8	10.5	471.51	1.00	.96	3.32	4	234				86	81	19.8
7	14	473.38	.89	.86	5.04	4	232	241	250	38	87	81	19.7
6	17.5	475.14	.76	.74	6.67	3.5	229				88	81	19.7
5	21	476.61	.67	.65	9.29	3.5	231	238	247	39	89	82	19.8
4	24.5	478.33	.67	.65	9.04	3	234				89	82	19.7
3	28	479.93	.61	.59	1.33	3	229	240	248	39	90	82	19.7
2	31.5	481.41	.56	.55	2.56	3	229				90	83	19.7
1	35	482.74	.38	.37	4.16	3.5	230	245	244	38	89	83	19.8
A-10	38.5	484.21	.61	.60	5.73	3.5	235				92	84	19.8
9	42	485.89	.66	.64	7.34	3.5	233	241	249	39	93	85	19.9
8	45.5	487.53	.65	.64	9.00	3.5	233				94	85	19.9
7	49	489.17	.69	.68	0.70	4	231	239	249	41	85	94	19.7
6	52.5	490.80	.72	.71	2.43	4	234				95	87	19.7
5	56	492.51	.75	.74	4.15	4	232	243	245	41	96	87	19.6
4	59.5	494.19	.74	.73	5.93	4	234				96	88	19.6
3	63	495.96	.79	.78	7.70	4	234	240	244	41	97	88	19.7
2	66.5	497.76	.77	.76	9.26	3.5	234				98	89	19.7
1	70	499.50	.61	.60									
	1052												
	0 - 70	V_m - 33.80		ΔH - .70							Avg. - 87.2		

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. / Hayward, WI — Date 2-22-96 Test 11 Run 3
Source Boos RTO / Stack — No. of traverse points 20
Method M01 Filter holder: NA — Filter type: NA

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0.02 cfm at 7 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used: NA

Recovery solvent(s)
☐ acetone
☒ other(s) Toluene + Acetonitrile

No. of probe wash bottles: Added to Impingers
Sample recovered by: M. Kuehler + L. Hennessy

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	525	589	(36)
Impinger No. 2	494	470	24
Impinger No. 3	508	535	(27)
Condenser	1533	1492	41
Desiccant	1457	1455	2
	1511	1510	11
Total			15

Integrated Gas Sampling Data:

Bag Pump No. 31B — Box No. 19 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar — Size: 44 L
Pretest leak check: 0 — cc/min at 15 IN.HG
Time start: 1117 (HRS) — Time end: 1229 (HRS)
Sampling rate: 400 cc/min — Operator: M. Kuehler

S/N of O_2 Analyzer used to monitor train outlet: 7

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ERP EAU VIC , WI
(612) 7 6020

EPA Method 5 Field Data Sheet

Job L.P. / Hayward, WI
Source Press RTO / Stack
Date 2-22-96 Test 11 Run 3

Operators M. Koehler & H. Hanse 4
Meter Box No. 18 ΔH@ ____ in.WC
Gasmeter Coeff. 1.0051

Nozzle No. Glass - 3
Nozzle Dia. .187 in.
Bar. Press. 28.91 in.Hg

Pitot No. M-05-B
C_p .84
H_2O 2.6 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	1117	499.80											
A-10	3.5	501.40	.56	.57	1.31	3	233	230	247	45	91	90	19.7
9	7	502.99	.63	.64	2.93	3.5	232				91	90	19.7
B	10.5	504.80	.77	.79	4.72	4	231	233	253	41	92	90	19.7
7	14	506.49	.71	.72	6.44	4	234				93	90	19.8
6	17.5	508.25	.74	.75	8.19	4	235	241	252	42	94	90	19.8
5	21	509.99	.25	.27	9.96	4	232				94	90	19.7
4	24.5	511.90	.80	.81	1.78	4	235	235	246	40	95	90	19.7
3	28	513.76	.80	.81	3.61	4	236				96	90	19.6
2	31.5	515.63	.83	.85	5.47	4	234	240	243	40	97	90	19.6
1	35	517.23	.70	.71	7.18	4	236				97	91	19.7
B-10	38.5	519.15	.86	.88	9.07	4	236	243	240	41	97	91	19.9
9	42	521.14	.97	1.00	1.09	4.5	232				98	92	19.9
8	45.5	523.12	.93	.95	3.07	4	236	241	245	41	98	92	19.9
7	49	525.06	.95	.97	5.06	4	238				98	92	19.8
6	52.5	526.80	.66	.67	6.73	3.5	235	245	243	41	98	92	19.9
5	56	528.59	.68	.70	8.42	3.5	232				98	93	19.7
4	59.5	530.20	.60	.61	0.01	3	235	242	248	42	99	93	19.8
3	63	531.70	.60	.61	1.60	3	235				98	93	19.8
2	66.5	533.20	.61	.62	3.21	3	235	240	247	42	98	93	19.8
1	70	534.71	.49	.50	4.64	3	236				99	93	19.9
	(1229)												
	0 - 70	V_m - 34.91		ΔH - .25							Avg. - 93.6		

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: G.P. / Hayward, WI
Source: Press RTO / Stack
Test: 12 Run: 0 Date: 2-22-96
Stack Dimen.: 25.5 IN.
Dry Bulb: 245 °F Wet bulb: 108 °F
Manometer: ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 28.91 IN.HG
Static Pressure: -.79 IN.WC
Operators: M. Kaebisch, K. Hansen
Pitot No.: MM5-8 C_p: .84

Drawing of Test Site

Cross-section View	Elevation View

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length:	IN.	Time Start:	HRS
		Refer to Test No. 9			
		for pts and flows			

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P./Hammond, WI
Source Press RTO / Stack
Method 0011 Filter holder: NA

Date 2-22-96 Test 12 Run 1
No. of traverse points 20
Filter type: NA

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0.02 cfm at _____ IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used: 8

Recovery solvent(s)
☐ acetone
☒ other(s) $MeCl_2$

No. of probe wash bottles: Added to Impingers
Sample recovered by: M. Kuehler & L. Hansen

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	969	975	(6)
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1470	1457	13
Total			7

Integrated Gas Sampling Data:

Bag Pump No. 36B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1335
Sampling rate: 400

Box No. 20 Bag No. 1
Size: 44 L
cc/min at 15 IN.HG
(HRS) Time end: 1436 (HRS)
cc/min Operator: M. Kuehler

S/N of O_2 Analyzer used to monitor train outlet: 7

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(612) 786-6020

EPA Method 5 Field Data Sheet

Job L.P. / Hayward, WI
Source Brass 1-50 / Stack
Date 2-22-96 Test 12 Run 1

Operators M. Kaehler & L. Hancey
Meter Box No. 1B ΔH@ 1.81 in.WC
Gasmeter Coeff. 1.0051

Nozzle No. Glass-4
Nozzle Dia. .250 in.
Bar. Press. 28.91 in.Hg

Pitot No. M-M5-B
C_p .84
H_2O 2 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	1335	535.30											
B-10	3	538.07	.87	2.82	9.19	6	234	243	249	40	02	03	19.7
9	6	541.10	1.03	3.25	1.28	7	232				01	03	19.6
8	9	544.14	1.02	3.18	4.32	7.5	246	240	255	43	03	03	19.8
7	12	547.12	.89	2.81	7.19	7	238				06	02	19.9
6	15	549.54	.57	1.82	9.50	5	234	245	251	42	07	02	19.9
5	18	551.99	.66	2.09	1.98	5	239				09	02	19.8
4	21	554.58	.69	2.19	4.52	5	238	245	246	42	90	02	19.8
3	24	556.99	.63	1.99	6.95	5	242				92	03	A.8
2	27	559.45	.62	1.96	9.36	5	243	239	247	43	93	04	19.8
1	30	561.50	.43	1.37	1.38	4	240				94	04	19.7
A-10	33	563.82	.57	1.82	3.70	4.5	241	234	253	42	93	04	19.7
9	36	566.35	.68	2.19	6.25	5	232				95	05	19.8
8	39	568.97	.71	2.27	8.84	5.5	238	243	250	42	96	05	19.8
7	42	571.59	.73	2.33	1.48	5.5	240				96	06	19.7
6	45	573.99	.66	2.11	3.98	5	242	240	254	43	97	07	19.7
5	48	576.73	.75	2.43	6.67	6	233				97	07	19.8
4	51	579.50	.78	2.52	9.41	6	234	237	249	41	98	07	19.8
3	54	582.34	.83	2.65	2.22	6.5	243				99	08	19.9
2	57	584.99	.81	2.58	4.99	6	247	243	246	41	99	09	20.0
1	60	587.34	.53	1.71	7.26	4	238				100	90	20.0
	(1436)												
	θ = 60	V_m = 52.04		2.30 ΔH =							Avg. =	08.5	

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job L.P. / Hayward, WI
Source Press RTO / Stack
Date 2-22-96 Test 12 Run 2

Operators M. Kuehlert L. Hansen
Meter Box No. 1B ΔH@ 1.81 in.WC
Gasmeter Coeff. 1.0051

Nozzle No. Glass - 4
Nozzle Dia. .250 in.
Bar. Press. 28.91 in.Hg

Pitot No. M015-8
C_p .84
H_2O 1 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	1450	587.60											
A-10	3	590.06	.68	2.20	0.15	5	241	234	253	42	91	90	19.7
9	6	592.81	.74	2.42	2.83	6	235				92	89	19.8
8	9	595.35	.69	2.22	5.40	5.5	246	237	251	42	94	90	19.8
7	12	597.99	.68	2.22	7.97	5.5	239				95	90	19.7
6	15	600.72	.74	2.44	0.67	6	233	241	249	44	97	90	19.7
5	18	603.44	.79	2.60	3.45	6	235				98	91	19.9
4	21	606.22	.80	2.59	6.23	6	248	240	245	44	98	91	19.9
3	24	609.13	.87	2.81	9.13	6.5	249				99	91	19.9
2	27	611.98	.81	2.63	1.94	6	245	237	251	44	99	91	19.8
1	30	614.51	.62	2.05	4.42	5	235				99	91	19.8
B-10	33	617.44	.88	2.89	7.36	7	237	243	245	46	100	92	19.7
9	36	620.57	1.02	3.37	0.54	8	233				100	92	19.7
8	39	623.70	1.05	3.45	3.75	8	238	239	250	47	100	92	19.7
7	42	626.74	.95	3.08	6.78	8	247				100	93	19.8
6	45	629.46	.72	2.34	9.44	6	247	245	253	47	99	93	19.7
5	48	632.07	.66	2.18	2.00	5.5	235				100	93	19.7
4	51	634.46	.60	1.98	4.44	5	237	250	247	45	100	94	19.8
3	54	636.83	.59	1.95	6.86	5	238				101	94	19.8
2	57	639.32	.62	2.05	9.34	5	237	246	249	45	101	94	19.9
1	60	641.40	.42	1.39	1.39	4	237				101	94	19.9
	(1551)												
	0 - 60	V_m - 53.00		2.44 ΔH -							Avg. -	94.9	

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WATERLOO LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job L.P. / Hayward, WI
Source Press AFD / Stack
Date 2-22-96 Test 12 Run 2

Operators M. Kaehler + L. Hansen
Meter Box No. 1B ΔH@ 1.81 in.WC
Gasmeter Coeff. 1.0051

Nozzle No. Glass - 4
Nozzle Dia. .250 in.
Bar. Press. 28.91 in.Hg

Pilot No. M-15-B
C_p .84
H_2O 1 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	1450	587.60											
A-10	3	590.06	.68	2.20	0.15	5	241	234	253	42	91	90	19.7
9	6	592.81	.74	2.42	2.83	6	235				92	89	19.8
8	9	595.35	.69	2.22	5.40	5.5	246	237	251	42	94	90	19.8
7	12	597.99	.68	2.22	7.97	5.5	239				95	90	19.7
6	15	600.72	.74	2.44	0.67	6	233	241	249	44	97	90	19.7
5	18	603.44	.79	2.60	3.45	6	235				98	91	19.9
4	21	606.22	.80	2.59	6.23	6	248	240	245	44	98	91	19.9
3	24	609.13	.87	2.81	9.13	6.5	249				99	91	19.9
2	27	611.98	.81	2.63	1.94	6	245	237	251	44	99	91	19.8
1	30	614.51	.62	2.05	4.42	5	235				99	91	19.8
B-10	33	617.44	.88	2.89	7.36	7	237	243	245	46	100	92	19.7
9	36	620.57	1.02	3.37	0.54	8	233				100	92	19.7
8	39	623.70	1.05	3.45	3.75	8	238	239	250	47	100	92	19.7
7	42	626.74	.95	3.08	6.78	8	247				100	93	19.8
6	45	629.46	.72	2.34	9.44	6	247	245	253	47	99	93	19.7
5	48	632.07	.66	2.18	2.00	5.5	235				100	93	19.7
4	51	634.46	.60	1.98	4.44	5	237	250	247	45	100	94	19.8
3	54	636.83	.59	1.95	6.86	5	238				101	94	19.8
2	57	639.32	.62	2.05	9.34	5	237	246	249	45	101	94	19.9
1	60	641.40	.42	1.39	1.39	4	237				101	94	19.9
	(1551)												
	θ - 60	V_m - 53.00		2.44 ΔH -							Avg. -	94.9	

INTERPOLL LABORATORIES, INC.
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Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job G.P. / Hayward, WI
Source Press RTO / Stack
Method 0011 Filter holder: NA

Date 2-22-96 Test 12 Run 3
No. of traverse points 20
Filter type: NA

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☑
Post test 0.01 cfm at 10 IN. HG (vac) ☑

Particulate Catch Data:

No. of filters used: NA

Recovery solvent(s)

☐ acetone
☑ other(s) $MeCl_2$

No. of probe wash bottles: Added to Impingers
Sample recovered by: M. Kaebler + B. Hansen

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	480	474	6
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1444	1439	5
Total			11

Integrated Gas Sampling Data:

Bag Pump No. 36B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1608
Sampling rate: 400

Box No. 20 Bag No. 3
Size: 44 L
cc/min at 15 IN.HG
(HRS) Time end: 1208 (HRS)
cc/min Operator: M. Kaebler

S/N of O_2 Analyzer used to monitor train outlet: 7

052394-G:\STACK\WP\FORMS\S-0046RR

(612) 786-6020

EPA Method 5 Field Data Sheet

Job
Source Presss ATO / Stack
Date 2-22-96 Test 12 Run 3

Operators
Meter Box No. 18 ΔH@ 1.81 in.WC
Gasmeter Coeff. 1.0051

Nozzle No. Glass -4
Nozzle Dia. .250 in.
Bar. Press. 28.91 in.Hg

Pitot No. M-5 -B
C_p .84
H_2O 1.2 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	1608	641.70											
B-10	3	644.57	.88	2.67	4.62	7	240	237	248	37	93	93	19.6
9	6	647.70	1.00	3.23	7.73	8	243				94	93	19.8
8	9	650.58	.93	3.05	0.74	7.5	235	243	247	38	95	92	19.7
7	12	653.70	.97	3.17	3.81	8	237				96	92	19.7
6	15	656.59	.79	2.56	6.58	6.5	243	240	251	38	97	92	19.7
5	18	659.27	.69	2.26	9.18	6	238				98	92	19.8
4	21	661.67	.64	2.10	1.69	5.5	238	233	245	40	99	92	19.8
3	24	664.18	.60	1.97	4.12	5.5	237				100	93	19.8
2	27	666.73	.64	2.10	6.63	5.5	240	238	240	41	100	93	19.8
1	30	668.96	.49	1.60	8.82	5	244				100	93	19.7
A-10	33	671.23	.55	1.80	1.15	5	241	240	237	41	100	93	19.7
9	36	673.94	.72	2.35	3.81	6	242				101	94	19.8
8	39	676.54	.67	2.19	6.37	5.5	244	243	242	43	101	94	19.8
7	42	678.98	.66	2.17	8.93	5.5	237				100	94	19.7
6	45	681.64	.77	2.53	1.69	6	237	247	250	44	99	94	19.8
5	48	684.41	.79	2.60	4.48	6	237				99	94	19.7
4	51	687.33	.85	2.76	7.36	7	245	244	251	44	98	94	19.6
3	54	690.17	.79	2.56	0.13	7	245				97	93	19.5
2	57	692.99	.83	2.73	2.99	7	235	241	250	45	95	93	19.7
1	60	695.66	.64	2.10	5.50	5.5	235				94	92	19.7
	(108)												
	0 - 60	V_m - 53.96		ΔH - 2.43							Avg. - 95.4		

C-70

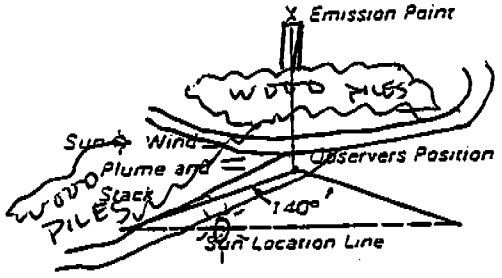
Interpoll Laboratories
(612)786-6020

Test 9

Visible Emissions Form

SOURCE NAME	Louisiana Pacific Corporation
ADDRESS	Hwy 63
CITY	Hayward
STATE	WI
ZIP	
PHONE	
SOURCE ID NUMBER	
PROCESS EQUIPMENT	Line 1 Press Stack
OPERATING MODE	
CONTROL EQUIPMENT	RTO
OPERATING MODE	
DESCRIBE EMISSION POINT	START round Metal Stack STOP Same
HEIGHT ABOVE GROUND LEVEL	START ~100' STOP Same
HEIGHT RELATIVE TO OBSERVER	START ~100' STOP Same
DISTANCE FROM OBSERVER	START ~350' STOP Same
DIRECTION FROM OBSERVER	START W STOP W
DESCRIBE EMISSIONS	START none STOP Same
PLUME TYPE	NA CONTINUOUS ☐
EMISSION COLOR	START NA STOP NA
FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT:	NO ☒ YES ☐
IF WATER DROPLET PLUME:	NA ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED	START 3 diameters STOP Same
DESCRIBE BACKGROUND	START Sky STOP Sky
BACKGROUND COLOR	START blue STOP Same
SKY CONDITIONS	START clear STOP Same
WIND SPEED	START 0-5 mph STOP Same
WIND DIRECTION	START E/NE STOP Same
AMBIENT TEMP.	START 25°F STOP 28°F
WET BULB TEMP	*
RH, percent	*

Source Layout Sketch — Draw North Arrow



SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

START TIME	1215
STOP TIME	1315
OBSERVATION DATE	Feb 21, 1996
AVERAGE OPACITY FOR HIGHEST PERIOD	0
NUMBER OF READINGS ABOVE % WERE	
RANGE OF OPACITY READINGS MINIMUM	0
MAXIMUM	0
OBSERVER'S NAME (PRINT)	Sheryl Bergerud
OBSERVER'S SIGNATURE	Sheryl Bergerud
DATE	2/21/96
ORGANIZATION	Interpoll Labs.
CERTIFIED BY	ETA
DATE	10/4/95
VERIFIED BY	
DATE	

COMMENTS
* Not determined w/ sling psychrometer due to low temps

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE
TITLE
DATE

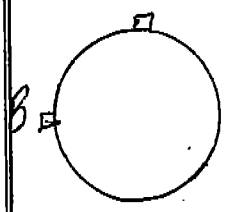
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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job AP/HAWARD
Source FINE 1 PLASS RTO INLET
Test 13 Run 1 Date 02-21-96
Stack Dimen. 53.125 IN.
Dry Bulb ____ °F Wet bulb ____ °F
Manometer ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure 29.24 IN.HG
Static Pressure -6.0 IN.WC
Operators EJ-AB
Pitot No. S1V-6 C_p .84

Drawing of Test Site

Cross-section View	Elevation View
	

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: IN.		Time Start: 1215	HRS
A 1				1.70	
2				2.70	
3				2.75	
4				3.00	
5				3.00	115
6				3.10	
7				2.20	
8				2.70	
9				2.60	
10				1.90	
11				1.90	
12				2.00	
B 1				3.10	
2				3.20	
3				3.00	
4				2.50	
5				1.50	115
6				1.50	
7				2.10	
8				2.30	
9				2.30	
10				2.50	
11				2.00	
12				1.70	

Temp. Meas. Device & S/N:

Time End: HRS

R or nothing = reg. manometer; S = expanded; E = electronic

INTERPOLL LABORATORIES, INC.
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EPA Method 2 Field Data Sheet

Job: 291 (HAYWARD)
Source: LINE 1 PRESS RTO INLET
Test: 13 Run 2 Date 2-21-96
Stack Dimen.: 53.125 IN.
Dry Bulb: ____ °F Wet bulb: ____ °F
Manometer: ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 29.24 IN.HG
Static Pressure: -6.0 IN.WC
Operators: ET - JB
Pitot No.: 91V-6 C_p .840

Drawing of Test Site

Cross-section View	Elevation View

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length:	IN.	Time Start: 1400	HRS
B 1				2.40	
2				2.80	
3				3.20	
4				3.00	
5				2.70	113
6				2.50	
7				1.70	
8				1.60	
9				2.30	
10				2.20	
11				2.10	
12				1.80	
A 1				1.7	
2				2.8	
3				2.8	
4				3.0	
5				2.8	113
6				2.9	
7				2.5	
8				2.3	
9				2.3	
10				2.2	
11				2.1	
12				1.8	

Temp. Meas. Device & S/N:

Time End: HRS

R or nothing = reg. manometer; S = expanded; E = electronic

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: LP / HAYWARD
Source: LINE 1 PRESS RTO INLET
Test: 13 Run 3 Date 2-21-96
Stack Dimen.: 53.125 IN.
Dry Bulb: °F Wet bulb: °F
Manometer: [X] Reg. [ ] Exp [ ] Elec.
Barometric Pressure: 29.24 IN.HG
Static Pressure: -6.5 IN.WC
Operators: ET-JB
Pitot No.: 410-6 C_p .85

Drawing of Test Site

Cross-section View	Elevation View

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length:	IN.	Time Start: 1535	HRS
A 1				2.7	
2				2.6	
3				2.7	
4				2.5	
5				2.6	
6				2.1	111
7				2.0	
8				2.1	
9				2.0	
10				1.80	
11				1.80	
B 12				1.90	
1				2.6	
2				2.5	
3				2.4	
4				2.8	
5				2.6	
6				2.6	111
7				2.9	
8				2.2	
9				2.3	
10				2.5	
11				2.4	
12				2.0	

Temp. Meas. Device & S/N:
Time End: HRS

R or nothing = reg. manometer; S = expanded; E = electronic

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INTERPOLL LABORATORIES, INC.
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EPA Method 4 and 6 Field Data Sheet

Job LP/HAYWARD
Source LINER PRESS RTO INLET
Date 2-21-96 Test 13 Run 1
Wet Bulb _____
Dry Bulb _____

Operator(s) ET-JB
Meter Box No. IR 1 Gasmeter Coef. .9976
ΔH@ 2.0 in.WC Bar.Press 29.24 in.Hg
Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in.WC
Post Test: 0 cfm at ✓ in.WC

Trav. Point No.	Sample Time (min)	Sample Volume (cf)	Orif. Meter (in.WC)	Vac. in.Hg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/ In	Gas/ Out	O_2 (%v/v)
	1215	939.440									
	5	939.550	1000 cc	+						68	
	10	939.750	1000	+						68	
	15	939.920	1000	+						68	
	20	940.100	1000	+						68	
	25	940.260	1000	/						68	
	30	940.448	1000	/						68	
	35	940.630	1000	/						68	
	40	940.750	1000	/						68	
	45	940.970	1000	/						68	
	50	941.150	1000	/						68	
	55	941.312	1000	/						68	
	60	941.520	1000	/						68	
	1315										
	θ = 60	V_m = 2.110	ΔH = 1000 cc		$\bar{t}_s$ =					$\bar{t}_m$ = 68	

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impingers			
Condenser			
Desiccant	771.753	771.2203	.5750
		Total	.5750

Preliminary Results of SO_2 Concentration Determination		
V_{std} =	2.11	DSCF
Moisture Gravimetric =	1.26	%v/v
Moisture Psychrometric =		%v/v
SO_2, DRY =		PPM
SO_2, WET =		PPM
LB/MMBtu =		

INTERPOLL LABORATORIES, INC.
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EPA Method 4 and 6 Field Data Sheet

Job LP/Hayward
Source Line 1 Preh RTO Inlet
Date 2-21-96 Test 13 Run 2
Wet Bulb _____
Dry Bulb _____

Operator(s) ET-TB
Meter Box No. TR 1 Gasmeter Coef. .996
ΔH@ 0 in.WC Bar.Press 29.24
Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in.WC
Post Test: .02 cfm at 15 in.WC

Trav. Point No.	Sample Time (min)	Sample Volume (cf)	Orif. Meter (in.WC)	Vac. in.Hg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/ In	Gas/ Out	O_2 (%v/v)
	1400	941.800									
	5	941.985	1000CC	1					68		
	10	942.170	1000	1					68		
	15	942.352	1000	1					68		
	20	942.540	1000	1					68		
	25	942.716	1000	1					68		
	30	942.911	1000	1					68		
	35	943.080	1000	1					68		
	40	943.275	1000	1					68		
	45	943.450	1000	1					68		
	50	943.639	1000	1					68		
	55	943.814	1000	1					68		
	60	944.005	1000	1					68		
	(1500)								68		
	θ = 60	V_m = 2.205	ΔH = 1000		$\bar{t}$ =				$\bar{t}_m$ = 68		

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impingers			
Condenser			
Desiccant	78.5457	77.9690	0.5767
		Total	.5767

Preliminary Results of SO_2 Concentration Determination	
V_{std} =	2.15 DSCF
Moisture Gravimetric =	1.25 %v/v
Moisture Psychrometric =	%v/v
SO_2, DRY =	PPM
SO_2, WET =	PPM
LB/MMBtu =	

INTERPOLL LABORATORIES, INC.
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EPA Method 4 and 6 Field Data Sheet

Job LP/HAZWASTE
Source LINE 1 PRESS RTO INLET
Date 2-21-96 Test 15 Run 3
Wet Bulb _____
Dry Bulb _____

Operator(s) ET-TB
Meter Box No. TR1 Gasmeter Coef. .9976
ΔH@ — in.WC Bar.Press 29.24 in.Hg

Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in.WC
Post Test: 0 cfm at 15 in.WC

Trav. Point No.	Sample Time (min)	Sample Volume (cf)	Orif. Meter (in.WC)	Vac. in.Hg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/ In	Gas/ Out	O_2 (%v/v)
	1535	944.070									
	5	944.215	1000	1					68		
	10	944.412		1					68		
	15	944.596		1					68		
	20	944.778		1					68		
	25	944.960		1					68		
	30	945.118		1					68		
	35	945.276		1					68		
	40	945.434		1					68		
	45	945.592		1					68		
	50	945.750		1					68		
	55	946.085		1					68		
	60	946.262		1					68		
	1635										
	θ = 60	V_m = 2.192	ΔH = 1000		$\bar{t}$ =				$\bar{t}_m$ = 68		

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impingers			
Condenser			
Desiccant	88.436	88.5879	.5502
		Total	.5502

Preliminary Results of SO_2 Concentration Determination		
V_{std} =	2.136	DSCF
Moisture Gravimetric =	1.28	%v/v
Moisture Psychrometric =		%v/v
SO_2, DRY =		PPM
SO_2, WET =		PPM
LB/MMBtu =		

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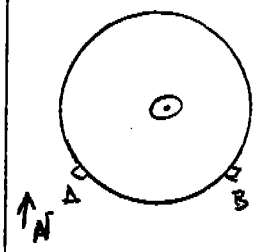
EPA Method 2 Field Data Sheet

Job: L.P. Hayward
Source: Line 1 Thermal Oil Heater Stack
Test: 14 Run Date: 2/20, 21/96
Stack Dimen.: 52 IN.
Dry Bulb: °F Wet bulb: °F
Manometer: ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 29.24 IN.HG
Static Pressure: -.21 IN.WC
Operators: D. Van Hoever & S. Kelter
Pitot No.: VMM5-6 C_p .84

Drawing of Test Site

Cross-section View

Elevation View



Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 6.5 IN.		Time Start: 1545 HRS	
A 1		1.35	7.85	.05	
2		4.26	10.76	.07	
3		7.59	14.09	.08	
4		11.75	18.25	.08	
5		17.78	24.28	.10	
6		34.22	40.71	.12	
7		40.24	46.74	.14	
8		44.4	50.90	.14	
9		47.74	54.24	.12	
10		50.64	57.14	.12	
B 1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Temp. Meas. Device & S/N:

Time End: H.

R or nothing = reg. manometer; S = expanded; E = electronic

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Modified Method 5 Sample Log Sheet

Job L.P Hayward
Source Line 1 Thermal Oil Htr
Cyclone ☐ Yes ☒ No
Analytes PAH
Field Recovery Spike Added

Date 2/20/96
No. Of Traverse Points 20
Filter Holder MM5
XAD - 2 Resin __ g
☒ Yes ☐ No

Test 1A Run 1
Filter Type 4" Glass Fiber
Batch No.
Ref. EPA SW-846 Method 0010

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 15 IN.HG (vac) ☒

Semivolatile Catch Data:

No. of filters used:

Recovery solvent(s)

☐ ~~$MeCl_2$ * MeOH (50:50 v/v)~~
☒ Other(s) Acetone

No. of bottles for condensate trap catch 1
Samples recovered by DAH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Condensate Trap	261	0	261
Condensate Trap			
Condensate Trap			
Impingers			
Desiccant	1447	1403	43
Total			304

Integrated Gas Sampling Data:

Bag Pump No. 23H
Bag Material: 4-layer Aluminized Tedlar
Pretest Leak Check: 0 cc/min at
Time Start: 1555 (HRS)
Sampling Rate: 400 cc/min

Box No. 20

Bag No. 1
Size: 44 L
15 IN.HG
Time End: 1905 (HRS)
O_2 Analyzer S/N 4

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Pg 1 of 2

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Modified Method 5 Field Data Sheet

Job L.P. Hayward
Source Unit 1 Thermal Oil Heater Stack
Date 2/20/96 Test 14 Run 1

Operators DWH & S.K
Meter Box No. 17 ΔH@ 1.74 in.WC
Gasmeter Coeff. .9985

Nozzle No. .453
Nozzle Dia. 7/8 in.
Bar. Pres. 28.48 in.Hg

Pitot No. mm5-6
C_p .84
H_2O 9 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	XAD-2	Imp.	Meter (In/Out)		Oxygen (% v/v)
	1550	222.00					342	271	253	48	46	55	53	11.3
A 10	4	225.16	.10	2.46	5.39	12	342					59	54	14.1
10	8	228.90	.09	2.13	8.95	12	344	268	263	34	37	61	54	13.4
9	12	232.40	.11	2.61	2.60	14	344					65	55	11.1
9	16	236.64	.11	2.61	0.08	14	341	260	232	34	37	66	56	11.4
8	20	240.01	.11	2.63	0.93	14	341					68	57	10.5
8	24	243.75	.11	2.64	3.88	14	341	249	233	42	40	69	57	10.7
7	28	247.53	.11	2.65	1.65	15	341					68	59	11.1
7	32	251.31	.12	2.89	1.58	16	345	252	225	39	38	67	59	11.3
6	36	255.20	.11	2.64	5.35	15	345					66	59	11.0
6	40	259.03	.11	2.64	9.11	15	347	255	246	38	37	67	59	12.0
5	44	262.43	.095	2.27	2.60	14	347					68	60	11.1
5	48	266.01	.09	2.15	6.00	14	341	254	252	35	37	68	60	11.2
4	52	269.23	.085	2.05	9.32	14	341					69	61	11.2
4	56	272.41	.08	1.93	2.55	13	340	253	256	39	37	69	62	10.8
3	60	275.60	.07	1.70	5.58	12	340					69	62	11.0
3	64	278.80	.07	1.70	8.61	12	340	238	255	45	42	69	62	11.1
2	68	281.49	.06	1.46	1.41	11	340					74	62	9.8
2	72	284.40	.06	1.46	4.22	11	336	240	254	45	42	77	63	9.6
1	76	286.87	.05	1.23	6.80	11	336					79	64	9.9
1	80	289.63	.055	1.35	9.52	11	336	253	253	45	42	76	65	12.0
B 10	84	292.44	.06	1.48	2.37	11	336					80	66	12.4
10	88	295.24	.06	1.48	5.21	11	351	253	274	41	40	80	65	12.3
9	92	298.41	.07	1.70	8.26	12	351					81	65	13.1
9	96	301.30	.075	1.82	1.42									
	Over													
	θ =	V_m =		ΔH =								Avg. =		

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IN...POL BOI DRI NC.
(612) 78 020

EPA Modified Method 5 Field Data Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Date 2/26/96 Test #4 Run 1

Operators PR 20
Meter Box No. ____ ΔH@ ____ in.WC
Gasmeter Coeff. ____

Nozzle No. ____
Nozzle Dia. ____ in.
Bar. Pres. ____ in.Hg

Pitot No. ____
C_p ____
H_2O ____ %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	XAD-2	Imp.	Meter (In/Out)		Oxyge (% v/v)
8	100	304.57	.08	1.93	4.67	14	357	254	258	42	40	83	66	11.9
8	104	308.01	.085	2.05	8.03	15	357					83	68	13.7
7	108	311.60	.095	2.29	1.57	15	361	261	274	41	40	81	70	13.5
7	112	315.13	.095	2.29	5.12	15	361					80	70	13.0
6	116	318.94	.12	2.63	8.92	16	364	264	266	43	40	80	70	14.8
6	120	322.61	.11	2.63	2.72	16	364					73	68	13.8
5	124	326.40	.11	2.61	6.49	16	364	266	267	44	43	73	69	15.6
5	128	330.40	.12	2.85	0.43	17	364					72	69	11.2
4	132	334.40	.12	2.84	4.36	17	366	264	260	45	44	71	68	13.8
4	136	338.15	.12	2.84	8.29	17	366					70	67	13.1
3	140	342.17	.12	2.84	2.21	17	364	265	257	43	42	69	67	12.9
3	144	346.04	.12	2.84	6.13	17	362					68	66	14.1
2	148	349.93	.12	2.84	0.04	17	362	260	258	45	42	61	65	12.2
2	152	353.84	.12	2.83	3.93	17	362					67	63	11.0
1	156	357.37	.11	2.64	7.70	16	346	257	261	46	42	68	66	11.5
1	160	361.45	.11	2.65	1.49		346					68	65	11.5
	(1905)													
	0 - 160	V_m - 138.45		ΔH - 2.2								Avg. - 66.9		

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Modified Method 5 Sample Log Sheet

Job L.F. Hayward
Source Line 1 Thermal Oil Heater Stack
Cyclone ☐ Yes ☒ No
Analytes P.A.H
Field Recovery Spike Added

Date 2/21/96
No. Of Traverse Points 20 / 40
Filter Holder MM5
XAD - 2 Resin ___ g
☒ Yes ☐ No

Test 14 Run 2
Filter Type 4" Glass Fiber
Batch No. ___
Ref. EPA SW-846 Method 0010

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac)
Post test: 0 cfm at 18 IN.HG (vac)

Semivolatile Catch Data:

No. of filters used:

Recovery solvent(s)

☒ $MeCl_2$ * ~~MeOH (50:50 v/v)~~
☒ Other(s) Acetone

No. of bottles for condensate trap catch 1
Samples recovered by Dirt

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Condensate Trap	228	0	228
Condensate Trap			
Condensate Trap			
Impingers			
Desiccant	1493	1444	49
Total			277

Integrated Gas Sampling Data:

Bag Pump No. 23A
Bag Material: 4-layer Aluminized Tedlar
Pretest Leak Check: 0 cc/min at
Time Start: 0840 (HRS)
Sampling Rate: 100 cc/min

Box No. 20

Bag No. 2
Size: 44 L
15 IN.HG
Time End: 1130 (HRS)
O_2 Analyzer S/N 4

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Pg. of 2

IN POL BOR ORI NC.
(612) 78 020

EPA Modified Method 5 Field Data Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Date 2/21/96 Test 14 Run 2

Operators D.V.H & S.K
Meter Box No. 6 ΔH@ 1.89 in.WC
Gasmeter Coeff. 1.0054

Nozzle No. 8-8
Nozzle Dia. .434 in.
Bar. Pres. 29.24 in.Hg

Pitot No. mm5-6
C_p .84
H_2O 10 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	XAD-2	Imp.	Meter (In/Out)		Oxyge (% v/v)	
	0835	174.70					334	246	225	40	40	48	46	19.0	
B 10	4	178.01	.11	2.40	8.09	11						58	44	18.7	Leak Check (210)
10	8	181.10	.10	2.09	4.19	11	340	253	231	40	40	57	46	19.5	
9	12	184.37	.11	2.32	4.49	11						66	47	16.5	
9	16	187.70	.11	2.30	7.76	12	336	241	235	35	33	65	49	17.3	
8	20	192.20	.12	2.54	1.21	13						63	46	16.4	
8	24	194 47	.11	2.33	4.52	13	343	244	237	35	33	70	54	16.1	
7	28	197.83	.11	2.30	7.80	13						72	56	16.0	
7	32	201.04	.11	2.34	1.13	13	347	249	238	36	33	73	58	16.3	
6	36	204.43	.11	2.33	4.46	13						74	60	12.9	
6	40	207.81	.12	2.55	7.95	13	357	253	248	37	33	69	56	13.7	
5	44	211.20	.11	2.32	1.28	13						69	58	13.4	
5	48	214.48	.11	2.29	4.58	13	359	256	249	38	33	69	58	13.8	
4	52	217.81	.11	2.30	7.88	13						68	60	15.4	
4	56	221.17	.11	2.30	1.19	13	360	251	253	40	38	71	60	15.7	
3	60	224.50	.12	2.50	4.64	14						74	65	13.9	
3	64	228.02	.12	2.51	8.10	14	363	258	253	41	39	75	66	15.3	
2	68	231.34	.11	2.31	1.43	14						74	66	15.4	
2	72	234.51	.11	2.32	4.77	13	360	257	257	41	39	72	66	14.3	
1	76	238.03	.11	2.32	8.12	13						71	66	15.0	
1	80	241.50	.11	2.32	1.46	13	360	261	259	41	39	68	66	12.9	
A 10	84	244.84	.115	2.42	4.86	14						68	66	13.3	
10	88	248.24	.12	2.48	8.31	15	376	264	260	43	40	68	66	14.0	
9	92	251.60	.12	2.47	1.74	15						69	66	15.4	
9	96	255.07	.12	2.47	5.18	15									
	(over)														
	θ =	V_m =		ΔH =								Avg. =			

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Modified Method 5 Field Data Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Date 2/21/96 Test 14 Run 2
Operators DCH & SK
Meter Box No. ____ ΔH@ ____ in.WC
Gasmeter Coeff. ____
Nozzle No. ____
Nozzle Dia. ____ in.
Bar. Pres. ____ in.Hg
Pitot No. ____
C_p ____
H_2O ____ %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	XAD-2	Imp.	Meter (In/Out)		Oxyge (% v/v)
A 8	100	258.65	.12	2.50	8.64	15	367	256	258	43	41	66	63	14.6
8	104	262.06	.12	2.49	2.08	15	367					68	64	15.0
7	108	265.37	.12	2.49	5.53	15	367	261	260	43	41	66	64	13.7
7	112	268.81	.12	2.49	8.97	15	367					63	60	14.4
6	116	271.31	.07	1.44	1.59	11	367	257	262	44	42	64	60	14.6
6	120	274.77	.12	2.47	5.02	15	367					65	61	14.4
5	124	277.94	.10	2.08	8.16	13	362	259	263	44	42	66	61	13.2
5	128	280.86	.09	1.87	1.15	12	362					66	62	13.0
4	132	283.97	.09	1.86	4.13	12	368	254	259	45	42	66	63	12.1
4	136	287.04	.09	1.86	7.11	12	368					66	63	13.2
3	140	290.07	.09	1.87	0.10	12	364	253	258	45	44	69	65	12.5
3	144	293.11	.09	1.88	3.10	12	364					69	65	11.7
2	148	295.83	.07	1.46	5.75	11	368	257	259	45	44	68	66	11.8
2	152	298.72	.08	1.66	8.57	12	368					71	66	13.5
1	156	301.40	.07	1.46	1.23	11	367	259	261	45	43	72	66	13.4
1	160	303.95	.07	1.46	3.89	11	367					72	66	13.1
	1130													
	θ - 160	V_m - 129.25		ΔH - 2.2								Avg. - 64		

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Modified Method 5 Sample Log Sheet

Job L.P. Hayward.
Source Line 1 Thc.
Cyclone ☐ Yes ☒ No
Analytes
Field Recovery Spike Added

Date 2/2/96
No. Of Traverse Points 20
Filter Holder MM5
XAD - 2 Resin __ g
☐ Yes ☐ No

Test 14 Run 3
Filter Type 4" Glass Fiber
Batch No.
Ref. EPA SW-846 Method 0010

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 4 IN.HG (vac) ☐

Semivolatile Catch Data:

No. of filters used:

Recovery solvent(s)

☐$MeCl_2$ * MeOH (50:50 v/v)
☐Other(s)

No. of bottles for condensate trap catch
Samples recovered by

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Condensate Trap	198	0	198
Condensate Trap			
Condensate Trap			
Impingers			
Desiccant	1458	1401	57
Total			255

Integrated Gas Sampling Data:

Bag Pump No. 23A
Bag Material: 4-layer Aluminized Tedlar
Pretest Leak Check: 0 cc/min at
Time Start: 1335 (HRS)
Sampling Rate: 100 cc/min

Box No. 20

Bag No. 3
Size: 44 L
15 INHG
Time End: 1615 (HRS)
O_2 Analyzer S/N 4

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Modified Method 5 Field Data Sheet

Job: L.P. Hayward
Source: Line 1 Thermal oil Heater Stack
Date: 2/21/96 Test 14 Run 3
Operators: DVH & S.K
Meter Box No. 6 ΔH@ 1.89 in.WC
Gasmeter Coeff. 1.0054
Nozzle No. 8-8
Nozzle Dia. .434 in.
Bar. Pres. 29.24 in.Hg
Pitot No. MM5-6
C_p .84
H_2O 10 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	XAD-2	Imp.	Meter (In/Out)		Oxygen (% v/v)
	1329	304.30												
1 10	4	307.91	.13	2.73	7.90	11	355	261	258	50	48	58	58	13.9
10	8	311.24	.12	2.44	1.29	11	371					61	59	13.6
9	12	314.80	.13	2.66	4.83	12	370	265	260	45	43	65	56	14.2
9	16	318.41	.13	2.66	8.37	12	370					73	59	15.0
8	20	321.66	.13	2.67	1.94	12	377	264	260	46	44	74	59	14.8
8	24	325.57	.13	2.67	5.51	13	378					75	60	15.0
7	28	328.91	.13	2.68	9.09	13	375	263	257	42	40	77	61	15.2
7	32	332.71	.13	2.69	2.68	13	375					75	62	15.1
6	36	336.40	.13	2.69	6.28	13	374	264	261	43	41	79	63	14.6
6	40	339.90	.13	2.69	9.87	13	374					79	64	13.5
5	44	343.40	.13	2.70	3.48	13	374	266	264	44	41	79	64	12.6
5	48	346.71	.11	2.59	6.80	13	374					72	64	13.1
4	52	349.86	.095	1.96	9.87	13	376	264	265	44	42	80	65	13.7
4	56	352.93	.095	1.98	2.97	12	376					81	65	12.6
3	60	355.91	.085	1.77	5.90	11	376	265	263	44	42	82	66	12.4
3	64	358.77	.08	1.67	8.75	11	376					83	66	12.3
2	68	361.55	.065	1.39	1.35	11	360	264	264	44	42	85	67	14.9
2	72	364.25	.08	1.71	4.23	10	360					86	67	14.5
1	76	366.90	.07	1.50	6.94	10	360	258	262	44	42	89	69	13.7
1	80	369.53	.065	1.40	9.56	10	360					89	68	12.3
13 10	84	373.08	.12	2.57	3.11	15	360	257	260	42	40	79	71	14.1
10	88	376.44	.105	2.24	6.40	14	360					86	71	14.0
9	92	379.80	.11	2.27	9.74	14	391					85	72	14.1
9	96	383.11	.11	2.27	3.07	14	391					84	72	14.1
	0 –	V_m =		ΔH =								Avg. =		

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Pg 2 of 2

[illegible] LABORATORIES INC
(612) 786 [illegible]20

EPA Modified Method 5 Field Data Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Date 2/21/96 Test 14 Run 3

Operators
Meter Box No. ΔH@ in.WC
Gasmeter Coeff.

Nozzle No.
Nozzle Dia. in.
Bar. Pres. in.Hg

Pitot No.
C_p
H_2O %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	XAD-2	Imp.	Meter (In/Out)		Oxyge (% v/v)
B 8	100	386.43	.11	2.28	6.41	14	387	254	257	43	41	80	70	13.7
8	104	389.75	.11	2.28	9.75	14	387					82	73	13.9
7	108	393.28	.12	2.53	3.26	15	372	261	260	43	41	82	73	11.1
7	112	396.72	.12	2.48	6.74	15	390					81	73	11.1
6	116	400.16	.12	2.48	0.21	15	390	254	262	44	42	78	70	12.1
6	120	403.49	.12	2.46	3.67	15	390					78	73	13.2
5	124	406.71	.11	2.27	6.99	14	389	257	261	43	41	77	73	13.9
5	128	410.34	.11	2.26	0.30	14	389					76	72	14.0
4	132	413.51	.11	2.29	3.62	15	389	258	264	43	41	76	73	13.5
4	136	417.10	.12	2.47	7.08	15	389					75	72	14.9
3	140	420.56	.12	2.46	0.53	15	389	256	260	44	41	75	72	14.9
3	144	423.84	.11	2.27	3.85	15	383					76	72	13.8
2	148	427.35	.11	2.27	7.17	15	386	257	263	45	42	75	71	14.0
2	152	430.54	.11	2.26	0.48	15	386					75	71	14.7
1	156	433.60	.095	1.96	3.56		386					75	71	15.1
1	160 (1618)	436.66	.095	1.96	6.64		386					74	71	14.8
	θ = 160	V_m = 132.36		ΔH = 2.2								Avg. = 72.5		

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Benzene Field Data Sheet

Job L.P. Hayward
Source Line 1 Thermal O.I Heater Stack
Date 2/22/96 Test 15 Run 1

Operator(s) DVL
Meter Box No. 15 Meter Coef. .9883
Barometric Pressure 29.01 IN.HG

Sample Train Leak Check:
Pretest: 0 cc/min at 15 IN.HG
Post test: 0 cc/min at 5 IN.HG

Trav. point No.	Sample Time (min)	Sample Volume (cf)	Sample Rate (cc/min)	Vac. (IN.HG)	Temperatures (°F)		
					Stack	Probe	Gasmeter
	0900	861.736					
	5	861.902	1000	5	319		72
	10	862.051	1000	6			76
	15	862.260	1000	6	386		78
	20	862.434	1000	6			80
	25	862.596	1000	6			84
	30	862.767	1000	6			84
	35	862.958	1000	6			90
	40	863.082	1000	6			92
	45	863.225	1000	6			94
	50	863.370	1000	6			94
	55	863.530	1000	8			96
	60	863.695	1000	9			96
	θ = 60	V_m = 1.959					t_m = 86.33

(1005)

V_{STD} = 1.834

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Benzene Field Data Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Date 2/22/96 Test 15 Run 2

Operator(s) Dust + S.K
Meter Box No. 15 Meter Coef. .9993
Barometric Pressure 29.02 IN.HG

Sample Train Leak Check:
Pretest: 0 cc/min at 15 IN.HG
Post test: 0 cc/min at 15 IN.HG

Trav. point No.	Sample Time (min)	Sample Volume (cf)	Sample Rate (cc/min)	Vac. (IN.HG)	Temperatures (°F)		
					Stack	Probe	Gasmeter
	1057	863.723					
	5	863.934	1000	5			106
	10	864.136	1000	5			108
	15	864.318	1000	5			108
	20	864.515	1000	5	388		108
	25	864.681	1000	6			108
	30	864.842	1000	8			108
	35	865.085	1000	8			108
	40	865.271	1000	8			108
	45	865.458	1000	8			108
	50	865.640	1000	8			108
	55	865.817	1000	8			109
	60	866.065	1000	8			109
	θ = 60	V_m = 2.345					t_m = 108

(1157)

V_{STD} = 2.11

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Benzene Field Data Sheet

Job L.P. Hayward
Source Line 1 Oil Heater Stack
Date 2/22/96 Test 15 Run 3

Operator(s) D.W. & S.K.
Meter Box No. 15 Meter Coef. .9993
Barometric Pressure 29.01 IN.HG

Sample Train Leak Check:
Pretest: 0 cc/min at 16 IN.HG
Post test: 0 cc/min at 16 IN.HG

Trav. point No.	Sample Time (min)	Sample Volume (cf)	Sample Rate (cc/min)	Vac. (IN.HG)	Temperatures (°F)		
					Stack	Probe	Gasmeter
	1303	866.090					
	5	866.277	1000	5			104
	10	866.454	1000	5			104
	15	866.627	1000	5			104
	20	866.517	1000	5			104
	25	867.003	1000	5			104
	30	867.199	1000	5			104
	35	867.390	1000	6			104
	40	867.548	1000	6			106
	45	867.71	1000	6			106
	50	867.88	1000	6			106
	55	868.061	1000	6			106
	60	868.220	1000	6			106
	θ =	V_m = 2.124					t_m = 104.8

V_{STD} = 1.92

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Test 1/6 Run Date 2/22/96
Stack Dimen. 52 IN.
Dry Bulb ____ °F Wet bulb ____ °F
Manometer ☐ Reg. ☐ Exp ☐ Elec.
Barometric Pressure 29.01 IN.HG
Static Pressure -.21 IN.WC
Operators D Van Hoover & S. Kelkeu
Pitot No. V23-5 C_p .84

Drawing of Test Site

Cross-section View	Elevation View

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length:	IN.	Time Start:	HRS
A 1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
B 1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
Temp. Meas. Device & S/N:				Time End:	HRS

R or nothing = reg. manometer; S = expanded; E = electronic

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Method 5 Filter holder: Glass

Date 2/22/96 Test 16 Run 1
No. of traverse points 20
Filter type: NA

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 11 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used:

NA

Recovery solvent(s)

☐ acetone
☒ other(s) $MeCl_2$ + DI H_2O

No. of probe wash bottles: 1
Sample recovered by: JH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	295	200	95
Impinger No. 3			
Condenser			
Desiccant	1395	1375	20
Total			115

Integrated Gas Sampling Data:

Bag Pump No. 23A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 0905
Sampling rate: 400

Box No. 26 Bag No. 1
Size: 44 L
cc/min at 15 IN.HG
(HRS) Time end: 1003 (HRS)
cc/min Operator: JH

S/N of O_2 Analyzer used to monitor train outlet: 7

052394-C:\STACK\WP\FORMS\S-0046RR

(612) 6-66...

EPA Method 5 ...eld Data Sheet

Job: L.P. Hayward
Source: Line 1 Thermal Oil Heater Stack
Date: 3/22/96 Test 16 Run 1
Operators: Dirk + SK
Meter Box No. 6 ΔH@ 1.89 in.WC
Gasmeter Coeff. 1.0054
Nozzle No. Glass
Nozzle Dia. .434 in.
Bar. Press. 29.01 in.Hg
Pitot No. 123-5
C_p .84
H_2O 10 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	0900	437.32					379	254	250	39	52	50	10.4
10	3	440.10	.14	2.74	0.02	7	383				57	48	9.6
9	6	443.80	.15	2.98	2.82	10	386	258	252	40	54	48	11.5
8	9	445.45	.15	2.98	5.61	10	386				62	49	13.6
7	12	448.36	.15	2.98	8.42	10	384	254	252	40	66	50	13.6
6	15	451.20	.14	2.80	1.14	10	382				67	51	11.4
5	18	453.70	.13	2.62	3.79	8	380	258	257	41	68	51	11.9
4	21	456.41	.14	2.83	6.54	9	377				71	56	13.1
3	24	458.89	.11	2.24	8.98	7	370	256	253	40	73	54	13.6
2	27	461.30	.09	1.86	1.23	7	370				73	54	11.8
1	30	463.40	.08	1.66	3.34	7	370	261	256	40	72	61	13.4
10	33	466.21	.14	2.89	6.13	9	372				70	61	12.1
9	36	468.96	.14	2.90	8.93	9	377	264	257	41	77	61	12.8
8	39	471.86	.15	3.08	1.82	10	377				80	62	14.0
7	42	474.71	.15	3.10	4.72	10	377	257	261	40	80	62	13.6
6	45	477.66	.15	3.12	7.64	10	378				81	63	11.3
5	48	480.51	.14	2.91	0.45	10	378	256	261	41	82	61	13.4
4	51	483.11	.12	2.50	3.07	8	376				83	64	11.7
3	54	485.73	.12	2.49	5.68	8	377	260	261	42	84	65	11.8
2	57	488.26	.11	2.30	8.19	7	371				81	60	12.5
1	60	490.60	.10	2.11	6.60	7							
	1003												
	0 - 60	V_m - 53.28 - 52.68		ΔH - 2.66							Avg. - 64.2		

C-93

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Method 6011 Filter holder: NA

Date 2/22/96 Test 16 Run 3
No. of traverse points 20
Filter type: NA

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☐
Post test: 0 cfm at 12 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used:

NA

Recovery solvent(s)

☐ acetone
☒ other(s) $MeCl_2$ & $.1N HNO_3$

No. of probe wash bottles: Dirk
Sample recovered by: 1

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	327	200	127
Impinger No. 3			
Condenser			
Desiccant	1458	1440	18
Total			145

Integrated Gas Sampling Data:

Bag Pump No. 23A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1058
Sampling rate: 400

Box No. 26 Bag No. 1
Size: 44 L
cc/min at 15 IN.HG
(HRS) Time end: 1157 (HRS)
cc/min Operator: Dirk

S/N of O_2 Analyzer used to monitor train outlet: 1

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...TERI ... LA... ATC ... S, IN
(612) ... 6020

EPA Method 5 Field Data Sheet

Job L.P. Hayward
Source Line 9 Thermal Oil Heater Stack
Date 2/22/96 Test 16 Run 2

Operators Dirt & S.K.
Meter Box No. 6 ΔH@ 1.89 in.WC
Gasmeter Coeff. 1.0054

Nozzle No. Glass
Nozzle Dia. .434 in.
Bar. Press. 29.01 in.Hg

Pitot No. V23-5
C_p .84
H_2O 10 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	1053	491.20											
A 10	3	493.80	.12	2.48	3.78	7	371	227	231	42	72	72	14.1
9	6	496.62	.14	2.90	6.60	8	382				85	71	12.3
8	9	499.45	.13	2.72	9.34	8	383	236	239	42	84	69	11.6
7	12	502.31	.15	3.12	2.27	10	385				87	70	10.3
6	15	504.83	.13	2.50	4.90	7	388	251	254	43	88	70	12.3
5	18	507.54	.13	2.71	7.64	7	388				89	70	10.9
4	21	510.04	.10	2.09	0.05	6	387	259	260	42	89	73	12.2
3	24	512.60	.105	2.20	2.53	6	385				90	73	11.2
2	27	514.77	.075	1.58	4.63	5	382	257	261	43	91	73	11.6
1	30	516.93	.08	1.69	6.81	5	384				91	74	12.4
B 10	33	519.71	.15	3.10	9.77	8	378	260	262	43	85	73	11.8
9	36	522.90	.15	3.17	2.74	9	374				89	73	12.5
8	39	525.51	.15	3.14	5.69	9	387	263	262	43	90	73	11.3
7	42	528.56	.15	3.13	8.64	9	390				87	73	12.0
6	45	531.32	.13	2.71	1.38	8	390	264	262	44	89	73	11.9
5	48	534.11	.13	2.71	4.12	7	391				90	73	10.5
4	51	536.51	.09	1.88	6.42	6	390	264	263	45	91	73	10.0
3	54	538.95	.10	2.10	8.84	6	387				86	73	10.8
2	57	540.97	.07	1.47	0.86	5	382	259	260	44	91	73	11.5
1	60	542.92	.07	1.47	2.89	5	385				90	74	10.0
	(1157)												
	θ = 60	V_m = 51.72		ΔH = 2.45							Avg. = 80		

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Method 0011 Filter holder: NA

Date 2/22/96 Test 16 Run 3
No. of traverse points 20
Filter type: NA

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☑
Post test: 0 cfm at 13 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used:

Recovery solvent(s)

☐ acetone
☑ other(s) MeCl₂ & DI

No. of probe wash bottles:
Sample recovered by: DH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	319	200	119
Impinger No. 3			
Condenser			
Desiccant	1413	1395	18
Total			137

Integrated Gas Sampling Data:

Bag Pump No. 23A
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1305
Sampling rate: 400

Box No. 86 Bag No. 3
Size: 44 L
cc/min at 15 IN.HG
(HRS) Time end: 1406 (HRS)
cc/min Operator: DH

S/N of O_2 Analyzer used to monitor train outlet: 7

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ERP [illegible]
(612) [illegible] 6020

EPA Method 5 Field Data Sheet

Job L.P. Hayward
Source June 1 Thermal Oil Heater Stack
Date 2/22/96 Test 16 Run 3

Operators Dale & SK
Meter Box No. 6 ΔH@ 1.89 in.WC
Gasmeter Coeff. 1.0054

Nozzle No. 6655
Nozzle Dia. .434 in.
Bar. Press. 29.01 in.Hg

Pitot No. 123-5
C_p .84
H_2O 10 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	1303	543.105											
10	3	545.62	.11	2.32	5.64	7	380	254	256	46	64	64	16.2
9	6	548.46	.16	3.28	8.61	10	3760				64	65	14.4
8	9	551.31	.14	2.88	1.40	9	376	256	257	47	72	65	14.4
7	12	554.22	.16	3.31	4.39	10	376				75	65	14.1
6	15	557.16	.14	2.90	7.21	9	377	266	261	45	79	66	12.8
5	18	560.10	.14	2.92	0.03	9	377				81	66	12.6
4	21	562.51	.10	2.09	2.43	7	377	260	263	45	82	66	11.1
3	24	564.86	.09	1.89	4.71	6	374				83	67	11.8
2	27	567.31	.11	2.31	7.23	6	374	264	266	46	81	67	12.7
1	30	569.50	.075	1.58	9.32	5	374				82	68	11.3
10	33	572.45	.15	3.15	2.26	10	374	261	263	46	75	68	12.4
9	36	574.99	.13	2.71	4.98	8	376				82	68	11.7
8	39	577.85	.14	2.91	7.81	9	383	266	266	45	84	68	9.5
7	42	580.77	.15	3.10	0.73	10	389				86	68	10.1
6	45	583.25	.11	2.28	3.24	8	389	260	266	44	88	68	10.2
5	48	585.78	.11	2.28	5.76	8	391				89	69	10.7
4	51	588.31	.11	2.29	8.28	8	390	262	263	45	89	69	11.1
3	54	590.86	.11	2.29	0.80	8	390				90	69	11.1
2	57	592.93	.08	1.68	2.96		382	263	264	46	89	70	11.1
1	60	595.20	.08	1.65	5.13		382				90	70	10.1
	(1406)												
	θ - 60	V_m - 52.045		ΔH - 2.4							Avg. - 74.2		

C-97

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Test 17 Run Date 2/22/96
Stack Dimen. 52 IN.
Dry Bulb °F Wet bulb °F
Manometer ☐ Reg. ☐ Exp ☐ Elec.
Barometric Pressure 29.24 IN.HG
Static Pressure -.21 IN.WC
Operators D Van Hoever & S. Kelker
Pitot No. V23-5 C_p .84

Drawing of Test Site

Cross-section View	Elevation View

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length:	IN.	Time Start:	HRS
A 1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
B 1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
Temp. Meas. Device & S/N:				Time End:	

R or nothing = reg. manometer; S = expanded; E = electronic

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Method 5 Filter holder: glass

Date 2/21/96 Test 17 Run 1
No. of traverse points 20
Filter type: glass fiber

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 14 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used:

8281

Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DCH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	293	200	93
Impinger No. 3			
Condenser			
Desiccant	1526	1501	25
Total			118

Integrated Gas Sampling Data:

Bag Pump No. 23B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1540
Sampling rate: 400

Box No. 29 Bag No. 1
Size: 44 L
cc/min at 15 IN.HG
(HRS) Time end: 1651 (HRS)
cc/min Operator: DCH

S/N of O_2 Analyzer used to monitor train outlet: 7

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Field Data Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Date 2/21/96 Test 17 Run 1

Operators DVH & S.K
Meter Box No. 5 ΔH@ 1.82 in.WC
Gasmeter Coeff. .9997

Nozzle No. 7-8
Nozzle Dia. .453 in.
Bar. Press. 29.24 in.Hg

Pitot No. V23-5
C_p .84
H_2O 10 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	1535	847.10											
A 10	3	850.26	.14	3.36	0.22	11	390	258	261	54	87	66	13.2
9	6	852.51	.075	1.78	2.49	7	389				92	66	12.9
8	9	854.73	.075	1.79	4.76	7	389	258	262	53	95	66	12.7
7	12	857.21	.085	2.03	7.19	7	389				98	67	12.5
6	15	859.80	.10	2.40	9.83	9	388	260	261	53	100	66	12.7
5	18	862.74	.12	2.89	2.73	11	385				101	67	12.7
4	21	865.76	.13	3.14	5.75	13	383	266	264	51	101	67	12.8
3	24	868.70	.13	3.13	8.77	13	387				102	67	12.6
2	27	871.82	.13	3.13	1.79	13	386	261	260	50	101	67	11.4
1	30	874.53	.13	3.13	4.81	14	386				96	68	12.3
B 10	33	877.68	.11	2.64	7.58	12	386	264	261	50	69	68	13.2
9	36	880.45	.12	2.81	0.39	0.3	386				71	68	12.6
8	39	883.29	.12	2.81	3.22	13	386	260	257	48	73	68	14.5
7	42	886.17	.13	3.05	6.16	13	386				75	68	14.6
6	45	889.11	.12	2.87	9.02	12	373	260	259	48	75	68	14.2
5	48	891.91	.12	2.87	1.88	12	380				74	68	13.8
4	51	894.90	.12	2.84	4.72	12	381	257	262	50	73	68	12.5
3	54	897.88	.13	3.08	7.67	13	379				71	68	12.2
2	57	900.53	.115	2.72	0.45	12	380				71	65	12.3
1	60	903.25	.11	2.59	3.16	12	380				72	65	14.5
	(1651)												
	0 - 60	V_m = 56.15		ΔH = 2.73							Avg. = 75.9		

C-100

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Hayward Date 2/21/96 Test 17 Run 2
Source Lime 1 Thermal Oil Heater stack No. of traverse points 20
Method 5 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☑
Post test: 0 cfm at 11 IN. HG (vac) ☑

Particulate Catch Data:
No. of filters used:

Recovery solvent(s)
☑ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DLH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1		200	
Impinger No. 2	320		120
Impinger No. 3			
Condenser			
Desiccant	1440	1427	13
Total			133

Integrated Gas Sampling Data:

Bag Pump No. 23B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1730
Sampling rate: 400

Box No. 29 Bag No. 2
Size: 44 L
cc/min at 15 IN.HG
(HRS) Time end: 1829 (HRS)
cc/min Operator: DLH

S/N of O_2 Analyzer used to monitor train outlet: 7

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(612) 786-6020

EPA Method 5 Field Data Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Date 2/21/96 Test 17 Run 2

Operators DVH & S.K
Meter Box No. 5 ΔH@ 1.82 in.WC
Gasmeter Coeff. .9997

Nozzle No. 7-8
Nozzle Dia. .453 in.
Bar. Press. 29.24 in.Hg

Pitot No. V23-5
C_p .84
H_2O 9.5 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F)						Oxygen (% v/v)
							Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	
	1725	903.51											
B 10	3	906.16	.10	2.43	6.15	6	374	228	254	42	68	68	12.8
9	6	908.97	.12	2.86	8.99	7	377				76	67	12.9
8	9	911.89	.13	3.12	1.97	8	377	228	250	43	79	68	13.0
7	12	914.77	.12	2.87	4.84	8	382				81	68	11.0
6	15	917.57	.12	2.86	7.70	8	386	229	248	43	83	69	13.4
5	18	920.45	.12	2.88	0.57	8	385				85	69	13.4
4	21	923.40	.12	2.88	3.45	8	385	236	251	42	86	70	13.5
3	24	926.16	.11	2.65	6.22	7	384				87	71	12.9
2	27	929.00	.12	2.90	9.11	8	384	240	257	44	88	71	13.1
1	30	931.60	.09	2.19	1.62	6	380				88	72	13.4
A 10	33	934.88	.13	3.16	4.64	8	380	253	256	44	78	72	16.3
9	36	937.77	.13	3.11	7.63	8	386				86	73	16.2
8	39	940.75	.14	3.37	0.74	9	387	256	258	44	87	73	15.4
7	42	943.96	.14	3.37	3.86	9	387				87	73	11.5
6	45	946.99	.14	3.35	6.97	9	387	260	258	45	87	73	11.3
5	48	950.07	.13	3.13	9.98	9	391				87	73	12.0
4	51	952.90	.11	2.65	2.75	8	386	262	258	46	87	73	12.3
3	54	955.29	.09	2.18	5.27	7	383				87	73	13.4
2	57	957.72	.09	2.19	7.79	7	380	264	259	44	87	73	11.5
1	60	960.16	.08	1.95	0.16	7	380				87	73	14.2
	(1829)												
	0 - 60	V_m - 56.65		ΔH - .28							Avg. - 77.5		

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job: L.P. Hayward — Date: 2/21/96 — Test: 17 — Run: 3
Source: Line 1 Thermal Oil Heater Stack — No. of traverse points: 20
Method: 5 — Filter holder: glass — Filter type: glass fiber

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 14 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used: 8282

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DVH

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	497	400	97
Impinger No. 3			
Condenser			
Desiccant	1539	1526	13
Total			110

Integrated Gas Sampling Data:

Bag Pump No.: 23 b — Box No.: 29 — Bag No.: 3
Bag Material: 5-layer Aluminized Tedlar — Size: 44 L
Pretest leak check: 0 — cc/min at: 15 IN.HG
Time start: 1904 — (HRS) Time end: 2004 (HRS)
Sampling rate: 400 — cc/min Operator: DVH

S/N of O_2 Analyzer used to monitor train outlet: 7

052394-C:\STACK\WP\FORMS\S-0046RR

(612) 786-6020

EPA Method 5 Field Data Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Date 2/21/96 Test 17 Run 3

Operators DVN & S.K
Meter Box No. 5 ΔH@ 1.82 in.WC
Gasmeter Coeff. .9997

Nozzle No. 7-8
Nozzle Dia. .453 in.
Bar. Press. 29.24 in.Hg

Pitot No. V23-5
C_p .84
H_2O 9.5 10 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	1900	960.58											
10	3	963.67	.14	3.36	3.68	10	377	231	242	40	71	71	14.4
9	6	966.75	.14	3.31	6.75	10	380				74	67	14.8
8	9	969.85	.14	3.31	9.82	10	380	257	256	41	75	67	14.4
7	12	972.93	.14	3.33	2.89	11	376				78	68	16.7
6	15	975.81	.14	3.34	5.98	11	375	261	253	42	79	68	15.8
5	18	978.96	.13	3.10	8.95	11	377				80	69	15.8
4	21	981.84	.12	2.87	1.82	10	377	264	254	43	80	69	15.5
3	24	984.41	.095	2.29	4.38	10	372				80	69	15.1
2	27	986.65	.070	1.68	6.58	10	373	261	253	43	80	69	14.2
1	30	988.55	.055	1.33	8.54	6	372				81	69	13.2
10	33	991.33	.110	2.66	1.30	10	370	260	255	44	81	70	14.0
9	36	994.41	.140	3.36	4.40	13	375				81	70	15.5
8	39	997.40	.130	3.11	7.39	14	377	261	257	44	81	70	15.9
7	42	1000.28	.100	2.40	0.02	11	374				80	70	15.8
6	45	1003.69	.120	2.88	2.89	12	375	262	253	44	80	70	15.5
5	48	1005.85	.120	2.88	5.76	13	375				80	70	15.4
4	51	1008.66	.110	2.64	8.51	12	375	261	255	44	80	70	15.4
3	54	1011.60	.120	2.89	1.39	13	373				80	70	15.4
2	57	1013.99	.095	2.29	3.96	11	371	262	251	43	80	70	14.9
1	60	1016.57	.095	2.29	6.52	9	371				80	70	14.4
	(20:04)												
	0 - 60	V_m - 55.99		ΔH 2.77							Avg. - 74.2		

C-104

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Method 3+4 Filter holder: glass

Date 2/21/96 Test 19 Run 1
No. of traverse points 3
Filter type: glass fiber

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☑
Post test: ____ cfm at ____ IN. HG (vac) ☐

Particulate Catch Data:
No. of filters used:

Recovery solvent(s)

☐ acetone
☐ other(s)

No. of probe wash bottles:
Sample recovered by:

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. 23 B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 0940
Sampling rate: 400

Box No. 15 Bag No. 1
Size: 44 L
cc/min at 15 IN.HG
(HRS) Time end: 1035 (HRS)
cc/min Operator: DVL

S/N of O_2 Analyzer used to monitor train outlet: 7

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 4 and 6 Field Data Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Date 2/21/96 Test 19 Run 1
Wet Bulb _____
Dry Bulb _____

Operator(s) D.V.H + S.K
Meter Box No. 5 Gasmeter Coef. .9997
ΔH@ 1.82 in.WC Bar.Press 29.24 in.H
Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in.WC ☒
Post Test: 0 cfm at 11 in.WC ☒

Trav. Point No.	Sample Time (min)	Sample Volume (cf)	Orif. Meter (in.WC)	Vac. in.Hg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/ In	Gas/ Out	O_2 (%v/v)
	0934	709.40									
A 3	5	712.80	1.80	5		257	228	41	56	54	16.0
3	10	716.27	1.80	5					60	53	8.8
3	15	720.70	1.80	5		261	238	41	63	55	11.9
3	20	724.59	1.80	5					65	56	12.3
2	25	728.37	1.80	5		257	251	42	67	57	10.5
2	30	732.21	1.80	5					71	58	13.1
B 2	35	736.08	1.80	5	374	258	254	43	67	60	10.5
2	40	739.84	1.80	5					72	61	13.
1	45	743.61	1.80	5		259	257	44	73	61	14.4
1	50	747.50	1.80	5					81	62	13.9
1	55	751.18	1.80	5		258	253	44	75	62	11.9
1	60	754.87	1.80	5					76	62	11.7
	1038										
	θ - 60	V_m 45.47	ΔH - 1.80		$\bar{t}$ -				$\bar{t}_m$ - 63.62		

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impingers	280	200	80
Condenser			
Desiccant	1465	1458	7
		Total	87

Preliminary Results of SO_2 Concentration Determination		
V_{std} =	45.00	DSCF
Moisture Gravimetric =	8.35	%v/v
Moisture Psychrometric =		%v/v
SO_2, DRY =		PPM
SO_2, WET =		PPM
LB/MMBtu =		

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P Hayward
Source Line 1 Thermal Oil Heater stack
Method 3 Filter holder: glass

Date 2/21/96 Test 19 Run 2
No. of traverse points 3
Filter type: glass fiber

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☐
Post test: ____ cfm at ____ IN. HG (vac) ☐

Particulate Catch Data:
No. of filters used:

Recovery solvent(s)

☐acetone
☐other(s)

No. of probe wash bottles:
Sample recovered by:

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. 2313
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1100
Sampling rate: 400

Box No. 15 Bag No. 2
Size: 44 L
cc/min at 15 IN.HG
(HRS) Time end: 1158 (HRS)
cc/min Operator: DvH

S/N of O_2 Analyzer used to monitor train outlet: 7

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 4 and 6 Field Data Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Date 2/21/96 Test 19 Run 2
Wet Bulb
Dry Bulb

Operator(s) DVH & S.K
Meter Box No. 5 Gasmeter Coef. .9997
ΔH@ 1.82 in.WC Bar.Press 29.27 in.
Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in.WC ☑
Post Test: 0 cfm at 10 in.WC ☑

Trav. Point No.	Sample Time (min)	Sample Volume (cf)	Orif. Meter (in.WC)	Vac. in.Hg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/ In	Gas/ Out	O_2 (%v/v)
	1056	755.20									
3	5	759.09	1.80	6		250	253	44	68	67	15.3
3	10	762.91	1.80	6					72	66	10.9
3	15	766.73	1.80	6		258	257	45	75	65	10.0
3	20	770.56	1.80	7					77	66	11.0
2	25	774.40	1.80	7		261	253	45	78	66	12.0
2	30	777.89	1.80	7					78	66	12.5
2	35	781.20	1.80	7		264	254	46	79	67	11.1
2	40	785.55	1.80	8					80	67	11
2	45	789.32	1.80	8		264	258	46	80	67	11.0
1	50	793.15	1.80	8					79	69	10.8
1	55	796.85	1.80	8		261	260	46	79	69	9.1
1	60	799.	1.80	8					79	69	11.4
	(1158)	800.70									
	θ = 60	V_m = 45.0	ΔH = 1.80		$\bar{t}_s$ =				$\bar{t}_m$ = 72		

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impingers	301	200	101
Condenser			
Desiccant	1490	1501	11
		Total	111

Preliminary Results of SO_2 Concentration Determination		
V_{std} =	44.32	DSCF
Moisture Gravimetric =	10.55	%v/v
Moisture Psychrometric =		%v/v
SO_2, DRY =		PPM
SO_2, WET =		PPM
LB/MMBtu =		

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job L.P. Hayward Date 2/21/96 Test 19 Run 3
Source Line 1 Thermal Oil Heater Stack No. of traverse points 3
Method 3 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☐
Post test: ____ cfm at ____ IN. HG (vac) ☐

Particulate Catch Data:
No. of filters used:

Recovery solvent(s)

☐acetone
☐other(s)

No. of probe wash bottles:
Sample recovered by:

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. 23B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1345
Sampling rate: 400

Box No. 15 Bag No. 3
Size: 44 L
cc/min at 14 IN.HG
(HRS) Time end: 1441 (HRS)
cc/min Operator: DVH

S/N of O_2 Analyzer used to monitor train outlet: 7

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INTERPOLL LABORATORIES, INC.
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EPA Method 4 and 6 Field Data Sheet

Job L.P. Hayward
Source Line 1 Thermal Oil Heater Stack
Date 2/21/96 Test 14 Run 3
Wet Bulb
Dry Bulb

Operator(s) DuM & S.K
Meter Box No. 5 Gasmeter Coef. .9997
ΔH@ 1.82 in.WC Bar.Press 29.24 in.
Sample Train Leak Check:
Pretest: < 0.02 cfm at 15 in.WC ☒
Post Test: 0 cfm at 20 in.WC ☒

Trav. Point No.	Sample Time (min)	Sample Volume (cf)	Orif. Meter (in.WC)	Vac. in.Hg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/ In	Gas/ Out	O_2 (%v/v)
	1341	801.10 800.90									
3	5	804.97	1.80	5		257	262	45	60	59	14.0
3	10	808.84	1.80	8					64	59	13.4
3	15	812.84	1.80	8		261	257	40	67	59	13.4
3	20	816.57	1.80	8					71	59	14.0
2	25	820.38	1.80	8		263	254	42	73	59	13.6
2	30	824.12	1.80	8					75	59	12.5
2	35	827.87	1.80	8		261	253	43	76	61	16
2	40	831.60	1.80	8					77	61	11.4
1	45	835.26	1.80	8		258	251	43	78	62	9.4
1	50	839.10	1.80	8					78	62	9.4
1	55	843.00	1.80	8		257	256	44	79	64	9.7
1	60	846.73	1.80	8					79	64	13.5
	(1441)										
	θ = 60	V_m = 45.63	ΔH = 1.80		$\bar{t}$ =				$\bar{t}_m$ = 66.88		

Condensate Data:

Item	Weight (g) Final	Tare	Difference
Impingers	293	200	93
Condenser			
Desiccant	1427	1409	18
		Total	111

Preliminary Results of SO_2 Concentration Determination		
V_{std} =	44.876	DSCF
Moisture Gravimetric =	10.43	%v/v
Moisture Psychrometric =		%v/v
SO_2, DRY =		PPM
SO_2, WET =		PPM
LB/MMBtu =		

Interpoll Laboratories
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Test 17

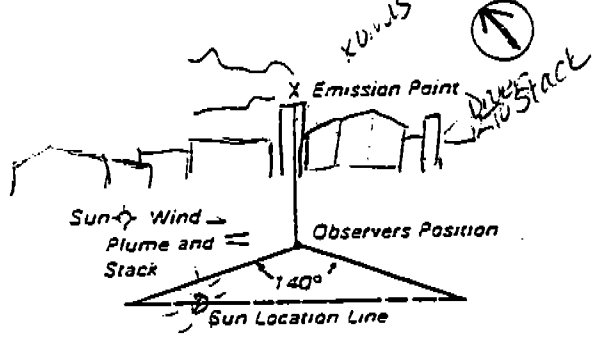
Visible Emissions Form

SOURCE NAME: Louisiana Pacific Corp	OBSERVATION DATE: Feb 21, 1996
ADDRESS:	START TIME: 1535
CITY: Hayward	STATE: WI ZIP:
PHONE:	SOURCE ID NUMBER:
PROCESS EQUIPMENT: Thermal Oil Heater Stack	OPERATING MODE:
CONTROL EQUIPMENT: ESP	OPERATING MODE:
DESCRIBE EMISSION POINT: START gray cylindrical stack	STOP Same
HEIGHT ABOVE GROUND LEVEL: START ~71' STOP Same	HEIGHT RELATIVE TO OBSERVER: START ~71' STOP Same
DISTANCE FROM OBSERVER: START ~250' STOP Same	DIRECTION FROM OBSERVER: START NE STOP Same
DESCRIBE EMISSIONS: START continuous	STOP Same
EMISSION COLOR: START plume	STOP
PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLETS PRESENT: NO ☒ YES ☐	IF WATER DROPLET PLUME: NA ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: START 3 stack diameters	STOP Same
DESCRIBE BACKGROUND: START sky	STOP Same
BACKGROUND COLOR: START blue	STOP Same
SKY CONDITIONS: START clear	STOP Same
WIND SPEED: START 0-5 mph	STOP Same
WIND DIRECTION: START FINE	STOP Same
AMBIENT TEMP: START [illegible]	STOP 31°F
WET BULB TEMP: *	RH, percent: *

STOP 1605 *
RE-START 1621

MIN	SEC 0	15	30	45	MIN	SEC 0	15	30	45
1	10	10	10	10	31	5	5	5	5
2	10	10	10	10	32	5	5	5	5
3	10	10	10	10	33	5	5	5	5
4	10	10	10	10	34	5	5	5	5
5	10	10	10	10	35	5	5	5	5
6	5	5	5	5	36	5	5	5	5
7	5	5	5	5	37	5	5	5	5
8	5	5	5	5	38	5	5	5	5
9	5	5	5	5	39	5	5	5	5
10	5	5	5	5	40	5	5	5	5
11	5	5	5	5	41	5	5	5	5
12	5	5	5	5	42	5	5	5	5
13	5	5	5	5	43	5	5	5	5
14	5	5	5	5	44	5	5	5	5
15	5	5	5	5	45	5	5	5	5
16	5	5	5	5	46	5	5	5	5
17	5	5	5	5	47	5	5	5	5
18	5	5	5	5	48	5	5	5	5
19	5	5	5	5	49	5	5	5	5
20	5	5	5	5	50	5	5	5	5
21	5	5	5	5	51	5	5	5	5
22	5	5	5	5	52	5	5	5	5
23	5	5	5	5	53	5	5	5	5
24	5	5	5	5	54	5	5	5	5
25	5	5	5	5	55	5	5	5	5
26	5	5	5	5	56	5	5	5	5
27	5	5	5	5	57	5	5	5	5
28	5	5	5	5	58	5	5	5	5
29	5	5	5	5	59	5	5	5	5
30	5	5	5	5	60	5	5	5	5

✓ Source Layout Sketch



AVERAGE OPACITY FOR HIGHEST PERIOD: 9.2	NUMBER OF READINGS ABOVE % WERE
RANGE OF OPACITY READINGS: MINIMUM 5	MAXIMUM 10
OBSERVER'S NAME (PRINT): Sheryl Bergeron	
OBSERVER'S SIGNATURE: Sheryl Bergeron	DATE: 2/21/96
ORGANIZATION: Interpoll Labs	
CERTIFIED BY: ETA	DATE: 10/4/95
VERIFIED BY	DATE

COMMENTS: PM & VE test was conducted while the PAH was finishing - had to stop for 30 min until next

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE: Port was available.
TITLE | DATE

* Not determined w/ Sling psychrom. due to low temps.

S-0079R

VISIBLE EMISSIONS EVALUATOR

This is to certify that

Sheryl L. Bergeron

met the specifications of Federal Reference Method 9 and qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates of Raleigh, North Carolina. This certificate is valid for six months from date of issue.

Thomas Lore
President

250593
Certificate Number

Vice President

Minneapolis
Location

David B. Savage, Jr.
Program Manager

October 4, 1995
Date of Issue

© GOES 445

APPENDIX D

INTERPOLL LABORATORIES ANALYTICAL DATA

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 3 Data Reporting Sheet - Orsat Analysis

Job: LP-Hayward
Team Leader: ET
Date Submitted:
Test No.: 2
Date of Analysis: 2-23-96

Source: LINE 1 DRYER RTO STACK
Test Site:
Date of Test: 2-21-96
No. of Runs Completed: 3
Technician: ET

Test/ Run	Sample Log No. and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
2-1	73R-13	1	0.00	3.8	20.7	3.8	16.9	
		2	0.00	3.8	20.7	3.8	16.9	
	☒B☐F	Avg				3.8	16.9	
2-2	73R-14	1	0.00	3.8	20.7	3.8	16.9	
		2	0.00	3.8	20.7	3.8	16.9	
	☒B☐F	Avg				3.8	16.9	
2-3	73R-15	1	0.00	3.8	20.7	3.8	16.9	
		2	0.00	3.8	20.7	3.8	16.9	
	☒B☐F	Avg				3.8	16.9	
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☑ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F = Flask (250 cc all glass)

B = Tedlar Bag (5 layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job L.P. / Hayward, WI
Team Leader E. Ivers
Date Submitted 2-21-96
Test No- 3
Date of Analysis 2-21-96

Source Dryer RTO
Test Site Stack
Date of Test 2-21-96
No. of Runs Completed 3
Technician Mark Jacklen

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
3/1		1	0.00	4.30	20.40	4.30	16.10	
		2	0.00	4.30	20.40	4.30	16.10	
	☒ B ☐ F	Avg				4.30	16.10	
3/2		1	0.00	4.40	20.40	4.40	16.00	
		2	0.00	4.40	20.40	4.40	16.00	
	☒ B ☐ F	Avg				4.40	16.00	
3/3		1	0.00	4.40	20.40	4.40	16.00	
		2	0.00	4.40	20.40	4.40	16.00	
	☒ B ☐ F	Avg				4.40	16.00	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☐ Ambient Air QA Check
☐ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

LSC-04-BR

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 3 Data Reporting Sheet - Orsat Analysis

Job: LP/HAYWARD
Team Leader: E-T
Date Submitted:
Test No.: 4
Date of Analysis: 2-23-96

Source: LINE 1 DRYER RTO
Test Site: STACK
Date of Test: 0-21+2-22-96
No. of Runs Completed: 3
Technician: ET

Test/ Run	Sample Log No. and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
4-1	7318-28	1	0.00	3.7	20.6	3.7	16.9	1.08
		2	0.00	3.7	20.6	3.7	16.9	
	☒B☐F	Avg				3.7	16.9	
4-2	7318-29	1	0.00	3.8	20.7	3.8	16.9	1.05
		2	0.00	3.8	20.7	3.8	16.9	
	☒B☐F	Avg				3.8	16.9	
4-3	7318-30	1	0.00	3.8	20.7	3.8	16.9	1.05
		2	0.00	3.8	20.7	3.8	16.9	
	☒B☐F	Avg				3.8	16.9	
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						

☑ Ambient Air QA Check
☐ Orsat Analyzer System Leak Check
☑ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F = Flask (250 cc all glass)

B = Tedlar Bag (5 layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 3 Data Reporting Sheet - Orsat Analysis

Job: LP/Hayward
Team Leader: ET
Date Submitted:
Test No.: 8
Date of Analysis: 2-27-96

Source: LINE 1 SURFACE DRYER
Test Site:
Date of Test: 2-20-96
No. of Runs Completed: 3
Technician: ET

Test/ Run	Sample Log No. and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
8-1	7318-07	1	0.00	15.6	20.8	15.6	5.2	1.00
		2	0.00	15.6	20.8	15.6	5.2	
	☑B☐F	Avg				15.6	5.2	
8-2	7318-08	1	0.00	15.5	20.8	15.5	5.3	1.01
		2	0.00	15.5	20.8	15.5	5.3	
	☑B☐F	Avg				15.5	5.3	
8-3	7318 09	1	0.00	15.3	20.8	15.3	5.5	1.01
		2	0.00	15.3	20.8	15.3	5.5	
	☑B☐F	Avg				15.3	5.5	
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☑ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F = Flask (250 cc all glass)

B = Tedlar Bag (5 layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

INTERPOLL LABORATORIES, INC.
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EPA Method 3 Data Reporting Sheet - Orsat Analysis

Job: LP/HAMMOND
Team Leader: MK
ate Submitted:
Test No.: 11
Date of Analysis: 2-23-96

Source: LINE 1 PRESS OD STACK
Test Site:
Date of Test: 2-22-96
No. of Runs Completed: 3
Technician: ET

Test/ Run	Sample Log No. and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_0
1-1	738-51	1	0.00	.4	20.9	.4	20.5	
		2	0.00	.4	20.9	.4	20.5	
	☒B☐F	Avg				.4	20.5	
1-2	52	1	0.00	.4	20.9	.4	20.5	
		2	0.00	.4	20.9	.4	20.5	
	☒B☐F	Avg				.4	20.5	
1-3	53	1	0.00	.4	20.9	.4	20.5	
		2	0.00	.4	20.9	.4	20.5	
	☒B☐F	Avg				.4	20.5	
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						

☒ Ambient Air QA Check
☒ Orsat Analyzer System Leak Check
☒ F_0 Within EPA M-3 Guidelines for fuel type.

Where $F_0 = \frac{20.9-O_2}{CO_2}$

F = Flask (250 cc all glass)

B = Tedlar Bag (5 layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 3 Data Reporting Sheet - Orsat Analysis

Job: LP/HAYWARD
Team Leader: MR
Date Submitted:
Test No.: 12
Date of Analysis: 2-23-96

Source: LINE 1 PRESS RTO
Test Site: STACK
Date of Test: 2-22-96
No. of Runs Completed: 3
Technician: ET

Test/ Run	Sample Log No. and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
12-1	7318-60	1	0.00	.4	20.4	.4	20.5	
		2	0.00	.4	20.9	.4	20.5	
	☒B☐F	Avg				.4	20.5	
12-2	7318-61	1	0.00	.4	20.4	.4	20.5	
		2	0.00	.4	20.9	.4	20.5	
	☒B☐F	Avg				.4	20.5	
12-3	7318-62	1	0.00	.4	20.4	.4	20.5	
		2	0.00	.4	20.9	.4	20.5	
	☒B☐F	Avg				.4	20.5	
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						

☑ Ambient Air QA Check
☐ Orsat Analyzer System Leak Check
☑ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9-O_2}{CO_2}$

F = Flask (250 cc all glass)

B = Tedlar Bag (5 layer)

EPA Method 3 Guidelines

Fuel Type	FO Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

INTERPOLL LABORATORIES, INC.
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EPA Method 3 Data Reporting Sheet - Orsat Analysis

Job: LP/HAYWARD
Team Leader: DVH
Date Submitted: 2-22-96
Test No.: 14
Date of Analysis: 2-22-96

Source: LINE 1 THERMAL OIL HEATER
Test Site: STACK
Date of Test: 2-20 21 -96
No. of Runs Completed: 3
Technician: ET

Test/ Run	Sample Log No. and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
14/1	7318	1				8.2	12.4	
		2						
	☒B☐F	Avg						
14/2		1				6.5	14.2	
		2						
	☒B☐F	Avg						
14/3		1				6.6	14.0	
		2						
	☒B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						

interpoll INTEGRATED BAG GAS SAMPLES

Job L.P. Hayward Date 2/20,21/96
Log #
Source Line 1 Thermal Oil Heater
Test Site Stack
Collected for test type: O_2 & CO_2 Tech DVH
Test/Run 14/1,23
1 of 1

☐ Ambient Air QA Check
☐ Orsat Analyzer System Le
☐ F_o Within EPA M-3 Guidu for fuel type.

Where $F_o = \frac{20.9-O_2}{CO_2}$

F = Flask (250 cc all glass)

B = Tedlar Bag (5 layer)

Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

INTERPOLL LABORATORIES, INC.
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EPA Method 3 Data Reporting Sheet - Orsat Analysis

Job: LP/HAYWARD
Team Leader: DVH
Date Submitted:
Test No.: 16
Date of Analysis: 2-23-96

Source: 4 DE / THERMAL oil HEATER
Test Site: STACK
Date of Test: 2-22-96
No. of Runs Completed: 3
Technician: [redacted] ET

Test/ Run	Sample Log No. and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
16-1	73R-79	1	0.00	6.0	20.6	6.0	14.6	1.05
		2	0.00	6.0	20.6	6.0	14.6	1.05
	☒B☐F	Avg				6.0	14.6	
16-2	73R-80	1	0.00	8.5	20.6	8.5	12.1	1.04
		2	0.00	8.5	20.6	8.5	12.1	1.04
	☒B☐F	Avg				8.5	12.1	
16-3	73R-81	1	0.00	8.0	20.6	8.0	12.6	1.04
		2	0.00	8.0	20.6	8.0	12.6	1.04
	☒B☐F	Avg				8.0	12.6	
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☑ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F = Flask (250 cc all glass)

B = Tedlar Bag (5 layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

INTERPOLL LABORATORIES, INC.
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EPA Method 3 Data Reporting Sheet - Orsat Analysis

Job: LP/HAYWARD
Team Leader: BJH
Date Submitted: 2-22-96
Test No.: 17
Date of Analysis: 2-22-96

Source: LINE 1 THERMAL OIL HEATER
Test Site: STACK
Date of Test: 2-21-96
No. of Runs Completed: 3
Technician: CT

Test/ Run	Sample Log No. and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
17/1	7318	1				5.9	14.8	
	☒B☐F	2						
		Avg						
17/2		1				7.3	13.3	
	☒B☐F	2						
		Avg						
17/3		1				~~7.3~~ 5.9	14.8	
	☒B☐F	2						
		Avg						
		1						
	☐B☐F	2						
		Avg						
		1						
	☐B☐F	2						
		Avg						
		1						
	☐B☐F	2						
		Avg						
		1						
	☐B☐F	2						
		Avg						
		1						
	☐B☐F	2						
		Avg						
		1						
	☐B☐F	2						
		Avg						

interpoll INTEGRATED BAG GAS SAMPLES
Job L. P. Hayward Date 2/21/96
Source Line 1 Therma 1 Oil Heater Log # 7318
Test Site Stack
Collected for test type: O_2 CO_2 & CO Tech DWH
Test/Run 17/1, 2, 3
1 of 1

☐ Ambient Air QA Check
☐ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F = Flask (250 cc all glass)

B = Tedlar Bag (5 layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job L.P. / Hayward, WI
Team Leader D. VanHeuvel
Date Submitted 2-21-96
Test No. 19
Date of Analysis 2-21-96

Source Line 1, Thermal O.I. Heater
Test Site Stack
Date of Test 2-21-96
No. of Runs Completed 3
Technician Mark Rachler

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
19/1		1	0.00	6.60	20.30	6.60	13.70	
		2	0.00	6.60	20.30	6.60	13.70	
	☒ B ☐ F	Avg				6.60	13.70	
19/2		1	0.00	8.00	20.50	8.00	12.50	
		2	0.00	8.00	20.50	8.00	12.50	
	☒ B ☐ F	Avg				8.00	12.50	
19/3		1	0.00	4.50	20.40	4.50	15.90	
		2	0.00	4.50	20.40	4.50	15.90	
	☒ B ☐ F	Avg				4.50	15.90	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☐ Ambient Air QA Check
☐ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016–1.130
Bituminous	1.083–1.230
Oil:	
Distillate	1.260–1.413
Residual	1.210–1.370
Gas:	
Natural	1.600–1.836
Propane	1.434–1.586
Butane	1.405–1.553
Wood/Wood Bark	1.000–1.130

LSC-04-BR

Interpoll Laboratories
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EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job L.P. / Hayward, WI
Team Leader D. VanHoever
Date Submitted 2-30-96
Test No. 20
Date of Analysis 2-20-96

Source Line 1 Dryer
Test Site 'E' Tube Outlet
Date of Test 2-20-96
No. of Runs Completed 3
Technician Mark Bachler

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
20/1		1	0.00	4.10	20.50	4.10	16.40	
		2	0.00	4.10	20.50	4.10	16.40	
	☐ B ☐ F	Avg				4.10	16.40	
20/2		1	0.00	4.20	20.50	4.20	16.30	
		2	0.00	4.20	20.50	4.20	16.30	
	☐ B ☐ F	Avg				4.20	16.30	
20/3		1	0.00	4.20	20.50	4.20	16.30	
		2	0.00	4.20	20.50	4.20	16.30	
	☐ B ☐ F	Avg				4.20	16.30	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☐ Ambient Air QA Check
☐ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016–1.130
Bituminous	1.083–1.230
Oil:	
Distillate	1.260–1.413
Residual	1.210–1.370
Gas:	
Natural	1.600–1.836
Propane	1.434–1.586
Butane	1.405–1.553
Wood/Wood Bark	1.000–1.130

LSC-04-BR

(612) 786-6020

EPA Method 10 NDIR Analysis

Job Name: CP/Hayward
Source: Line 1 Surface Dryer
Date of Analysis: 3-12-96
Technician: SF

NDIR Analyzer: ☒ Fugi ACS Model 3300
☐ Mon. Lab Model 8310
☐ Dasibi Model 3003
Range: 0 - 1000 PPM
Flow rate: 1000 cc/min

Pretest Calibration

	Concentration	Reading	Vendor	Cyl. No.
Zero Gas	0 PPM	0 PPM		
Upscale Gas	300.8 PPM	300.8 PPM	Scott	ALM-014239
Upscale Gas	590 PPM	590 PPM	Liquid Airborne	HA3780
Upscale Gas	PPM	PPM		

Sample Description Test/Run	Sample Log No.	CO Conc. (PPM, Dry)		
		Dilution Factor	Reading	Actual PPM
8/1	7318-107	6.782	145	983.39
8/2	7318-108	6.782	210	1424.22
8/3	7318-109	6.782	198	1342.84

Post-Test Calibration

	Conc.	Reading
Zero Gas	0 PPM	0 PPM
Upscale Gas	590 PPM	583.25 PPM
Upscale Gas	PPM	PPM
Upscale Gas	PPM	PPM

Note 1: If sample dilution is required, the sample is diluted with CO-free gas prior to analysis.
Note 2: The Fugi ACS model 3300 has a rejection ratio for CO to CO_2 greater then 100,000: 1 and the Mon. Labs Model 8310 and Dasibi Model 3003 have rejection ratios greater then 200,000: 1 and thus CO_2 removal prior to analysis is not required.
Note 3: The analyzer must be zeroed and spanned immediately before and after sample analysis. Additional checks may be performed between sample analyses if required.

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 10 NDIR Analysis

Job Name: LP/HAYWARD
Source: UNIT THERMAL OIL HEATER STACK
Date of Analysis: 2-22-96
Technician: ET

NDIR Analyzer: ☑ Fugi ACS Model 3300
☐ Mon. Lab Model 8310
☐ Dasibi Model 3003
Range: 0 - 1000 PPM
Flow rate: 1000 cc/min

Pretest Calibration				
	Concentration	Reading	Vendor	Cyl. No.
Zero Gas	PPM	PPM		
Upscale Gas	PPM	PPM		
Upscale Gas	PPM	PPM		
Upscale Gas	PPM	PPM		

Sample Description Test/Run	Sample Log No.	CO Conc. (PPM, Dry)		
		Dilution Factor	Reading	Actual PPM
1-4-1	738			764
2				126
3				86

Post-Test Calibration		
	Conc.	Reading
Zero Gas	PPM	PPM
Upscale Gas	PPM	PPM
Upscale Gas	PPM	PPM
Upscale Gas	PPM	PPM

Note 1: If sample dilution is required, the sample is diluted with CO-free gas prior to analysis.
Note 2: The Fugi ACS model 3300 has a rejection ratio for CO to CO_2 greater then 100,000: 1 and the Mon. Labs Model 8310 and Dasibi Model 3003 have rejection ratios greater then 200,000: 1 and thus CO_2 removal prior to analysis is not required.
Note 3: The analyzer must be zeroed and spanned immediately before and after sample analysis. Additional checks may be performed between sample analyses if required.

INTERTOX LABORATORIES, INC.
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EPA Method 10 NDIR Analysis

Job Name: LP/HAZWARD
Source: LINE 1 THERMAL OIL HEATER STACK
Date of Analysis: 2-22-96
Technician: ET

NDIR Analyzer: ☑ Fugi ACS Model 3300
☐ Mon. Lab Model 8310
☐ Dasibi Model 3003
Range: 0 - 1000 PPM
Flow rate: 1000 cc/min

Pretest Calibration				
	Concentration	Reading	Vendor	Cyl. No.
Zero Gas	PPM	PPM		
Upscale Gas	PPM	PPM		
Upscale Gas	PPM	PPM		
Upscale Gas	PPM	PPM		

Sample Description Test/Run	Sample Log No.	CO Conc. (PPM, Dry)		
		Dilution Factor	Reading	Actual PPM
T17/1	7318			120
17/2				595
17/3				271

Post-Test Calibration		
	Conc.	Reading
Zero Gas	PPM	PPM
Upscale Gas	PPM	PPM
Upscale Gas	PPM	PPM
Upscale Gas	PPM	PPM

Note 1: If sample dilution is required, the sample is diluted with CO-free gas prior to analysis.
Note 2: The Fugi ACS model 3300 has a rejection ratio for CO to CO_2 greater then 100,000: 1 and the Mon. Labs Model 8310 and Dasibi Model 3003 have rejection ratios greater then 200,000: 1 and thus CO_2 removal prior to analysis is not required.
Note 3: The analyzer must be zeroed and spanned immediately before and after sample analysis. Additional checks may be performed between sample analyses if required.

INTERPOLL LABORATORIES, INC.
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Impinger Catch Data Reporting Sheet

otocol: ☐Minnesota ☒Wisconsin ☐Iowa ☐EPA Method 202 ☐Other

Job: LP / Hayward
Date Submitted: 2-23-96
Date of Analysis: 2-26-96
Source/Site: Dryer RTO / Stack
Test No.: 1
Technician: B.D.

	Solvent Phase	Aqueous Phase
Test: 1 Run: 0	Dish No: 751	Dish No: 98
Log No: 7318-01I	Dish + Sample Wt: 44.2536 g	Dish + Sample Wt: 42.7034 g
Color & Appearance:	Dish Tare Wt: 44.2536 g	Dish Tare Wt: 42.7034 g
	Fraction Wt: 0.0000 g	Fraction Wt: 0.0000 g
Comments:	Smpl Vol: 200 ml, Alqt: 200 ml, Factor: 1.000	Smpl Vol: 200 ml, Alqt: 100 ml, Factor: 2.000
	Sample Wt: 0.0000 g	Sample Wt: 0.0000 g
Test: 1 Run: 1	Dish No: 755	Dish No: 106
Log No: -02I	Dish + Sample Wt: 46.0032 g	Dish + Sample Wt: 43.0176 g
Color & Appearance:	Dish Tare Wt: 46.0030 g	Dish Tare Wt: 43.0165 g
	Fraction Wt: 0.0002 g	Fraction Wt: 0.0011 g
Comments:	Smpl Vol: 460 ml, Alqt: 460 ml, Factor 1.000	Smpl Vol: 460 ml, Alqt: 100 ml, Factor 4.600
	Sample Wt: 0.0002 g	Sample Wt: 0.0051 g
Test: 1 Run: 2	Dish No: 758	Dish No: 436
Log No: -03I	Dish + Sample Wt: 45.3020 g	Dish + Sample Wt: 46.2474 g
Color & Appearance:	Dish Tare Wt: 45.3017 g	Dish Tare Wt: 46.2472 g
	Fraction Wt: 0.0003 g	Fraction Wt: 0.0002 g
Comments:	Smpl Vol: 470 ml, Alqt: 470 ml, Factor 1.000	Smpl Vol: 470 ml, Alqt: 100 ml, Factor 4.700
	Sample Wt: 0.0003 g	Sample Wt: 0.0009 g
Test: 1 Run: 3	Dish No: 760	Dish No: 721
Log No: -04I	Dish + Sample Wt: 44.0705 g	Dish + Sample Wt: 46.9088 g
Color & Appearance:	Dish Tare Wt: 44.0703 g	Dish Tare Wt: 46.9087 g
	Fraction Wt: 0.0002 g	Fraction Wt: 0.0001 g
Comments:	Smpl Vol: 470 ml, Alqt: 470 ml, Factor 1.000	Smpl Vol: 470 ml, Alqt: 100 ml, Factor 4.700
	Sample Wt: 0.0002 g	Sample Wt: 0.0005 g

Note: Factor = Sample Volume/Aliquot Volume

Blank Solvent Wt. 0.0000 g

	RUN 0	RUN 1	RUN 2	RUN 3
Results of Solvent Phase g	0.0000	0.0002	0.0003	0.0002
Results of Aqueous Phase g	0.0000 D-15	0.0051	0.0009	0.0005

INTERPOLL LABORATORIES, INC.
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Solvent Rinse Data Reporting Sheet

☒ EPA Method 5 Probe Wash ☐ EPA Method 29 Probe Wash ☐ EPA Method 202 Cup & Tube Wash

Job: L.P. Hayward
Date Submitted: 2/23/96
Date of Analysis: 2/26/96
Source/Site: DRYER RTO STACK
Test No.: 1
Technician: D. VAN Hoever

Transport Leakage☐ None☑ _____ ml Solvent _____

Test: 1 Run 0		Dish No: 63	
Log No: 7318-01P		Dish + Sample Wt: 50.4268	g
Volume of Solvent 100 ml		Dish Tare Wt: 50.4264	g
*Solvent Residue 4 ug/ml		Sample Wt: .0004	g
Test: 1 Run: 1		Dish No: 310	
Vol. of Solvent 100 ml		Dish + Sample Wt: 45.0735	g
Log Number 02P		Dish Tare Wt: 45.0626	g
Comments		Sample Wt: .0109	g
Test: 1 Run: 2		Dish No: 306	
Vol. of Solvent 110 ml		Dish + Sample Wt: 47.8412	g
Log Number 03P		Dish Tare Wt: 42.8345	g
Comments		Sample Wt: .0067	g
Test: 1 Run: 3		Dish No: 867	
Vol. of Solvent 100		Dish + Sample Wt: 45.6107	g
Log Number 04P		Dish Tare Wt: 45.6046	g
Comments		Sample Wt: .0061	g

*Solvent Residue _____ ug/ml = [(Sample Wt. .0004 g) (10^6)]/Vol. of Sol. 100 ml

EPA-M5 Acetone Residue Blank Spec. ≤ 7.8 ug/ml

		RUN	RUN	RUN	RUN
Results of Solvent Rinse	g	D-16	.0105	.0063	.0057

INTERPOLL LABORATORIES, INC.
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Filter Gravimetrics Reporting Sheet

Fiter Type: ☒ EPA Method 5 ☐ EPA Method 29 ☐ EPA Method 202 ☐ Other_____

Job: L.P Hayward
Date Submitted: 2/23/96
Date of Analysis: 2/27/96
Source/Site: DRYER RTO STACK
Test No.: 1
Technician: D. Van Hoever

Test: 1 Run: 0		Filter No:	8355
Field Blank:		Filter Type:	9f.
Log No: 7318-01F		Filter + Sample Wt:	.9311 g
Color:		Filter Tare Wt:	.9307 g
		Sample Wt:	.0004 g
Test: 1 Run: 1		Filter No:	8352
Log No: -02F		Filter Type:	9f
Color:		Filter + Sample Wt:	.9364 g
		Filter Tare Wt:	.9354 g
		Sample Wt:	.0010 g
Test: 1 Run: 2		Filter No:	8353
Log No: -03F		Filter Type:	9f.
Color:		Filter + Sample Wt:	.9359 g
		Filter Tare Wt:	.9355 g
		Sample Wt:	.0004 g
Test: 1 Run: 3		Filter No:	8354
Log No: -04F		Filter Type:	9f
Color:		Filter + Sample Wt:	.9404 g
		Filter Tare Wt:	.9394 g
		Sample Wt:	.0010 g

		RUN	RUN	RUN	RUN
Results of Filter Analysis	g		.0010	.0004	.0010

		RUN	RUN	RUN	RUN
Total Mass	g		0.0168	0.0079	0.0074

INTERPOLL LABORATORIES, INC.
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Impinger Catch Data Reporting Sheet

ɔtocol: ☐Minnesota ☒Wisconsin ☐Iowa ☐EPA Method 202 ☐Other _____

Job: LP Maywood
Date Submitted: 2-23-96
Date of Analysis: 2-29-96
Source/Site: Pre SI RTO / Stack
Test No.: 9
Technician: B.O.

	Solvent Phase	Aqueous Phase
Test: 9 Run: 0	Dish No: 795	Dish No: 772
Log No: 7318-38I	Dish + Sample Wt: 44.0310 g	Dish + Sample Wt: 48.1626 g
Color & Appearance:	Dish Tare Wt: 44.0310 g	Dish Tare Wt: 48.1620 g
	Fraction Wt: 0.0000 g	Fraction Wt: 0.0000 g
Comments:	Smpl Vol: 200 ml, Alqt: 200 ml, Factor: 1.000	Smpl Vol: 200 ml, Alqt: 100 ml, Factor: 2.000
	Sample Wt: 0.0000 g	Sample Wt: 0.0000 g
Test: 9 Run: 1	Dish No: 796	Dish No: 781
Log No: -39I	Dish + Sample Wt: 44.7978 g	Dish + Sample Wt: 44.1026 g
Color & Appearance:	Dish Tare Wt: 44.7972 g	Dish Tare Wt: 44.0972 g
	Fraction Wt: 0.0006 g	Fraction Wt: 0.0054 g
Comments:	Smpl Vol: 200 ml, Alqt: 200 ml, Factor 1.000	Smpl Vol: 200 ml, Alqt: 100 ml, Factor 2.000
	Sample Wt: 0.0006 g	Sample Wt: 0.0108 g
Test: 9 Run: 2	Dish No: 797	Dish No: 783
Log No: -40 I	Dish + Sample Wt: 43.0493 g	Dish + Sample Wt: 43.0887 g
Color & Appearance:	Dish Tare Wt: 43.0486 g	Dish Tare Wt: 43.0877 g
	Fraction Wt: 0.0007 g	Fraction Wt: 0.0010 g
Comments:	Smpl Vol: 210 ml, Alqt: 210 ml, Factor 1.000	Smpl Vol: 210 ml, Alqt: 100 ml, Factor 2.100
	Sample Wt: 0.0007 g	Sample Wt: 0.0021 g
Test: 9 Run: 3	Dish No: 844	Dish No: 789
Log No: -41 I	Dish + Sample Wt: 36.2138 g	Dish + Sample Wt: 44.6898 g
Color & Appearance:	Dish Tare Wt: 36.2121 g	Dish Tare Wt: 44.6887 g
	Fraction Wt: 0.0017 g	Fraction Wt: 0.0011 g
Comments:	Smpl Vol: 210 ml, Alqt: 210 ml, Factor 1.000	Smpl Vol: 210 ml, Alqt: 100 ml, Factor 2.100
	Sample Wt: 0.0017 g	Sample Wt: 0.0023 g

Note: Factor = Sample Volume/Aliquot Volume

Blank Solvent Wt. 0.0000 g

	RUN 0	RUN 1	RUN 2	RUN 3
Results of Solvent Phase g	0.0000	0.0006	0.0007	0.0017
Results of Aqueous Phase g	0.0000 D-18	0.0108	0.0021	0.0023

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Solvent Rinse Data Reporting Sheet

☒ EPA Method 5 Probe Wash ☐ EPA Method 29 Probe Wash ☐ EPA Method 202 Cup & Tube Wash

Job: L.P. Hayward
Date Submitted: 2/23/96
Date of Analysis: 2/26/96
Source/Site: Press RTO Stack
Test No.: 9
Technician: D. VanHoeven
Solvent: Acetone

Transport Leakage ☐ None ☒ _____ ml

Test:	9 Run: 0	Dish No:	618	
Log No:	7318-38P	Dish + Sample Wt:	46.5690	g
Volume of Solvent	100 ml	Dish Tare Wt:	46.5686	g
*Solvent Residue	ug/ml	Sample Wt:	.0004	g
Test:	9 Run: 1	Dish No:	622	
Vol. of Solvent	100 ml	Dish + Sample Wt:	48.8519	g
Log Number	39P	Dish Tare Wt:	48.8442	g
Comments		Sample Wt:	.0077	g
Test:	9 Run: 2	Dish No:	700	
Vol. of Solvent	100 ml	Dish + Sample Wt:	43.0605	g
Log Number	40P	Dish Tare Wt:	43.0547	g
Comments		Sample Wt:	.0058	g
Test:	9 Run: 3	Dish No:	702	
Vol. of Solvent	100	Dish + Sample Wt:	46.2288	g
Log Number	41P	Dish Tare Wt:	46.2220	g
Comments		Sample Wt:	.0068	g

*Solvent Residue 4 ug/ml = [(Sample Wt. .0004 g) (10^6)]/Vol. of Sol. 100 ml
EPA-M5 Acetone Residue Blank Spec. ≤ 7.8 ug/ml

	RUN	RUN	RUN	RUN
Results of Solvent Rinse g	D-19	.0073	.0054	.0064

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Filter Gravimetrics Reporting Sheet

Fiter Type: ☒ EPA Method 5 ☐ EPA Method 29 ☐ EPA Method 202 ☐ Other_____

Job: L.P Hayward
Date Submitted: 2/23/96
Date of Analysis: 2/26/96
Source/Site: Press RTO STACK
Test No.: 9
Technician: D. Van Hoever

Test: 9 Run: 0		Filter No: 8469	
Field Blank:		Filter Type:	
Log No: 7318-38F		Filter + Sample Wt: 9502	g
Color:		Filter Tare Wt: 9502	g
		Sample Wt: 0	g
Test: 9 Run: 1		Filter No: 8326	
Log No: 039F		Filter Type:	
Color:		Filter + Sample Wt: 9267	g
		Filter Tare Wt: .9264	g
		Sample Wt: .0003	g
Test: 9 Run: 2		Filter No: 8327	
Log No: 040F		Filter Type:	
Color:		Filter + Sample Wt: .9372	g
		Filter Tare Wt: .9324	g
		Sample Wt: .0048	g
Test: 9 Run: 3		Filter No: 8328	
Log No: 041F		Filter Type:	
Color:		Filter + Sample Wt: .9323	g
		Filter Tare Wt: .9314	g
		Sample Wt: .0009	g

		RUN	RUN	RUN	RUN
Results of Filter Analysis	g		.0003	.0048	.0009

		RUN	RUN	RUN	RUN
Total Mass	g		0.0190	0.0130	0.0113

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Impinger Catch Data Reporting Sheet

tocol: ☐Minnesota ☒Wisconsin ☐Iowa ☐EPA Method 202 ☐Other LP Haywood

Source/Site: Line 1 Thermal Oil Heater Stack
Test No.: 17
Technician: B.D.
Date Submitted: 2-23-96
Date of Analysis: 2-29-96

	Solvent Phase	Aqueous Phase
Test: 17 Run: 0	Dish No: 800	Dish No: 811
Log No: 7318-82I	Dish + Sample Wt: 45.6110 g	Dish + Sample Wt: 43.3631 g
Color & Appearance:	Dish Tare Wt: 45.6110 g	Dish Tare Wt: 43.3631 g
	Fraction Wt: 0.0000 g	Fraction Wt: 0.0000 g
Comments:	Smpl Vol: 200 ml, Alqt: 200 ml, Factor: 1.000	Smpl Vol: 200 ml, Alqt: 100 ml, Factor: 2.000
	Sample Wt: 0.0000 g	Sample Wt: 0.0000 g
Test: 17 Run: 1	Dish No: 803	Dish No: 812
Log No: -83I	Dish + Sample Wt: 47.5197 g	Dish + Sample Wt: 45.2472 g
Color & Appearance:	Dish Tare Wt: 47.5186 g	Dish Tare Wt: 45.2062 g
	Fraction Wt: 0.0011 g	Fraction Wt: 0.0410 g
Comments:	Smpl Vol: 280 ml, Alqt: 280 ml, Factor: 1.000	Smpl Vol: 280 ml, Alqt: 100 ml, Factor: 2.800
	Sample Wt: 0.0011 g	Sample Wt: 0.1148 g
Test: 17 Run: 2	Dish No: 804	Dish No: 813
Log No: -84I	Dish + Sample Wt: 46.6849 g	Dish + Sample Wt: 45.5796 g
Color & Appearance:	Dish Tare Wt: 46.6838 g	Dish Tare Wt: 45.5691 g
	Fraction Wt: 0.0011 g	Fraction Wt: 0.0105 g
Comments:	Smpl Vol: 310 ml, Alqt: 310 ml, Factor: 1.000	Smpl Vol: 310 ml, Alqt: 100 ml, Factor: 3.100
	Sample Wt: 0.0011 g	Sample Wt: 0.0326 g
Test: 17 Run: 3	Dish No: 805	Dish No: 814
Log No: -85I	Dish + Sample Wt: 45.1098 g	Dish + Sample Wt: 45.1017 g
Color & Appearance:	Dish Tare Wt: 45.1086 g	Dish Tare Wt: 45.1014 g
	Fraction Wt: 0.0012 g	Fraction Wt: 0.0003 g
Comments:	Smpl Vol: 290 ml, Alqt: 290 ml, Factor: 1.000	Smpl Vol: 290 ml, Alqt: 100 ml, Factor: 2.900
	Sample Wt: 0.0012 g	Sample Wt: 0.0009 g

Note: Factor = Sample Volume/Aliquot Volume

Blank Solvent Wt. 0.0000 g

	RUN 0	RUN 1	RUN 2	RUN 3
Results of Solvent Phase g	0.0000	0.0011	0.0011	0.0012
Results of Aqueous Phase g	0.0000 D-21	0.1148	0.0326	0.0009

INTERPOLL LABORATORIES, INC.
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Solvent Rinse Data Reporting Sheet

☑ EPA Method 5 Probe Wash ☐ EPA Method 29 Probe Wash ☐ EPA Method 202 Cup & Tube Wash

Job: L.P Hayward
Date Submitted: 2/23/96
Date of Analysis: 2/26/96
Source/Site: Thermal Oil Heater
Test No.: 17
Technician: D. Van Hoeven
Transport Leakage ☐ None ☐ _____ ml
Solvent: Acetone

Test: 17 Run: 0		Dish No:	855
Log No:	7318-82P	Dish + Sample Wt:	44.2649 g
Volume of Solvent	205 ml	Dish Tare Wt:	44.2638 g
*Solvent Residue	ug/ml	Sample Wt:	.0011 g
Test: 17 Run: 1		Dish No:	209
Vol. of Solvent	150 ml	Dish + Sample Wt:	43.4208 g
Log Number	-83P	Dish Tare Wt:	42.2097 g
Comments		Sample Wt:	.2111 g
Test: 17 Run: 2		Dish No:	105
Vol. of Solvent	150 ml	Dish + Sample Wt:	47.9327 g
Log Number	-84P	Dish Tare Wt:	47.8654 g
Comments		Sample Wt:	.0673 g
Test: 17 Run: 3		Dish No:	93
Vol. of Solvent	150	Dish + Sample Wt:	54.1993 g
Log Number	-85P	Dish Tare Wt:	53.9840 g
Comments		Sample Wt:	.2153 g

*Solvent Residue 5.36 ug/ml = [(Sample Wt. .0011 g) (10^6)]/Vol. of Sol. 205 ml
EPA-M5 Acetone Residue Blank Spec. ≤ 7.8 ug/ml

		RUN	RUN	RUN	RUN
Results of Solvent Rinse	g	D-22	.2103	.0665	.2145

INTERPOLL LABORATORIES, INC.
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Filter Gravimetrics Reporting Sheet

Fiter Type: ☒ EPA Method 5 ☐ EPA Method 29 ☐ EPA Method 202 ☐ Other_____

Job: L.P. Hayward
Date Submitted: 2/23/96
Date of Analysis: 2/27/96

Source/Site: Thermal Oil Heater Stack
Test No.: 17
Technician: D. Van Hoever

Test: 17 Run: 0		Filter No:	8283
Field Blank:		Filter Type:	9. f
Log No: 7318-82F		Filter + Sample Wt:	.9321 g
Color:		Filter Tare Wt:	.9316 g
		Sample Wt:	.0005 g
Test: 17 Run: 1		Filter No:	8281
Log No: 7318-83F		Filter Type:	9. f
Color:		Filter + Sample Wt:	1.1714 g
		Filter Tare Wt:	.9221 g
		Sample Wt:	.2493 g
Test: 17 Run: 2		Filter No:	8387
Log No: 7318-84F		Filter Type:	9. f.
Color:		Filter + Sample Wt:	1.4148 g
		Filter Tare Wt:	.9321 g
		Sample Wt:	.4827 g
Test: 17 Run: 3		Filter No:	8282
Log No: 7318-85F		Filter Type:	9. f.
Color:		Filter + Sample Wt:	1.1724 g
		Filter Tare Wt:	.9284 g
		Sample Wt:	.2437 g

		RUN	RUN	RUN	RUN
Results of Filter Analysis	g		.2493	.4827	.2437

		RUN	RUN	RUN	RUN
Total Mass	g		0.5755	0.5829	0.4603

Due Date: 3/8/96

Interpoll Laboratories
(612)786-6020

Data Reporting Sheet

CLIENT: ID020/LP Hayward

JOB:
CLIENT NO:
P.O. NO:
PROJECT MGR:

PHONE:

DATE:

CONTACT:

LABORATORY REPORT #:
SAMPLES COLLECTED:
SAMPLES RECEIVED:

	Invoicing	Signature	Report Routing
PL	☐	☐	☐
Lab Mgr	☐	☐	☐
Ino Mgr	☐	☐	☐
Org Mgr	☐	☐	☐

Dryer RTO Stack

SAMPLE ID:				
	1/1	1/2	1/3	
SAMPLE TYPE:	I.G.S.	→	→	
LOG NO:	7318-05	-06	-07	

PARAMETER	UNITS	DETECT LIMIT	ANALYSIS DATE & INITIALS	METHOD				
Methane	ppm	5	2/22/96 DWNS	M-25	BDL	BDL	BDL	

Footnotes:

In-House Comments:

LC1-01R

Due Date: 3/8/96

Interpoll Laboratories
(612)786-6020

Data Reporting Sheet

CLIENT: ID020/LP Hayward

JOB:
CLIENT NO:
P.O. NO:
PROJECT MGR:

PHONE:

DATE:

CONTACT:

LABORATORY REPORT #:
SAMPLES COLLECTED:
SAMPLES RECEIVED:

	Invoicing	Signature	Report Routing
PL	☐	☐	☐
Lab Mgr	☐	☐	☐
Ino Mgr	☐	☐	☐
Org Mgr	☐	☐	☐

Line 1 Surface Dryer Duct

SAMPLE ID:	8/1	8/2	8/3	
SAMPLE TYPE:	I.C.S.	→	→	
LOG NO:	7318-107	-108	-109	

PARAMETER	UNITS	DETECT LIMIT	ANALYSIS DATE & INITIALS	METHOD				
Methane	ppm	5	2/20/96 DWJ	M-25	22	77	73	

Footnotes:

In-House Comments:

LC1-01R

Due Date: 3/8/96

Interpoll Laboratories
(612)786-6020

Data Reporting Sheet

CLIENT: ID020/LP Hayward

JOB:
CLIENT NO:
P.O. NO:
PROJECT MGR:

PHONE:

DATE:

CONTACT:

LABORATORY REPORT #:
SAMPLES COLLECTED:
SAMPLES RECEIVED:

	Invoicing	Signature	Report Routing
PL	☐	☐	☐
Lab Mgr	☐	☐	☐
Ino Mgr	☐	☐	☐
Org Mgr	☐	☐	☐

SAMPLE ID:	Press Vent RTO Stack			
	9/1	9/2	9/3	
SAMPLE TYPE:	I.G.S.	→	→	
LOG NO:	7318-42	-43	-44	

PARAMETER	UNITS	DETECT LIMIT	ANALYSIS DATE & INITIALS	METHOD				
Methane	ppm	5	2/29/96 BMM	M-25	BDL	BDL	BDL	

Footnotes:

In-House Comments:

LC1-01R

Due 3/8/96

Interpoll Laboratories, Inc.
(612)786-6020

Air Samples (Charcoal Tubes) by NIOSH Method 1501 Data Reporting Sheet

Client: ID020 / LP Hayward

Sample Collected: _____

Sample Received: _____

Sample Log #: 7318-31

Sample Description: 5/0

			FRONT			BACK		
Parameter	Units	Analysis Date & Initials	Detection Limit Front	Analytical Result Front	Method Blank Front	Detection Limit Back	Analytical Result Back	Method Blank Back
Benzene	Total ug	XMN	2.1	BDL	BDL	0.101	BDL	BDL
	Total ug	2-27-96						
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
Dilution factor								

Footnotes: _____

In-House Comments: _____

LCI-136

Due 3/8/96

Interpoll Laboratories, Inc.
(612)786-6020

Air Samples (Charcoal Tubes) by NIOSH Method 1501 Data Reporting Sheet

Client: ID020 / LP Hayward

Sample Collected: _____

Sample Received: _____

Sample Log #: 7318-32

Sample Description: 5/1

Parameter	Units	Analysis Date & Initials	FRONT Detection Limit Front	FRONT Analytical Result Front	FRONT Method Blank Front	BACK Detection Limit Back	BACK Analytical Result Back	BACK Method Blank Back
Benzene	Total ug	[illegible]	2.1	15	BDL	0.101	BDL	BDL
	Total ug	2/27/96						
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
Dilution factor								

Footnotes: _____

In-House Comments: _____

LCI-136

Due 3/8/96

Interpoll Laboratories, Inc.
(612)786-6020

Air Samples (Charcoal Tubes) by NIOSH Method 1501 Data Reporting Sheet

Client: ID020 / LP Hayward

Sample Collected: _____

Sample Received: _____

Sample Log #: 7318-34

Sample Description: 5/2

			FRONT			BACK		
Parameter	Units	Analysis Date & Initials	Detection Limit Front	Analytical Result Front	Method Blank Front	Detection Limit Back	Analytical Result Back	Method Blank Back
Benzene	Total ug	[illegible]	2.1	17	BDL	0.61	BDL	BDL
	Total ug	3/7/96						
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
Dilution factor								

Footnotes: _____

In-House Comments: _____

LCI-136

Due 3/8/96

Interpoll Laboratories, Inc.
(612)786-6020

Air Samples (Charcoal Tubes) by NIOSH Method 1501 Data Reporting Sheet

Client: ID020 / LP Hayward

Sample Collected: _____

Sample Received: _____

Sample Log #: 7318-36

Sample Description: 5/3

			FRONT			BACK		
Parameter	Units	Analysis Date & Initials	Detection Limit Front	Analytical Result Front	Method Blank Front	Detection Limit Back	Analytical Result Back	Method Blank Back
Benzene	Total ug	MMN	2.1	17	BDL	0.61	BDL	BDL
	Total ug	2/29/96						
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
Dilution factor								

Footnotes: _____

In-House Comments: _____

LCI-136

Due 3/3/96

Interpoll Laboratories, Inc.
(612)786-6020

Air Samples (Charcoal Tubes) by NIOSH Method 1501 Data Reporting Sheet

Client: ID020 / LP Hayward

Sample Collected: _____

Sample Received: _____

Sample Log #: 7318-67

Sample Description: 15/0

			FRONT			BACK		
Parameter	Units	Analysis Date & Initials	Detection Limit Front	Analytical Result Front	Method Blank Front	Detection Limit Back	Analytical Result Back	Method Blank Back
Benzene	Total ug	[illegible]	2.1	BDL	BDL	0.61	BDL	BDL
	Total ug	3-27-96						
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
Dilution factor								

Footnotes: _____

In-House Comments: _____

LCI-136

Dm 3/8/96

Interpoll Laboratories, Inc.
(612)786-6020

Air Samples (Charcoal Tubes) by NIOSH Method 1501 Data Reporting Sheet

Client: ID020 / LP Haynland

Sample Collected: _____

Sample Received: _____

Sample Log #: 7318-68

Sample Description: 15/1

			FRONT			BACK		
Parameter	Units	Analysis Date & Initials	Detection Limit Front	Analytical Result Front	Method Blank Front	Detection Limit Back	Analytical Result Back	Method Blank Back
Benzene	Total ug	[illegible]	2.1	[illegible]	[illegible]	0.101	[illegible]	[illegible]
	Total ug	2-8-96						
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
Dilution factor								

Footnotes: _____

In-House Comments: _____

LCI-136

Due 3/8/96

Interpoll Laboratories, Inc.
(612)786-6020

Air Samples (Charcoal Tubes) by NIOSH Method 1501 Data Reporting Sheet

Client: ID020 / LP Hayward

Sample Collected: _____

Sample Received: _____

Sample Log #: 7318-70

Sample Description: 15/2

Parameter	Units	Analysis Date & Initials	FRONT Detection Limit Front	FRONT Analytical Result Front	FRONT Method Blank Front	BACK Detection Limit Back	BACK Analytical Result Back	BACK Method Blank Back
Benzene	Total ug	[illegible]	2.1	BDL	BDL	0.01	BDL	BDL
	Total ug	3/7/96						
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
Dilution factor								

Footnotes: _____

In-House Comments: _____

LCI-136

Due 3/8/96

Interpoll Laboratories, Inc.
(612)786-6020

Air Samples (Charcoal Tubes) by NIOSH Method 1501 Data Reporting Sheet

Client: ID020 / CP Hayward

Sample Collected: _____

Sample Received: _____

Sample Log #: 7318-72

Sample Description: 15/3

			FRONT			BACK		
Parameter	Units	Analysis Date & Initials	Detection Limit Front	Analytical Result Front	Method Blank Front	Detection Limit Back	Analytical Result Back	Method Blank Back
Benzene	Total ug	3/7/96	3.1	BDL	BDL	0.101	BDL	BDL
	Total ug	3/7/96						
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
	Total ug							
Dilution factor								

Footnotes: _____

In-House Comments: _____

LCI-136

INTERPOLL LABORATORIES INC.

Formaldehyde Results Using EPA Method 0011
For Dept. 20/LP Hayward
Collected 2/21-22/96

	Field Spike #1			Test: 2			Source: Dryer RTO Stack
	Actual	Found	% Recovery	Run 0	Run 1	Run 2	Run 3
Log #		(7318-09)		(7318-08)	(7318-10)	(7318-11)	(7318-12)
Mass (ug)*	**750**	**490**	**65.3**	**< 0.50**	**11000**	**12000**	**14000**

	Field Spike #2			Test: 12			Source: Press Vent RTO Stack
	Actual	Found	% Recovery	Run 0	Run 1	Run 2	Run 3
Log #		(7318-55)		(7318-56)	(7318-57)	(7318-58)	(7318-59)
Mass (ug)*	**750**	**630**	**84.0**	**< 0.50**	**690**	**560**	**670**

	Field Spike #3			Test: 16			Source: Line 1 Thermal Oil Heater Stack
	Actual	Found	% Recovery	Run 0	Run 1	Run 2	Run 3
Log #		(7318-75)		(7318-74)	(7318-76)	(7318-77)	(7318-78)
Mass (ug)*	**750**	**640**	**85.3**	**< 0.50**	**130**	**150**	**130**

* = Total Mass of formaldehyde in the sample in ug. The laboratory method blanks contained 1.1ug and 0.66ug.

Reviewed by:



David J. Schneider, Manager
Chemistry Department

INTERPOLL LABORATORIES INC.

Phenol Result By EPA Method 8270
For Dept. 20/ LP Hayward
Collected 2/20-21/96

	Test 3			Source: Dryer RTO Stack
	Run 0	Run 1	Run 2	Run 3
Log #	7318-16/17	7318-18/19	7318-20/21	7318-22/23
Analysis Date	3/07/96	3/07/96	3/07/96	3/07/96
Phenol*	**< 840**	**< 840**	**< 840**	**< 840**
2-Fluorophenol**	55.0	16.2	18.1	18.5
D6-Phenol**	44.7	27.5	26.7	28.7
2,4,6-Tribromophenol***	69.4	93.1	72.8	89.9

	Test: 19			Source: Line 1 Thermal Oil Heater Stack
	Run 0	Run 1	Run 2	Run 3
Log #	7318-86/87	7318-88/89	7318-90/91	7318-92/93
Analysis Date	3/07/96	3/07/96	3/07/96	3/07/96
Phenol*	**< 840**	**< 840**	**< 840**	**< 840**
2-Fluorophenol**	65.8	32.0	39.3	39.7
D6-Phenol**	48.7	44.7	50.9	51.5
2,4,6-Tribromophenol***	76.3	81.2	94.5	94.2

* = Total mass of the specified compound in the sample in ug.
** = Percent recovery of the field surrogate. (59800 ug 2-Fluorophenol and 5002 ug Phenol-D6 was added to the impinger solution before sampling.)
*** = Percent recovery of the lab surrogates.

Reviewed by:

David J. Schneider, Manager
Chemistry Department

INTERPOLL LABORATORIES INC.

4,4-Methylenebis(phenyl isocyanate) Results
For Dept. 20/LP Hayward
Collected 2/22/96

Item	Field Spike 1			Field Spike 2			Test: 11 Source: Press Vent RTO Stack			
	Actual	Found	% Rec.	Actual	Found	% Rec.	Run 0	Run 1	Run 2	Run 3
EPA Draft Method 1,2-PP										
Log #		7318-46			7318-47		7318-45	7318-48	7318-49	7318-50
MDI (ug)*	323	319	98.8	323	316	97.8	< 6.2	< 6.2	< 6.2	< 6.2

* = Total mass of MDI in the sample in ug.

Reviewed by:

David J. Schneider, Manager
Chemistry Department

INTERPOLL LABORATORIES INC.

Polycyclic Organic Matter Results By EPA Method 8270
For Dept. 20/LP Hayward, Collected 2/19-22/96

	Test : 4			Source: Dryer RTO Stack
	Run 0	Run 1	Run 2	Run 3
Log #	7318-24	7318-25	7318-26	7318-26
Compounds of Interest				
Benz(a)anthracene*	< 1.8	< 1.8	< 1.8	< 1.8
Benzo(b)fluoranthene*	< 0.99	< 0.99	< 0.99	< 0.99
Benzo(a)pyrene*	< 1.2	< 1.2	< 1.2	< 1.2
Dibenz(a,h)acridine*	< 15	< 15	< 15	< 15
Dibenz(a,j)acridine*	< 1.6	< 1.6	< 1.6	< 1.6
Dibenz(a,h)anthracene*	< 0.88	< 0.88	< 0.88	< 0.88
7H-Dibenzo(c,g)carbazole*	< 1.2	< 1.2	< 1.2	< 1.2
Dibenzo(a,h)pyrene*	< 20	< 20	< 20	< 20
Dibenzo(a,i)pyrene*	< 20	< 20	< 20	< 20
Indeno(1,2,3-cd)pyrene*	< 0.90	< 0.90	< 0.90	< 0.90
Field Surrogate Recovery				
D10-Fluoranthene**	66.0	102	80.3	69.2
Lab Surrogate Recovery				
D5-Nitrobenzene***	59.0	97.8	76.8	58.7
2-Fluorobiphenyl***	74.7	96.8	83.3	67.3
D14-Terphenyl***	83.6	107	92.5	75.7

	Test : 14			Source: Line 1 Thermal Oil Heater Stack
	Run 0	Run 1	Run 2	Run 3
Log #	7318-63	7318-64	7318-65	7318-66
Compounds of Interest				
Benz(a)anthracene*	< 1.8	< 1.8	< 1.8	1.8
Benzo(b)fluoranthene*	< 0.99	< 0.99	5.0	5.8
Benzo(a)pyrene*	< 1.2	< 1.2	5.2	5.8
Dibenz(a,h)acridine*	< 15	< 15	< 15	< 15
Dibenz(a,j)acridine*	< 1.6	< 1.6	< 1.6	< 1.6
Dibenz(a,h)anthracene*	< 0.88	< 0.88	< 0.88	< 0.88
7H-Dibenzo(c,g)carbazole*	< 1.2	< 1.2	< 1.2	< 1.2
Dibenzo(a,h)pyrene*	< 20	< 20	< 20	< 20
Dibenzo(a,i)pyrene*	< 20	< 20	< 20	< 20
Indeno(1,2,3-cd)pyrene*	< 0.90	< 0.90	9.9	8.4
Field Surrogate Recovery				
D10-Fluoranthene**	62.1	42.3	86.6	71.3
Lab Surrogate Recovery				
D5-Nitrobenzene***	51.9	47.3	70.4	60.8
2-Fluorobiphenyl***	67.8	47.0	89.5	75.6
D14-Terphenyl***	80.0	50.4	99.2	84.2

* = Total mass of the specified compound in the sample in ug.
** = Percent recovery of the field surrogate.
*** = Percent recovery of the lab surrogates.

Reviewed by:

David J. Schneider, Manager
Chemistry Department

Interpoll Laboratories
(612) 786-6020

XAD-2 & VOST Trap Preparation Work Order Form

Project Name: LP Hayward Order Date: 2.16.96
Date Required: 2.16.96 Delivery Date: 2-16-96

Number of XAD-2 Traps Required: 8

Number of VOST Tubes Required: _____ Tenax
_____ Tenax/Charcoal

XAD-2 TRAP HISTORY

XAD-2 Lot Number: 2077 Date of Spiking: 2.16.96
XAD-2 Lot Date: _____ Technician: MRR/BD
XAD-2 Lot Technician: All tech

Nature of Spiking Material	Spike Concentration	Spike Volume	Total Mass of Spike
D_{10}-Fluorathene 950-78-9-1	4.0 ug/ml	5.0 mL	20.0 ug

VOST TUBE HISTORY

Date of Thermal Disorption: _____ Technician: _____

Total Hydrocarbon Analysis: ____ ppm

SPECIAL REQUIREMENTS

**Please return this form with the samples.

LOA-10RR

Interpoll Laboratories
(612) 786-6020

IMPINGER CATCHES

Project Name: LP/Hayward
Date Required: 2-16-96

Order Date: 2-12-96
Delivery Date: 2-16-96 B.D.

Nature of Spiking Material	Spike Concentration	Spike Volume	Total Mass of Spike
D-6 Phenol	5.002 mg/ml	1.0mL	5.002 mg
2-fluorophenol	50.096 mg/mL	1.2mL	60.115 mg

SPECIAL REQUIREMENTS

**Please return this form with the samples.

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job: L.P. Hayward | Source: Dryer Eto | Site: Stack | Log No.: 7318
Field Engineer: E.Sivis | Date of Test: 2-20-96 | Test No.: 1 | No. of Runs: 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
4	Probe Wash: ☒ Acetone ☐ $MeCl_2$	☐DI Water ☐_____	☒EPA M-5 ☐EPA M-29	☐EPA M-201A ☐_____		
4	Filter: ☒ 4" Glass ☐ SS Thimble	☐Pallflex ☐2.5" Glass	☒EPA M-5 ☐EPA M-29 ☐EPA M-201A	☐EPA M-17		
4	Impingers: ☒DI Water ☐3%H_2O_2 ☐1N NaOH ☐2,4-DNPH	☐H_2SO_4 ☐HNO_3/H_2O_2 ☐$KMnO_4/H_2SO_4$ ☐_____	☐MN Protocol ☒WI Protocol ☐EPA M-202 ☐EPA M6,8 ☐Acid Gases	☐IA Protocol ☐Formaldehyde ☐EPA M-29 ☐EPA M-26 ☐_____		
3	Integrated Gas: ☒Tedlar Bag	☐_____	☒EPA M-3 ☒ methane	☐EPA M-10		
—	Oxides of Nitrogen:		☐EPA M-7A ☐_____			
—	Fuel Lab: ☐Fuel Sample	☐Aggregate	☐Per S-0163			
—	Particle Sizing:		☐X-Ray Sdgraph ☐_____	☐Cascade Imp		
	Miscellaneous:	☐_____	☐_____			

Fuel Type: Coal: ☐Bituminous ☐Anthracite ☐Lignite | Wood: ☐Wood Waste ☐Dust ☐Bark | Oil: ☐Waste Oil ☐No. 2 ☐No. 6 | Misc: ☒Natural Gas ☐RDF ☐_____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
E.Sivis / Interpoll	Interpoll 0830	2-23-96

033094-G:\STACK\WP\FORMS\S-270.2

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job: L.P. Hayward | Source: Dryer RTO | Site: stack | Log No.: 7318
Field Engineer: E. Juers | Date of Test: 2-21-96 | Test No.: 2 | No. of Runs: 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
5	**Probe Wash:** ☐ Acetone ☒ ~~$MeCl_2$~~	☐DI Water ☐_____	☐EPA M-5 ☐EPA M-29	☐EPA M-201A ☒ 0011		
—	**Filter:** ☐ 4" Glass ☐ SS Thimble	☐Pallflex ☐2.5" Glass	☐EPA M-5 ☐EPA M-29 ☐EPA M-201A	☐EPA M-17		
5	**Impingers:** ☐DI Water ☐3%H_2O_2 ☐1N NaOH ☒ ~~2,4~~-DNPH	☐H_2SO_4 ☐HNO_3/H_2O_2 ☐$KMnO_4/H_2SO_4$ ☐_____	☐MN Protocol ☐WI Protocol ☐EPA M-202 ☐EPA M6,8 ☐Acid Gases	☐IA Protocol ☐Formaldehyde ☐EPA M-29 ☐EPA M-26 ☒ 0011		
3	**Integrated Gas:** ☒ ~~Tedlar~~ Bag	☐_____	☒ ~~EPA~~ M-3 ☐_____	☐EPA M-10		
—	**Oxides of Nitrogen:**		☐EPA M-7A ☐_____			
—	**Fuel Lab:** ☐Fuel Sample	☐Aggregate	☐Per S-0163			
—	**Particle Sizing:**		☐X-Ray Sdgraph ☐_____	☐Cascade Imp		
5	**Miscellaneous:**	☒ $meCl_2$ (Filter Rinse)	☒ 0011			

Fuel Type: Coal: ☐Bituminous ☐Anthracite ☐Lignite | Wood: ☐Wood Waste ☐Dust ☐Bark | Oil: ☐Waste Oil ☐No. 2 ☐No. 6 | Misc: ☒ ~~☐~~Natural Gas ☐RDF ☐_____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
Interpoll Labs	Interpoll	0830 2/23/96

033094-G:\STACK\WP\FORMS\S-270.2

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job: L.P. Hayward | Source: Dryer RTO | Site: Stack | Log No.: 7318
Field Engineer: Elsers | Date of Test: 2-20-96 | Test No.: 3 | No. of Runs: 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
—	**Probe Wash:** ☐ Acetone ☐ $MeCl_2$	☐DI Water ☐_____	☐EPA M-5 ☐EPA M-29	☐EPA M-201A ☐_____		
—	**Filter:** ☐ 4" Glass ☐ SS Thimble	☐Pallflex ☐2.5" Glass	☐EPA M-5 ☐EPA M-29 ☐EPA M-201A	☐EPA M-17		
11	**Impingers:** ☐DI Water ☐3%H_2O_2 ☐1N NaOH ☐2,4-DNPH	☐H_2SO_4 ☐HNO_3/H_2O_2 ☐$KMnO_4/H_2SO_4$ ☒ Phenol	☐MN Protocol ☐WI Protocol ☐EPA M-202 ☐EPA M6,8 ☐Acid Gases	☐IA Protocol ☐Formaldehyde ☐EPA M-29 ☐EPA M-26 ☒ 8270		
—	**Integrated Gas:** ☐Tedlar Bag	☐_____	☐EPA M-3 ☐_____	☐EPA M-10		
—	**Oxides of Nitrogen:**		☐EPA M-7A ☐_____			
—	**Fuel Lab:** ☐Fuel Sample	☐Aggregate	☐Per S-0163			
—	**Particle Sizing:**		☐X-Ray Sdgraph ☐_____	☐Cascade Imp		
—	**Miscellaneous:**	☐_____	☐_____			

Fuel Type: Coal: ☐Bituminous ☐Anthracite ☐Lignite | Wood: ☐Wood Waste ☐Dust ☐Bark | Oil: ☐Waste Oil ☐No. 2 ☐No. 6 | Misc: ☒Natural Gas ☐RDF ☐_____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
Interpoll	Interpoll 0830	2-23-96

033094-G:\STACK\WP\FORMS\S-278.2

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job: L.P. Hayward | Source: Dryer RTO | Site: Stack | Log No. 7318
Field Engineer: E. Ivers | Date of Test: 2-21,22-96 | Test No. 4 | No. of Runs 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
4	**Probe Wash:** ☒ Acetone ☒ $MeCl_2$	☐ DI Water ☐ _____	☐ EPA M-5 ☐ EPA M-29	☐ EPA M-201A ☒ 0010		
4	**Filter:** ☒ 4" Glass ☐ SS Thimble	☐ Pallflex ☐ 2.5" Glass	☐ EPA M-5 ☐ EPA M-29 ☐ EPA M-201A	☐ EPA M-17 ☒ 0010		
6	**Impingers:** ☐ DI Water ☐ 3% H_2O_2 ☐ 1N NaOH ☐ 2,4-DNPH	☐ H_2SO_4 ☐ HNO_3/H_2O_2 ☐ $KMnO_4/H_2SO_4$ ☒ Condensate	☐ MN Protocol ☐ WI Protocol ☐ EPA M-202 ☐ EPA M6,8 ☐ Acid Gases	☐ IA Protocol ☐ Formaldehyde ☐ EPA M-29 ☐ EPA M-26 ☒ 0010		
3	**Integrated Gas:** ☒ Tedlar Bag	☐ _____	☒ EPA M-3 ☐ _____	☐ EPA M-10		
	Oxides of Nitrogen:		☐ EPA M-7A ☐ _____			
	Fuel Lab: ☐ Fuel Sample	☐ Aggregate	☐ Per S-0163			
	Particle Sizing:		☐ X-Ray Sdgraph ☐ _____	☐ Cascade Imp		
4	**Miscellaneous:**	☒ Resin Cartridge	☒ 0010			

Fuel Type: Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite | Wood: ☐ Wood Waste ☐ Dust ☐ Bark | Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6 | Misc: ☒ Natural Gas ☐ RDF ☐ _____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
Interpoll	Interpoll 0830	2-23-96

033094-G\STACK\WP\FORMS\S-270.2

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job: C.P. Hayward — Source: Dryer RTO — Site: Stack — Log No. 7318
Field Engineer: EJJ&RS — Date of Test: 2-20-96 — Test No. 5 — No. of Runs 6

No. Items	Sample Type		Analysis		Sequence No.	Comments
____	**Probe Wash:** ☐ Acetone ☐ $MeCl_2$	☐DI Water ☐_____	☐EPA M-5 ☐EPA M-29	☐EPA M-201A ☐_____		
____	**Filter:** ☐ 4" Glass ☐ SS Thimble	☐Pallflex ☐2.5" Glass	☐EPA M-5 ☐EPA M-29 ☐EPA M-201A	☐EPA M-17		
____	**Impingers:** ☐DI Water ☐3%H_2O_2 ☐1N NaOH ☐2,4-DNPH	☐H_2SO_4 ☐HNO_3/H_2O_2 ☐$KMnO_4/H_2SO_4$ ☐_____	☐MN Protocol ☐WI Protocol ☐EPA M-202 ☐EPA M6,8 ☐Acid Gases	☐IA Protocol ☐Formaldehyde ☐EPA M-29 ☐EPA M-26 ☐_____		
____	**Integrated Gas:** ☐Tedlar Bag	☐_____	☐EPA M-3 ☐_____	☐EPA M-10		
____	**Oxides of Nitrogen:**		☐EPA M-7A ☐_____			
____	**Fuel Lab:** ☐Fuel Sample	☐Aggregate	☐Per S-0163			
____	**Particle Sizing:**		☐X-Ray Sdgraph ☐_____	☐Cascade Imp		
4	**Miscellaneous:**	☒ Charcoal tubes	☒ M-18 Benzene			

Fuel Type: Coal: ☐Bituminous ☐Anthracite ☐Lignite — Wood: ☐Wood Waste ☐Dust ☐Bark — Oil: ☐Waste Oil ☐No. 2 ☐No. 6 — Misc: ☒Natural Gas ☐RDF ☐_____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
EJJ&RS / Interpoll Labs	Interpoll 0830	2-23-96

033094-G:\STACK\WP\FORMS\S-278.2

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job: L.P. / Hayward, WI Source: Press RTO Site: Stack Log No.: 7318
Field Engineer: M. Kaebler Date of Test: 2-21-96 Test No.: 9 No. of Runs: 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
3+1	**Probe Wash:** ☒ Acetone ☐ $MeCl_2$	☐ DI Water ☐ _____	☐ EPA M-5 ☐ EPA M-29	☐ EPA M-201A ☐ _____		
3+1	**Filter:** ☒ 1" Glass ☐ SS Thimble	☐ Pallflex ☐ 2.5" Glass	☐ EPA M-5 ☐ EPA M-29 ☐ EPA M-201A	☐ EPA M-17		
3+1	**Impingers:** ☒ DI Water ☐ 3% H_2O_2 ☐ 1N NaOH ☐ 2,4-DNPH	☐ H_2SO_4 ☐ HNO_3/H_2O_2 ☐ $KMnO_4/H_2SO_4$ ☐ _____	☐ MN Protocol ☒ WI Protocol ☐ EPA M-202 ☐ EPA M6,8 ☐ Acid Gases	☐ IA Protocol ☐ Formaldehyde ☐ EPA M-29 ☐ EPA M-26 ☐ _____		
3	**Integrated Gas:** ☒ Pedlar Bag	☐ _____	☒ EPA M-3 ☒ Methane	☐ EPA M-10		
—	**Oxides of Nitrogen:**		☐ EPA M-7A ☐ _____			
—	**Fuel Lab:** ☐ Fuel Sample	☐ Aggregate	☐ Per S-0163			
—	**Particle Sizing:**		☐ X-Ray Sdgraph ☐ _____	☐ Cascade Imp		
—	**Miscellaneous:**	☐ _____	☐ _____			

Fuel Type:
Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite
Wood: ☐ Wood Waste ☐ Dust ☐ Bark
Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6
Misc: ☒ Natural Gas ☐ RDF ☐ _____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
Mark Kaebler / Interpoll Labs	[signature] / Interpoll	0830 2/23/96

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job: L.P. / Hayward, WI Source: Press RTO Site: Stack Log No.: 7318
Field Engineer: M. Kaebler Date of Test: 2-22-96 Test No.: 11 No. of Runs: 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
—	**Probe Wash:** ☐ Acetone ☐ $MeCl_2$	☐DI Water ☐_____	☐EPA M-5 ☐EPA M-29	☐EPA M-201A ☐_____		Added to Impingers
—	**Filter:** ☐ 4" Glass ☐ SS Thimble	☐Pallflex ☐2.5" Glass	☐EPA M-5 ☐EPA M-29 ☐EPA M-201A	☐EPA M-17		
6 1 2 1	**Impingers:** ☐DI Water ☐3%H_2O_2 ☐1N NaOH ☐2,4-DNPH	☐H_2SO_4 ☐HNO_3/H_2O_2 ☐$KMnO_4/H_2SO_4$ ☒ Toluene	☐MN Protocol ☐WI Protocol ☐EPA M-202 ☐EPA M6,8 ☐Acid Gases	☐IA Protocol ☐Formaldehyde ☐EPA M-29 ☐EPA M-26 ☒ MDI		
3	**Integrated Gas:** ☒Tedlar Bag	☐_____	☒EPA M-3 ☐_____	☐EPA M-10		
—	**Oxides of Nitrogen:**		☐EPA M-7A ☐_____			
—	**Fuel Lab:** ☐Fuel Sample	☐Aggregate	☐Per S-0163			
—	**Particle Sizing:**		☐X-Ray Sdgraph ☐_____	☐Cascade Imp		
—	**Miscellaneous:**	☐_____	☐_____			

Fuel Type: Coal: ☐Bituminous ☐Anthracite ☐Lignite Wood: ☐Wood Waste ☐Dust ☐Bark Oil: ☐Waste Oil ☐No. 2 ☐No. 6 Misc: ☒Natural Gas ☐RDF ☐_____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
Mark Kaebler / Interpoll Labs	/ Interpoll	0830 2/23/96

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job A.P. / Hayward, WI Source Press RTO Site Stack Log No. 7318
Field Engineer M. Kaechler Date of Test 2-22-96 Test No. 12 No. of Runs 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
—	**Probe Wash:** ☐ Acetone ☐ $MeCl_2$	☐DI Water ☐_____	☐EPA M-5 ☐EPA M-29	☐EPA M-201A ☐_____		Added to Impingers
—	**Filter:** ☐ 4" Glass ☐ SS Thimble	☐Pallflex ☐2.5" Glass	☐EPA M-5 ☐EPA M-29 ☐EPA M-201A	☐EPA M-17		
3	**Impingers:** ☐DI Water ☐3%H_2O_2 ☐1N NaOH ☐2,4-DNPH	☐H_2SO_4 ☐HNO_3/H_2O_2 ☐$KMnO_4/H_2SO_4$ ☐_____	☐MN Protocol ☐WI Protocol ☐EPA M-202 ☐EPA M6,8 ☐Acid Gases	☐IA Protocol ☒Formaldehyde ☐EPA M-29 ☐EPA M-26 ☐_____		
—	**Integrated Gas:** ☐Tedlar Bag	☐_____	☐EPA M-3 ☐_____	☐EPA M-10		
—	**Oxides of Nitrogen:**		☐EPA M-7A ☐_____			
—	**Fuel Lab:** ☐Fuel Sample	☐Aggregate	☐Per S-0163			
—	**Particle Sizing:**		☐X-Ray Sdgraph ☐_____	☐Cascade Imp		
—	**Miscellaneous:**	☐_____	☐_____			

Fuel Type: Coal: ☐Bituminous ☐Anthracite ☐Lignite Wood: ☐Wood Waste ☐Dust ☐Bark Oil: ☐Waste Oil ☐No. 2 ☐No. 6 Misc: ☒Natural Gas ☐RDF ☐_____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
Mark Kaechler / Interspec Labs	Chuck / Interpoll	0830 2/23/96

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job L.P. Hayward Source Line 1 Thermal Oil Site Stack Log No. 7318
Field Engineer Dirt Date of Test 2/22/96 Test No. 15 No. of Runs 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
	Probe Wash: ☐ Acetone ☐ $MeCl_2$	☐DI Water ☐_____	☐EPA M-5 ☐EPA M-29	☐EPA M-201A ☐_____		
	Filter: ☐ 4" Glass ☐ SS Thimble	☐Pallflex ☐2.5" Glass	☐EPA M-5 ☐EPA M-29 ☐EPA M-201A	☐EPA M-17		
	Impingers: ☐DI Water ☐3%H_2O_2 ☐1N NaOH ☐2,4-DNPH	☐H_2SO_4 ☐HNO_3/H_2O_2 ☐$KMnO_4/H_2SO_4$ ☐_____	☐MN Protocol ☐WI Protocol ☐EPA M-202 ☐EPA M6,8 ☐Acid Gases	☐IA Protocol ☐Formaldehyde ☐EPA M-29 ☐EPA M-26 ☐_____		
	Integrated Gas: ☐Tedlar Bag	☐_____	☐EPA M-3 ☐_____	☐EPA M-10		
	Oxides of Nitrogen:		☐EPA M-7A ☐_____			
	Fuel Lab: ☐Fuel Sample	☐Aggregate	☐Per S-0163			
	Particle Sizing:		☐X-Ray Sdgraph ☐_____	☐Cascade Imp		
4	**Miscellaneous:**	☒ Chain of	☒ M 18			

Fuel Type: Coal: ☐Bituminous ☐Anthracite ☐Lignite Wood: ☐Wood Waste ☐Dust ☐Bark Oil: ☐Waste Oil ☐No. 2 ☐No. 6 Misc: ☐Natural Gas ☐RDF ☐_____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
Diana VanHaaren		2/22/96
	Chad / Interpoll	1000 2/23/96

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job L.P. Hayward Source Line 1 O.I Heater Stack Site Stack Log No. 7318
Field Engineer DM Date of Test 2/22/96 Test No. 16 No. of Runs 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
3	Probe Wash: ☐ Acetone ☒ $MeCl_2$	☒ DI Water ☐ _____	☐ EPA M-5 ☐ EPA M-29	☐ EPA M-201A ☒ 00011		
	Filter: ☐ 4" Glass ☐ SS Thimble	☐ Pallflex ☐ 2.5" Glass	☐ EPA M-5 ☐ EPA M-29 ☐ EPA M-201A	☐ EPA M-17		
5	Impingers: ☐ DI Water ☐ 3% H_2O_2 ☐ 1N NaOH ☒ 2,4-DNPH	☐ H_2SO_4 ☐ HNO_3/H_2O_2 ☐ $KMnO_4/H_2SO_4$ ☐ _____	☐ MN Protocol ☐ WI Protocol ☐ EPA M-202 ☐ EPA M6,8 ☐ Acid Gases	☐ IA Protocol ☐ Formaldehyde ☐ EPA M-29 ☐ EPA M-26 ☒ 00011		3 + 1 blank 4 + 1 Spike
1	Integrated Gas: ☒ Tedlar Bag	☐ _____	☒ EPA M-3 ☐ _____	☐ EPA M-10		
	Oxides of Nitrogen:		☐ EPA M-7A ☐ _____			
	Fuel Lab: ☐ Fuel Sample	☐ Aggregate	☐ Per S-0163			
	Particle Sizing:		☐ X-Ray Sdgraph ☐ _____	☐ Cascade Imp		
	Miscellaneous:	☐ _____	☐ _____			

Fuel Type: Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite Wood: ☐ Wood Waste ☐ Dust ☐ Bark Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6 Misc: ☐ Natural Gas ☐ RDF ☐ _____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
Duane Van Hoevey		2/22/96
	Interpoll	2/23/96 1000

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job L.P. Hayward Source Line, Thermal Oil Heater Site Stack Log No. 7318
Field Engineer Dave Date of Test 2/21/96 Test No. 17 No. of Runs 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
4	**Probe Wash:** ☒ Acetone ☐ $MeCl_2$	☐ DI Water ☐ _____	☒ EPA M-5 ☐ EPA M-29	☐ EPA M-201A ☐ _____		
4	**Filter:** ☒ 4" Glass ☐ SS Thimble	☐ Pallflex ☐ 2.5" Glass	☒ EPA M-5 ☐ EPA M-29 ☐ EPA M-201A	☐ EPA M-17		
4	**Impingers:** ☒ DI Water ☐ 3% H_2O_2 ☐ 1N NaOH ☐ 2,4-DNPH	☐ H_2SO_4 ☐ HNO_3/H_2O_2 ☐ $KMnO_4/H_2SO_4$ ☐ _____	☐ MN Protocol ☒ WI Protocol ☐ EPA M-202 ☐ EPA M6,8 ☐ Acid Gases	☐ IA Protocol ☐ Formaldehyde ☐ EPA M-29 ☐ EPA M-26 ☐ _____		
3	**Integrated Gas:** ☒ Tedlar Bag	☐ _____	☒ EPA M-3 ☐ _____	☒ EPA M-10		
	Oxides of Nitrogen:		☐ EPA M-7A ☐ _____			
	Fuel Lab: ☐ Fuel Sample	☐ Aggregate	☐ Per S-0163			
	Particle Sizing:		☐ X-Ray Sdgraph ☐ _____	☐ Cascade Imp		
	Miscellaneous:	☐ _____	☐ _____			

Fuel Type: Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite Wood: ☐ Wood Waste ☐ Dust ☐ Bark Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6 Misc: ☐ Natural Gas ☐ RDF ☐ _____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
Duane VanHaaren		2/22/96
	Interpoll	2/23/96 1000

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Oil Heater

Job L.P. Hayward Source Stack Site Line 1 Thermal Log No. 7318
Field Engineer DVH Date of Test 2/21/96 Test No. 19 No. of Runs 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
	Probe Wash: ☐ Acetone ☐ $MeCl_2$	☐DI Water ☐_____	☐EPA M-5 ☐EPA M-29	☐EPA M-201A ☐_____		
	Filter: ☐ 4" Glass ☐ SS Thimble	☐Pallflex ☐2.5" Glass	☐EPA M-5 ☐EPA M-29 ☐EPA M-201A	☐EPA M-17		
4	**Impingers:** ☐DI Water ☐3%H_2O_2 ☐1N NaOH ☐2,4-DNPH	☐H_2SO_4 ☐HNO_3/H_2O_2 ☐$KMnO_4/H_2SO_4$ ☒ A+B Spike phenol	☐MN Protocol ☐WI Protocol ☐EPA M-202 ☐EPA M6,8 ☐Acid Gases	☐IA Protocol ☐Formaldehyde ☐EPA M-29 ☐EPA M-26 ☒_____		
	Integrated Gas: ☐Tedlar Bag	☐_____	☐EPA M-3 ☐_____	☐EPA M-10		
	Oxides of Nitrogen:		☐EPA M-7A ☐_____			
	Fuel Lab: ☐Fuel Sample	☐Aggregate	☐Per S-0163			
	Particle Sizing:		☐X-Ray Sdgraph ☐_____	☐Cascade Imp		
	Miscellaneous:	☐_____	☐_____			

Fuel Type: Coal: ☐Bituminous ☐Anthracite ☐Lignite Wood: ☐Wood Waste ☐Dust ☐Bark Oil: ☐Waste Oil ☐No. 2 ☐No. 6 Misc: ☐Natural Gas ☐RDF ☐_____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
Duane Van Hoven		2/21/96
	Chad / Interpoll	2/22/96 1000

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job L.P. Hayward Source Lime Dryer Site E. Tube Outlet Log No. 7318
Field Engineer D.V.H Date of Test 2/20/96 Test No. 20 No. of Runs 3

No. Items	Sample Type		Analysis		Sequence No.	Comments
	Probe Wash: ☐ Acetone ☐ $MeCl_2$	☐DI Water ☐_____	☐EPA M-5 ☐EPA M-29	☐EPA M-201A ☐_____		
	Filter: ☐ 4" Glass ☐ SS Thimble	☐Pallflex ☐2.5" Glass	☐EPA M-5 ☐EPA M-29 ☐EPA M-201A	☐EPA M-17		
	Impingers: ☐DI Water ☐3%H_2O_2 ☐1N NaOH ☐2,4-DNPH	☐H_2SO_4 ☐HNO_3/H_2O_2 ☐$KMnO_4/H_2SO_4$ ☐_____	☐MN Protocol ☐WI Protocol ☐EPA M-202 ☐EPA M6,8 ☐Acid Gases	☐IA Protocol ☐Formaldehyde ☐EPA M-29 ☐EPA M-26 ☐_____		
	Integrated Gas: ☐Tedlar Bag	☐_____	☐EPA M-3 ☐_____	☐EPA M-10		
13	**Oxides of Nitrogen:**		☑EPA M-7A ☐_____			
	Fuel Lab: ☐Fuel Sample	☐Aggregate	☐Per S-0163			
	Particle Sizing:		☐X-Ray Sdgraph ☐_____	☐Cascade Imp		
	Miscellaneous:	☐_____	☐_____			

Fuel Type: Coal: ☐Bituminous ☐Anthracite ☐Lignite Wood: ☐Wood Waste ☐Dust ☐Bark Oil: ☐Waste Oil ☐No. 2 ☐No. 6 Misc: ☐Natural Gas ☐RDF ☐_____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
Duane Van Hoeven	Chuck Interpoll	2/23/96 1000

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Interpoll Laboratories
(612)786-6020

Field Sample Chain Of Custody Sheet

Job L. P. Hayward

Date of Sampling 2/29/96 Site Line 1 Thermal Oil Heater Stack

Test 14 Run 0 Team Leader DVH

Type of Sample Train: PAH

Sample Collection/Recovery

Person performing sample recovery:

Signature Duane VanHoever Title Field Engineer

Location at which recovery was done Hayward Wisc

Special transport/storage requirements?

	Sample Description	No. of Items	Assigned Log Number
1.	Solvent Rinse	1 of 3	
2.	Filter	2 of 3	
3.	Resin Cartridge	3 of 3	
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			

Sample Transport

Method of transport Truck 38

Recipient of samples upon recovery (if not recovery person):

Signature _____ Title _____

Date of receipt _____ Time of receipt _____ HRS

S-0157RR-1

Sample Check-In at Interpoll Labs

Laboratory person receiving samples:

Signature CL Title Sample Custodian

Date of receipt 2/23/96 Time of receipt 1000 HRS

Sample storage location Walk-in Cooler

Special storage conditions? 4° c

Analysis

	Sample Log No.	Date of Analysis	Method of Analysis	Initials of Analyst
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				

Signature of each analyst:

Initials	Signature

S-0157RR-2

Interpoll Laboratories
(612)786-6020

Field Sample Chain Of Custody Sheet

Job L.P. Hayward

Date of Sampling 2/20/96 Site Line 1 Thermal O.I Heater Stack

Test 14 Run 1 Team Leader DVH

Type of Sample Train: DAH

Sample Collection/Recovery

Person performing sample recovery:

Signature Diane VanHoesen Title Field Engineer

Location at which recovery was done Hayward Wire

Special transport/storage requirements?

	Sample Description	No. of Items	Assigned Log Number
1.	Solvent Rinse	1 of 4	
2.	Filter	2 of 4	
3.	Resin Cartridge	3 of 4	
4.	Condensate Trap	4 of 4	
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			

Sample Transport

Method of transport Truck 38

Recipient of samples upon recovery (if not recovery person):

Signature _____ Title _____

Date of receipt _____ Time of receipt _____ HRS

S-0157RR-1

Sample Check-In at Interpoll Labs

Laboratory person receiving samples:

Signature [signature] Title Sample Custodian

Date of receipt 2/23/96 Time of receipt 1000 HRS

Sample storage location Walk in Cooler

Special storage conditions? 4°C

Analysis

	Sample Log No.	Date of Analysis	Method of Analysis	Initials of Analyst
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				

Signature of each analyst:

Initials	Signature

S-0157RR-2

Interpoll Laboratories
(612)786-6020

Field Sample Chain Of Custody Sheet

Job L.P. Hayward

Date of Sampling 2/21/96 Site Line 1 Thermal Oil Heater Stack

Test 14 Run 2 Team Leader Pitt

Type of Sample Train: PAH

Sample Collection/Recovery

Person performing sample recovery:

Signature [signature] Title Field Engineer

Location at which recovery was done Hayward

Special transport/storage requirements?

	Sample Description	No. of Items	Assigned Log Number
1.	Solvent Rinse	1 of 4	
2.	Filter	2 of 4	
3.	Resin Cartridge	3 of 4	
4.	Condensate Trap	4 of 4	
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			

Sample Transport

Method of transport Truck 38

Recipient of samples upon recovery (if not recovery person):

Signature _____ Title _____

Date of receipt _____ Time of receipt _____ HRS

S-0157RR-1

Sample Check-In at Interpoll Labs

Laboratory person receiving samples:

Signature SC Q Title Sample Custodian

Date of receipt 2/23/96 Time of receipt 1000 HRS

Sample storage location Walk-in Cooler

Special storage conditions? 4° C

Analysis

	Sample Log No.	Date of Analysis	Method of Analysis	Initials of Analyst
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				

Signature of each analyst:

Initials	Signature

S-0157RR-2

Interpoll Laboratories
(612)786-6020

Field Sample Chain Of Custody Sheet

Job L.P. Hayward

Date of Sampling 2/21/96 Site Line 1 Thermal Oil Heater Stack

Test 14 Run 3 Team Leader PAH

Type of Sample Train: PAH

Sample Collection/Recovery

Person performing sample recovery:

Signature Duane Van Hoeven Title Field Engineer

Location at which recovery was done Hayward

Special transport/storage requirements?

	Sample Description	No. of Items	Assigned Log Number
1.	Solvent Rinse	1 of 4	
2.	Filter	2 of 4	
3.	Resin Cartridge	3 of 4	
4.	Condensate Trap	4 of 4	
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			

Sample Transport

Method of transport Truck 38

Recipient of samples upon recovery (if not recovery person):

Signature _____ Title _____

Date of receipt _____ Time of receipt _____ HRS

S-0157RR-1

Sample Check-In at Interpoll Labs

Laboratory person receiving samples:

Signature [signature] Title Sample Custodian

Date of receipt 2/23/96 Time of receipt 1600 HRS

Sample storage location Walk in Cooler

Special storage conditions? 4° C

Analysis

	Sample Log No.	Date of Analysis	Method of Analysis	Initials of Analyst
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				

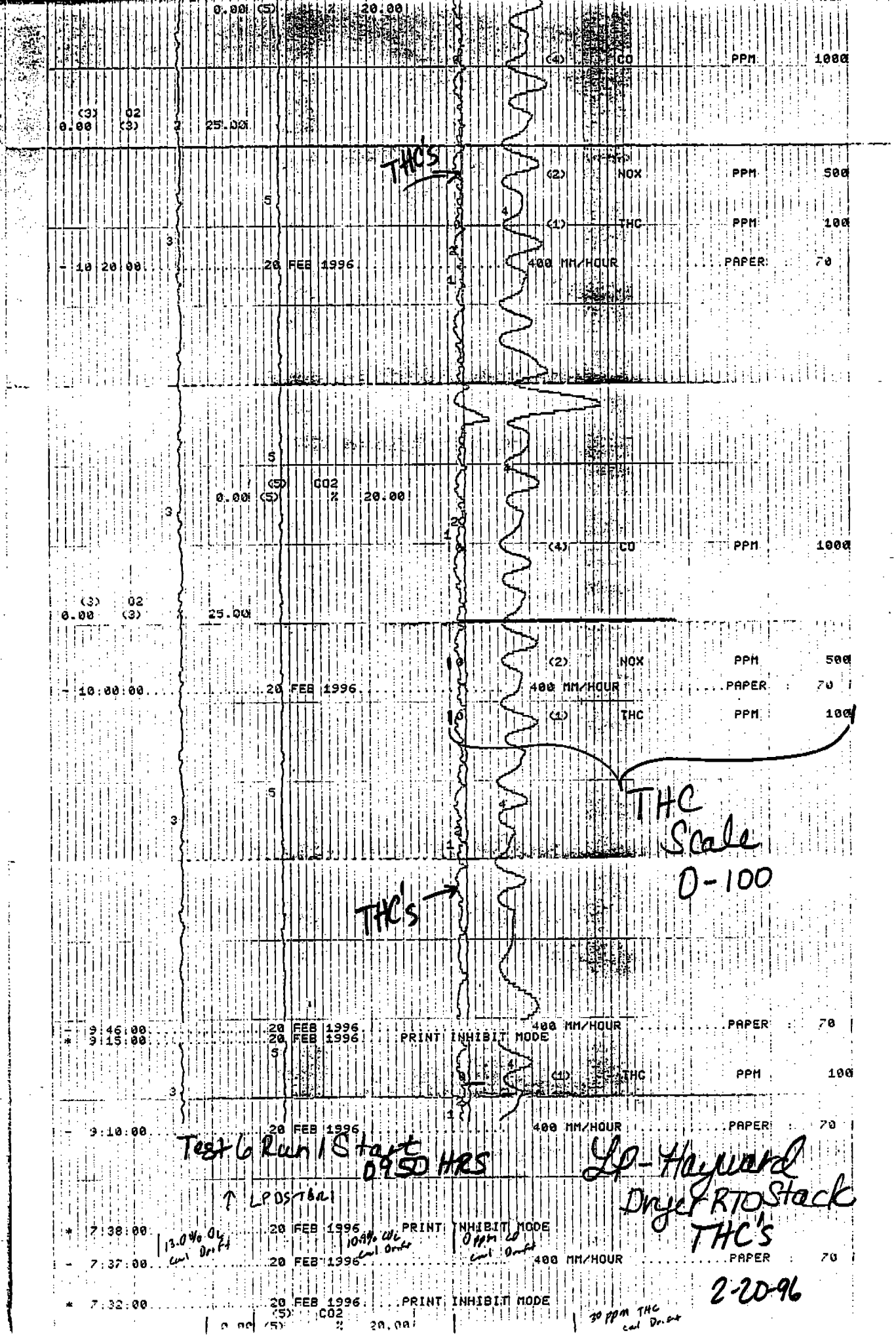
Signature of each analyst:

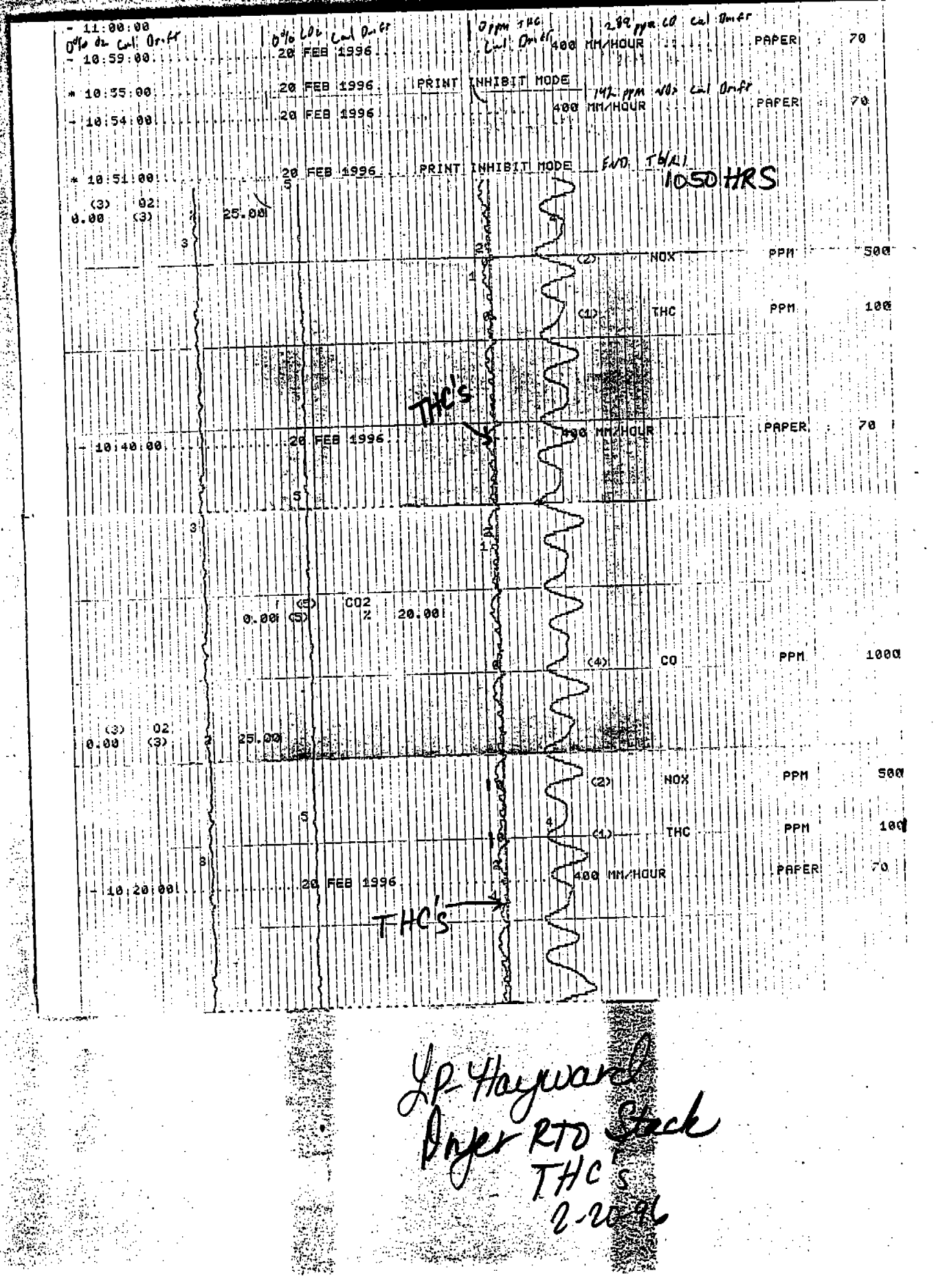
Initials	Signature

S-0157RR-2

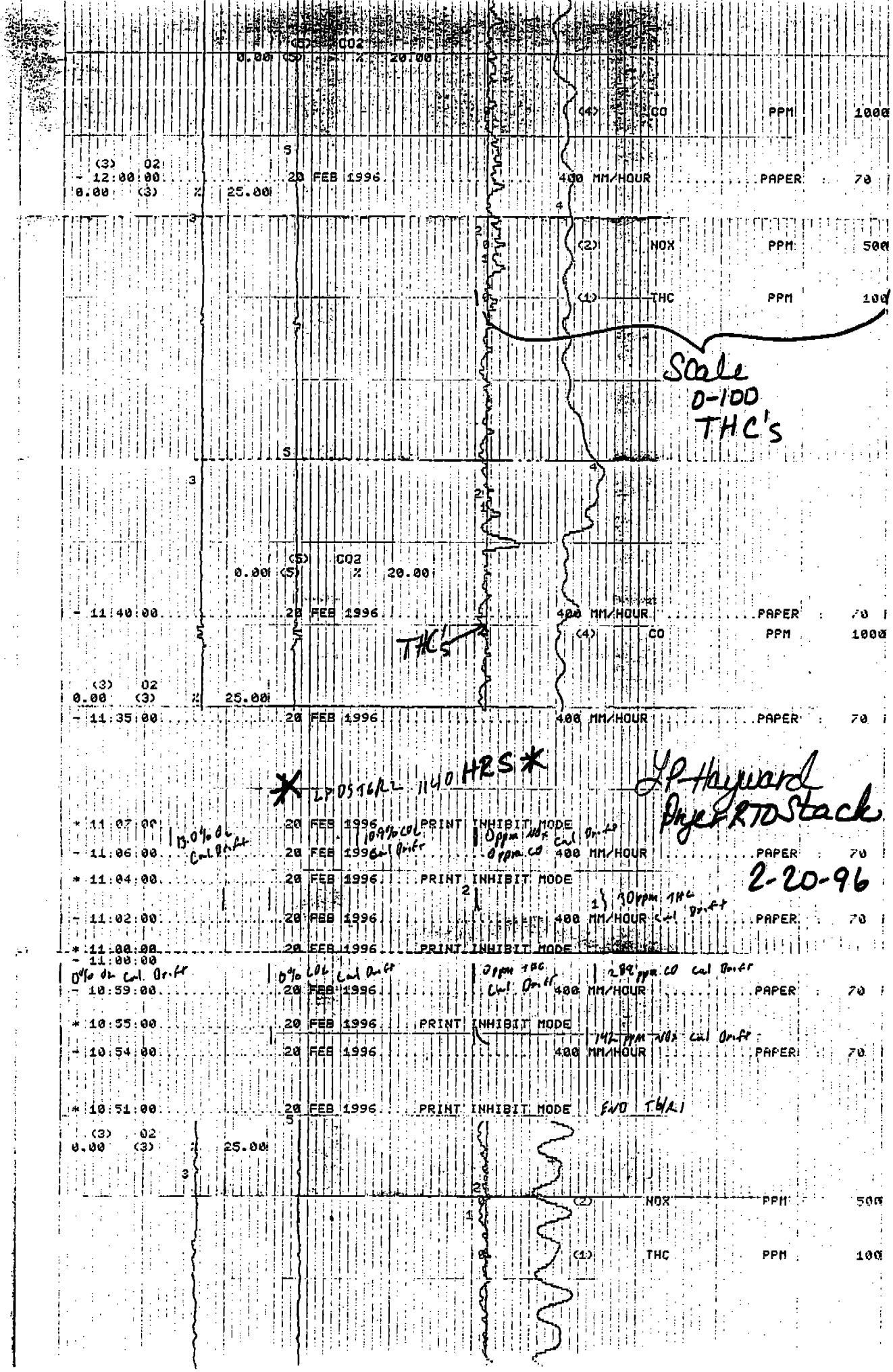
APPENDIX E

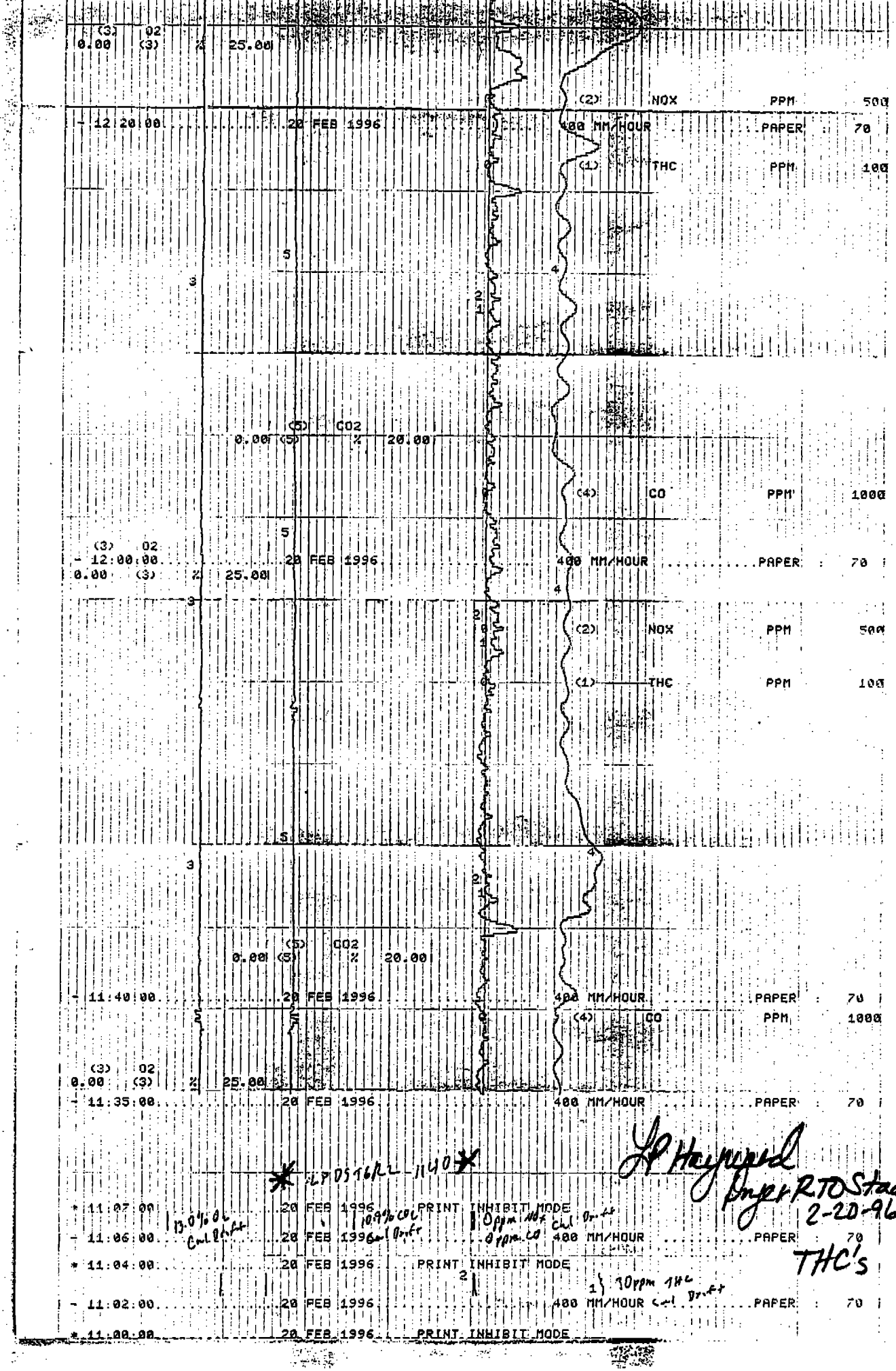
THC STRIPCHART


0.00 (5) CO2 % 20.00
(4) CO PPM 1000
(3) O2
0.00 (3) % 25.00
THC's
(2) NOX PPM 500
(1) THC PPM 100
- 10:20:00 20 FEB 1996 400 MM/HOUR PAPER 70
0.00 (5) CO2 % 20.00
(4) CO PPM 1000
(3) O2
0.00 (3) % 25.00
(2) NOX PPM 500
- 10:00:00 20 FEB 1996 400 MM/HOUR PAPER 70
(1) THC PPM 100
THC Scale 0-100
THC's
- 9:46:00 20 FEB 1996 400 MM/HOUR PAPER 70
* 9:15:00 20 FEB 1996 PRINT INHIBIT MODE
(1) THC PPM 100
- 9:10:00 20 FEB 1996 400 MM/HOUR PAPER 70
Test 6 Run 1 Start 0950 HRS
LP-Hayward Dryer RTO Stack THC's
2-20-96
↑ LPDST6a1
* 7:38:00 20 FEB 1996 PRINT INHIBIT MODE
13.0% O2 Cal Drift
10.9% CO2 Cal Order
0 ppm CO Cal Order
- 7:37:00 20 FEB 1996 400 MM/HOUR PAPER 70
* 7:32:00 20 FEB 1996 PRINT INHIBIT MODE
30 ppm THC Cal Drift
0.00 (5) CO2 % 20.00



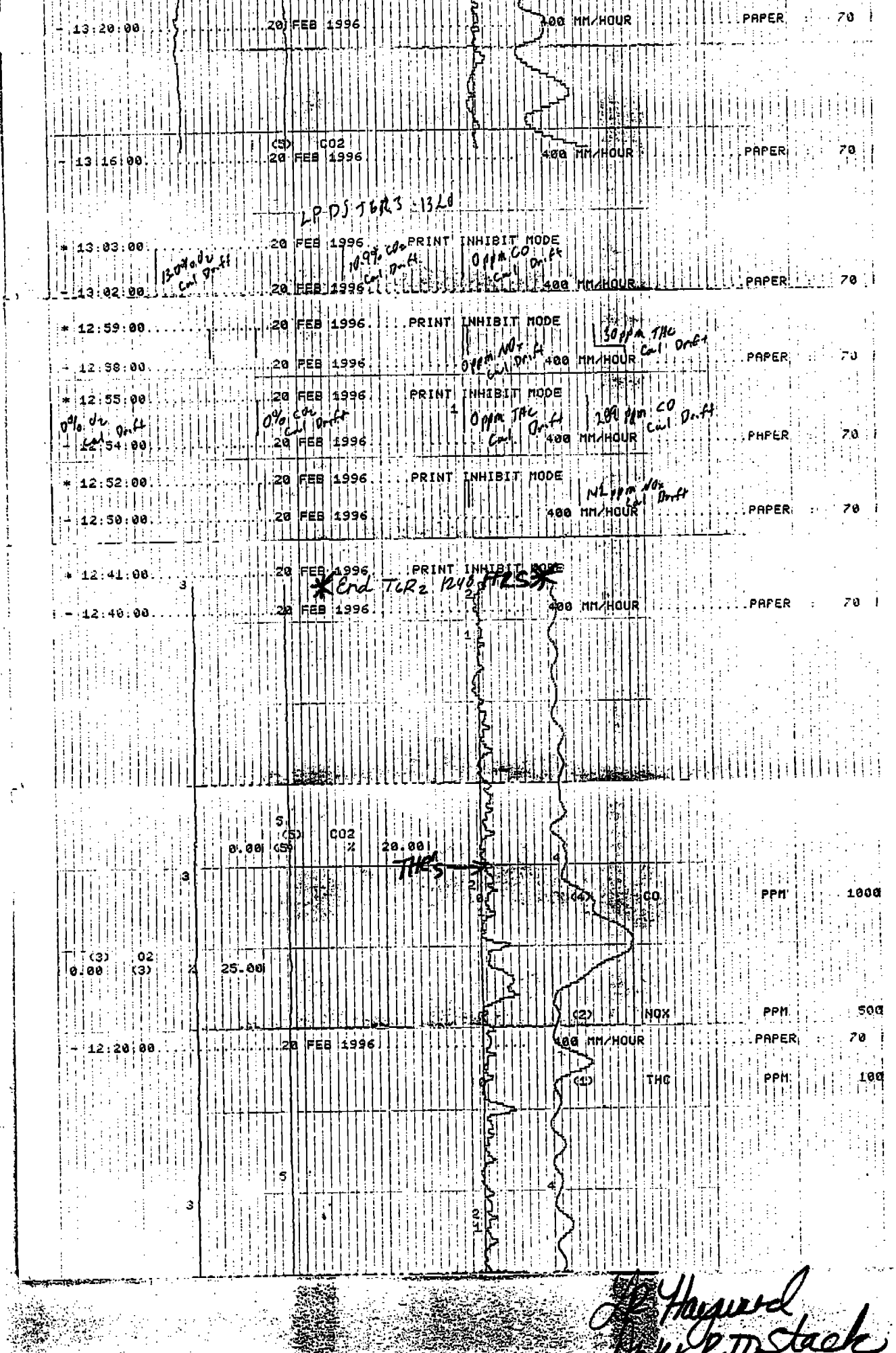
LP Hayward
Dryer RTO Stack
THC's
2-20-96

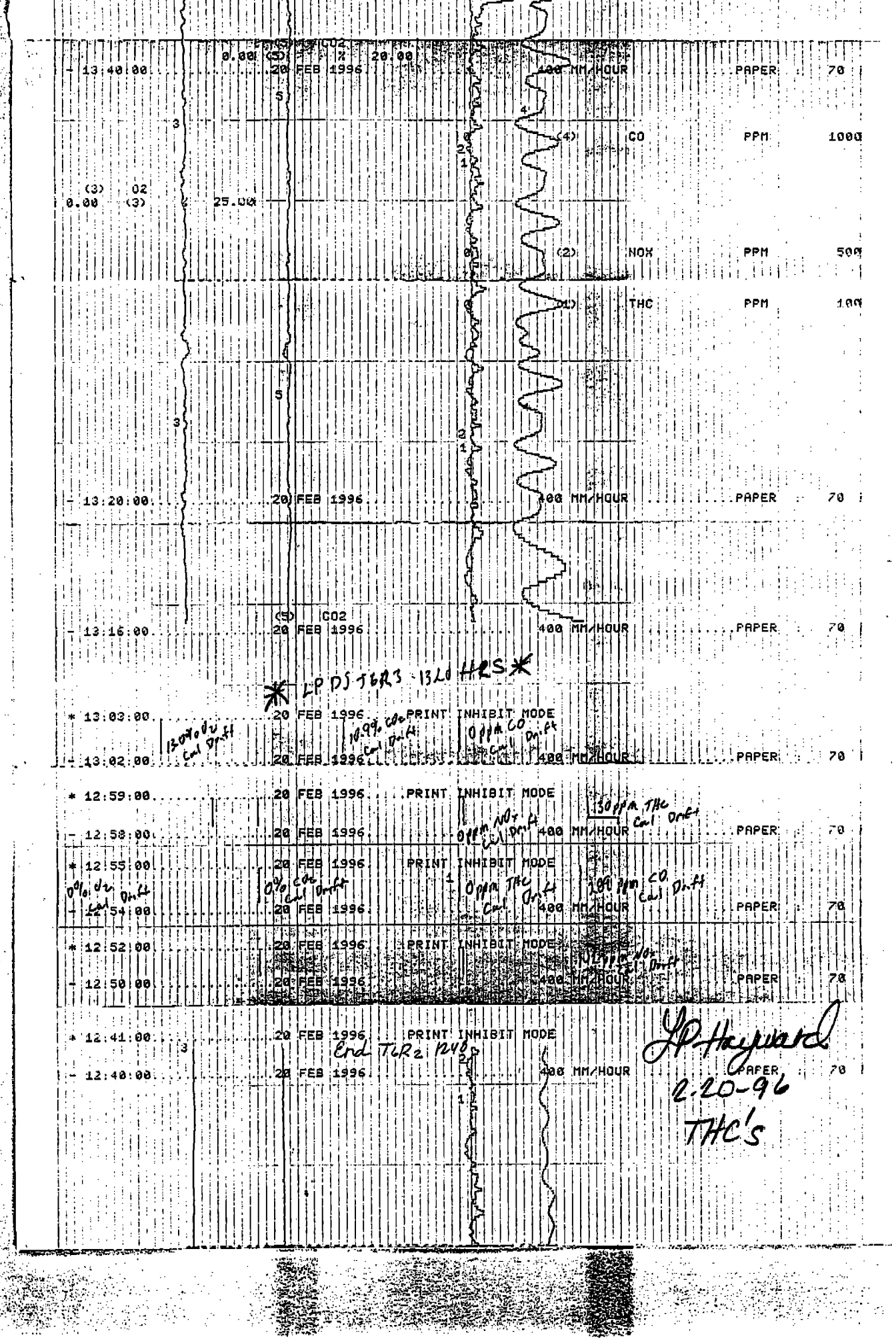

(5) CO2
0.00 (5) % 20.00
(4) CO PPM 1000
(3) O2
- 12:00:00 20 FEB 1996 400 MM/HOUR PAPER 70
0.00 (3) % 25.00
(2) NOX PPM 500
(1) THC PPM 100
Scale
0-100
THC's
- 11:40:00 20 FEB 1996 400 MM/HOUR PAPER 70
THC's
0.00 (3) % 25.00
- 11:35:00 20 FEB 1996 400 MM/HOUR PAPER 70
* LP05162 1140 HRS *
LP Hayward
Dryer RTO Stack
2-20-96
* 11:07:00 20 FEB 1996 PRINT INHIBIT MODE
- 11:06:00 20 FEB 1996 400 MM/HOUR PAPER 70
* 11:04:00 20 FEB 1996 PRINT INHIBIT MODE
- 11:02:00 20 FEB 1996 400 MM/HOUR PAPER 70
* 11:00:00 20 FEB 1996 PRINT INHIBIT MODE
- 10:59:00 20 FEB 1996 400 MM/HOUR PAPER 70
* 10:55:00 20 FEB 1996 PRINT INHIBIT MODE
- 10:54:00 20 FEB 1996 400 MM/HOUR PAPER 70
* 10:51:00 20 FEB 1996 PRINT INHIBIT MODE END TEST
0.00 (3) % 25.00

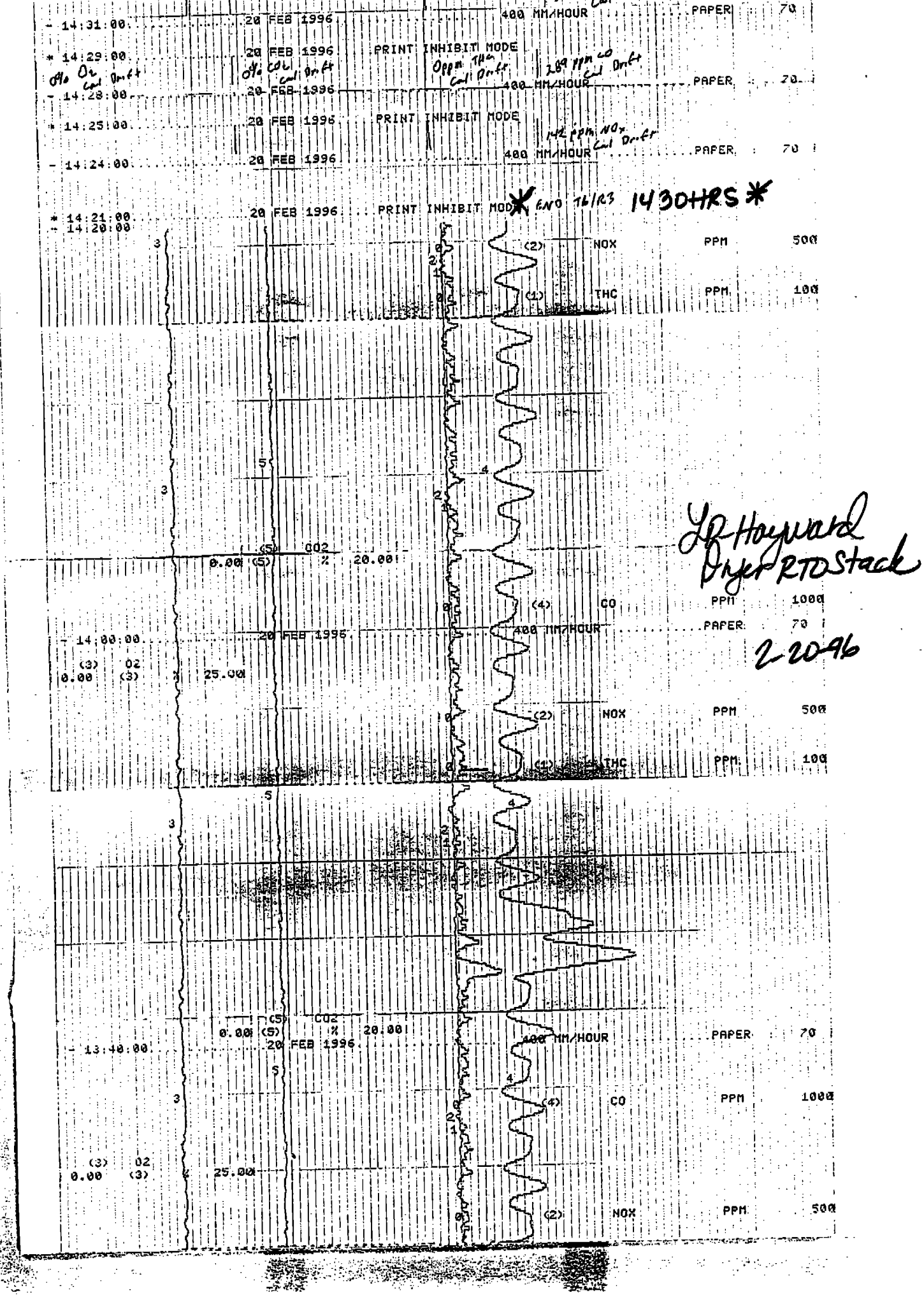


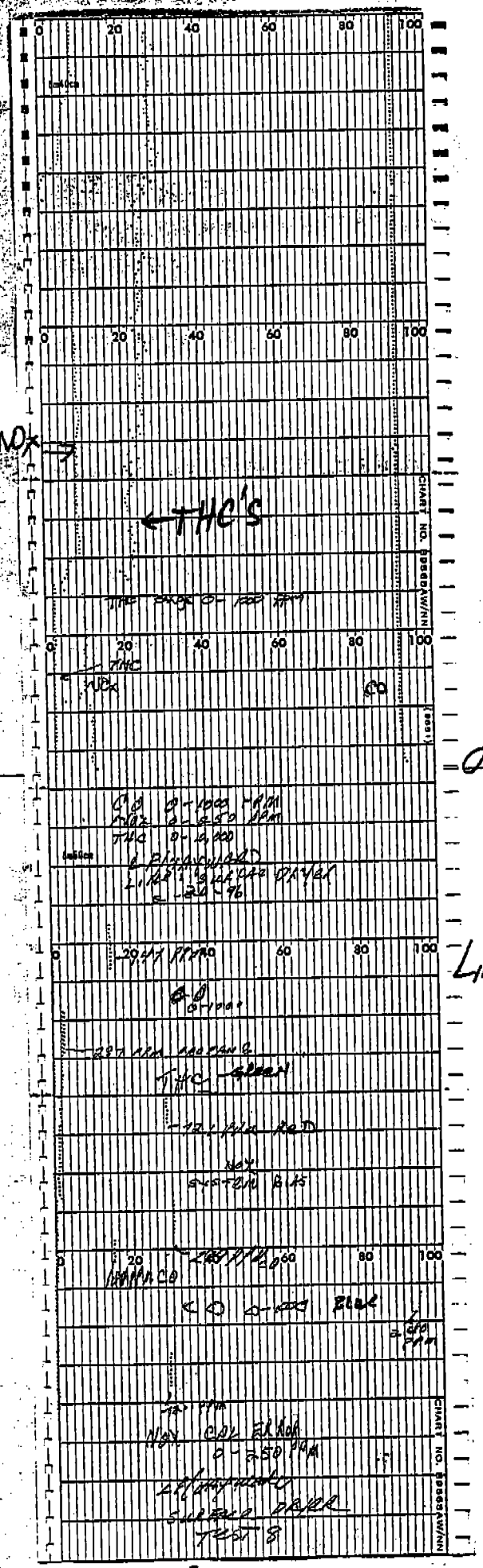
LP Hayward
Engr RTO Stack
2-20-96

THC's

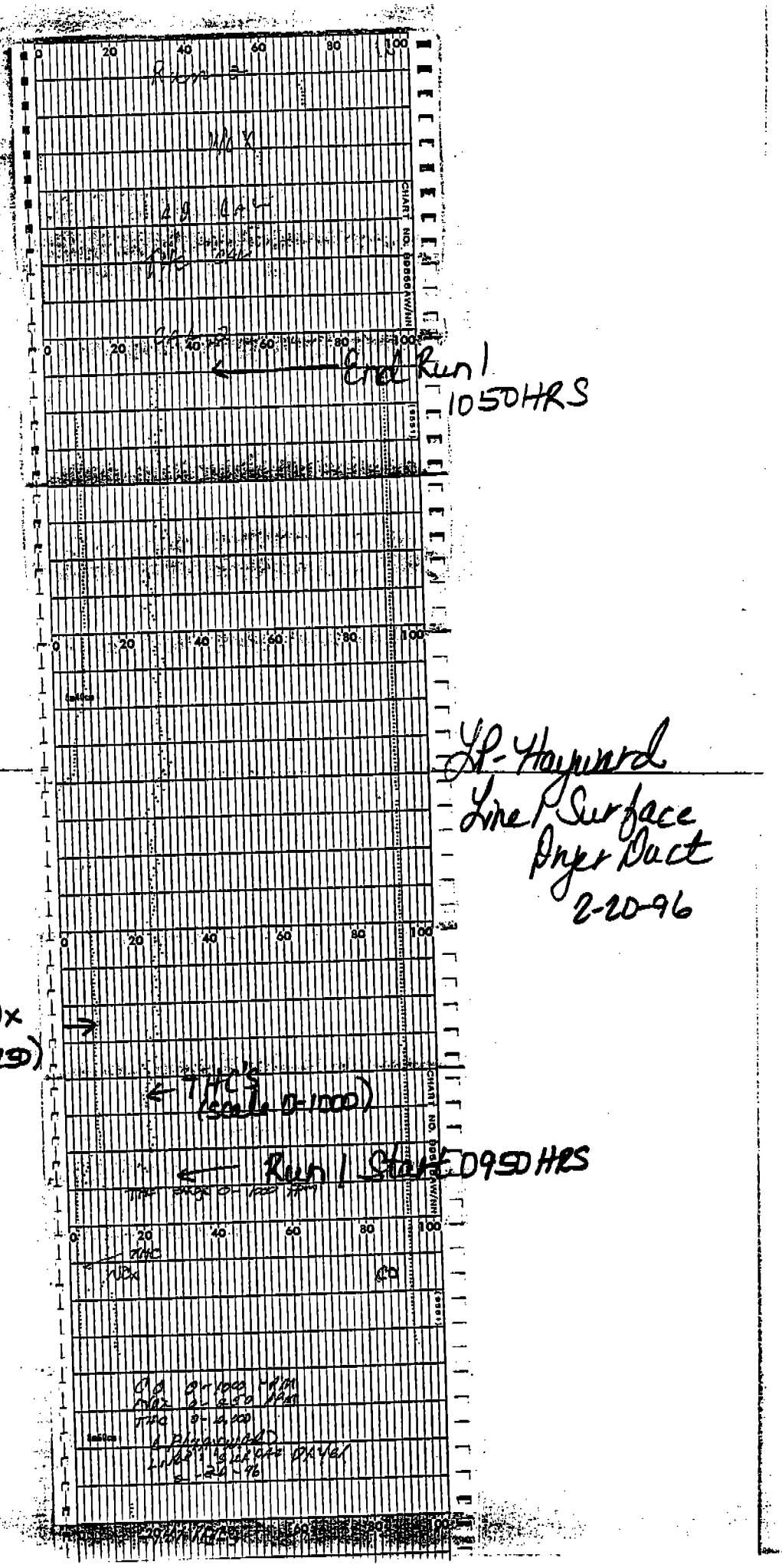

20 FEB 1996
400 MM/HOUR
PAPER
70
(5) CO2
LP-DS TCR3 1320
PRINT INHIBIT MODE
10.9% CO2 Cal Drift
0 ppm CO Cal Drift
30 ppm THC Cal Drift
0 ppm NOx Cal Drift
0% O2 Cal Drift
0% CO2 Cal Drift
0 ppm THC Cal Drift
100 ppm CO Cal Drift
End TCR2 1240 1255
0.00 (5) CO2 % 20.00
THIS
(4) CO
PPM
1000
(3) O2
0.00 (3) % 25.00
(2) NOX
PPM
500
(1) THC
PPM
100
Hayward Boiler RTO Stack 2-20-96

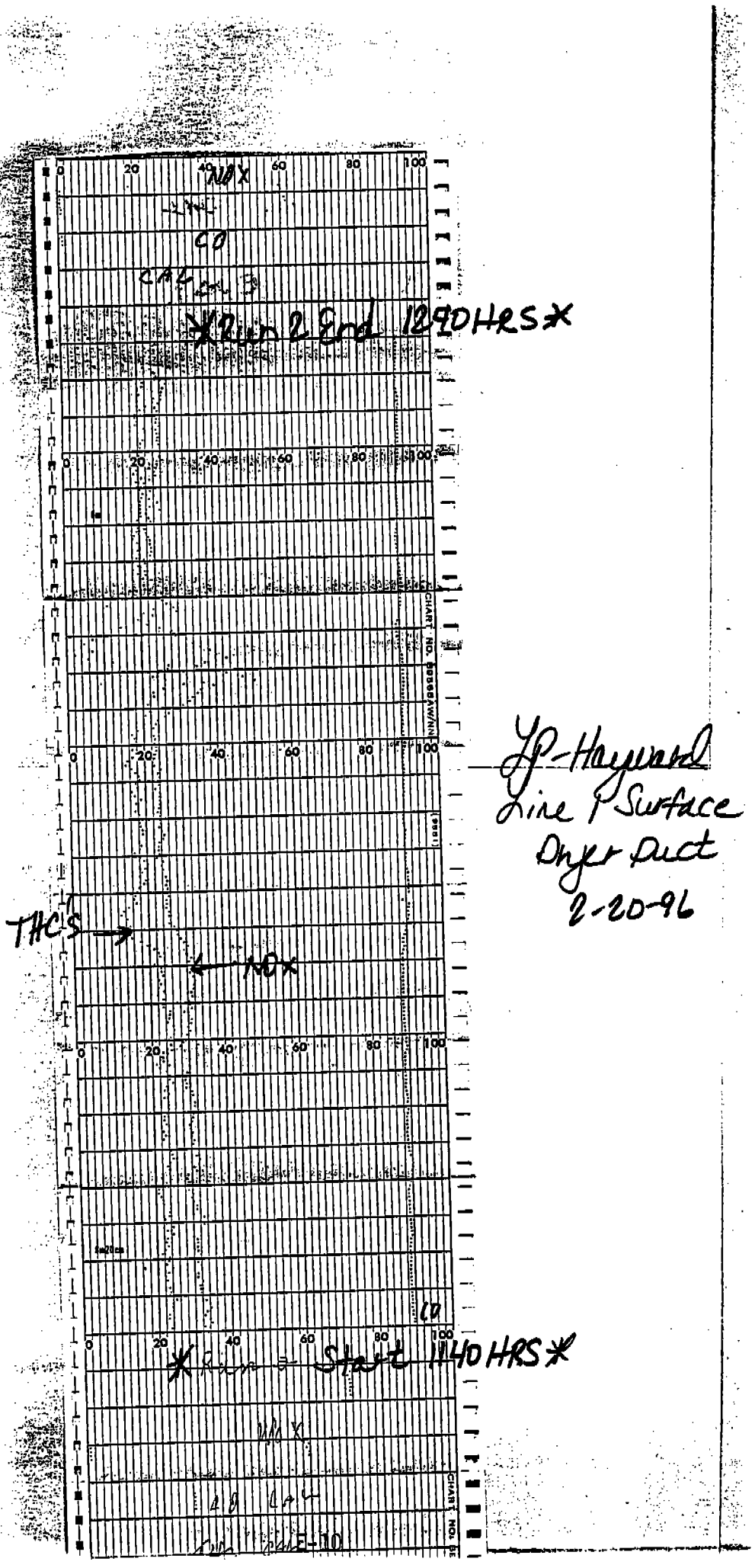

(5) CO2 % 20.00
0.00
- 13:40:00
20 FEB 1996
400 MM/HOUR
PAPER 70
(4) CO PPM 1000
(3) O2
0.00 (3) % 25.00
(2) NOX PPM 500
(1) THC PPM 100
- 13:20:00
20 FEB 1996
400 MM/HOUR
PAPER 70
(5) CO2
- 13:16:00
20 FEB 1996
400 MM/HOUR
PAPER 70
* LP DS T&R3 - 1320 HRS *
* 13:03:00
20 FEB 1996 PRINT INHIBIT MODE
13.00% O2 Cal Drift
10.9% CO2 Cal Drift
0 ppm CO Cal Drift
- 13:02:00
20 FEB 1996
400 MM/HOUR
PAPER 70
* 12:59:00
20 FEB 1996 PRINT INHIBIT MODE
130 ppm THC Cal Drift
0 ppm NO Cal Drift
- 12:58:00
20 FEB 1996
400 MM/HOUR
PAPER 70
* 12:55:00
20 FEB 1996 PRINT INHIBIT MODE
0% O2 Cal Drift
0% CO2 Cal Drift
0 ppm THC Cal Drift
189 ppm CO Cal Drift
- 12:54:00
20 FEB 1996
400 MM/HOUR
PAPER 70
* 12:52:00
20 FEB 1996 PRINT INHIBIT MODE
- 12:50:00
20 FEB 1996
400 MM/HOUR
PAPER 70
* 12:41:00
20 FEB 1996 PRINT INHIBIT MODE
End T&R2 1240
- 12:40:00
20 FEB 1996
400 MM/HOUR
PAPER 70
LP Hayward
2-20-96
THC's


20 FEB 1996
400 MM/HOUR
PAPER 70
PRINT INHIBIT MODE
0% O2 Cal Drift
0% CO Cal Drift
Oppm THC Cal Drift
289 ppm CO Cal Drift
142 ppm NOx Cal Drift
END TEST 1430HRS
(2) NOX PPM 500
(1) THC PPM 100
(5) CO2 0.00 % 20.00
(4) CO PPM 1000
(3) O2 0.00 % 25.00
LB Hayward Dryer RTO Stack
2-2096

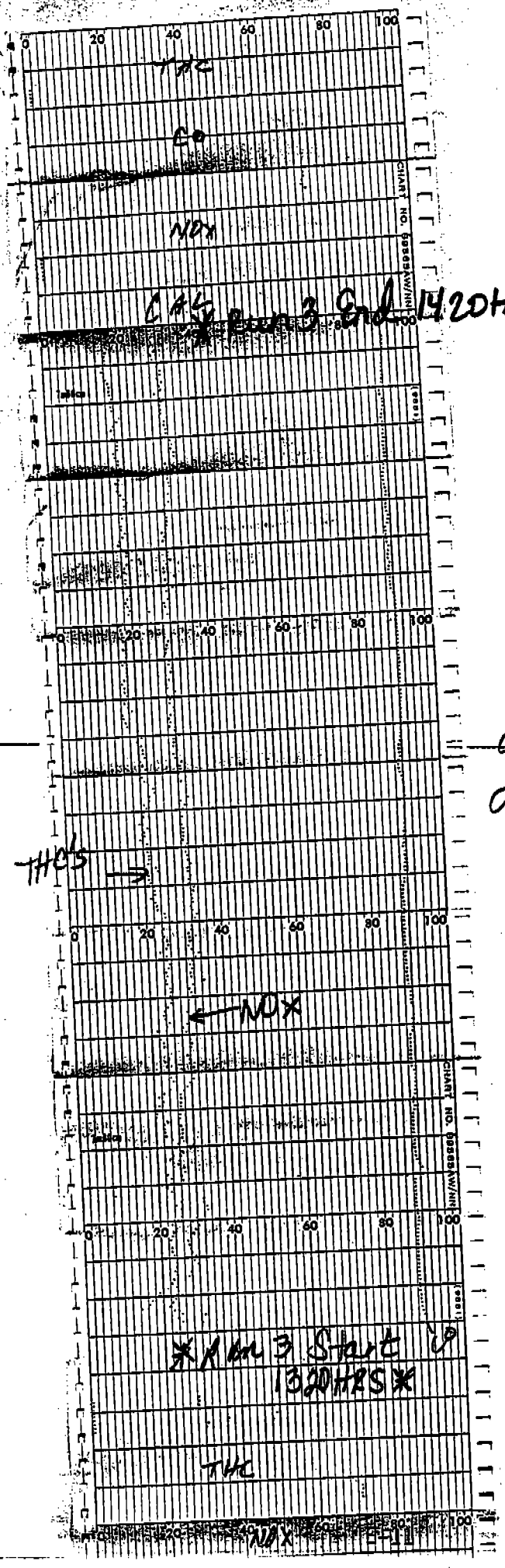


LP-Hayward
2-20-96
TEST 8
THC's and NOx
Line 1 Surface
Dryer Duct

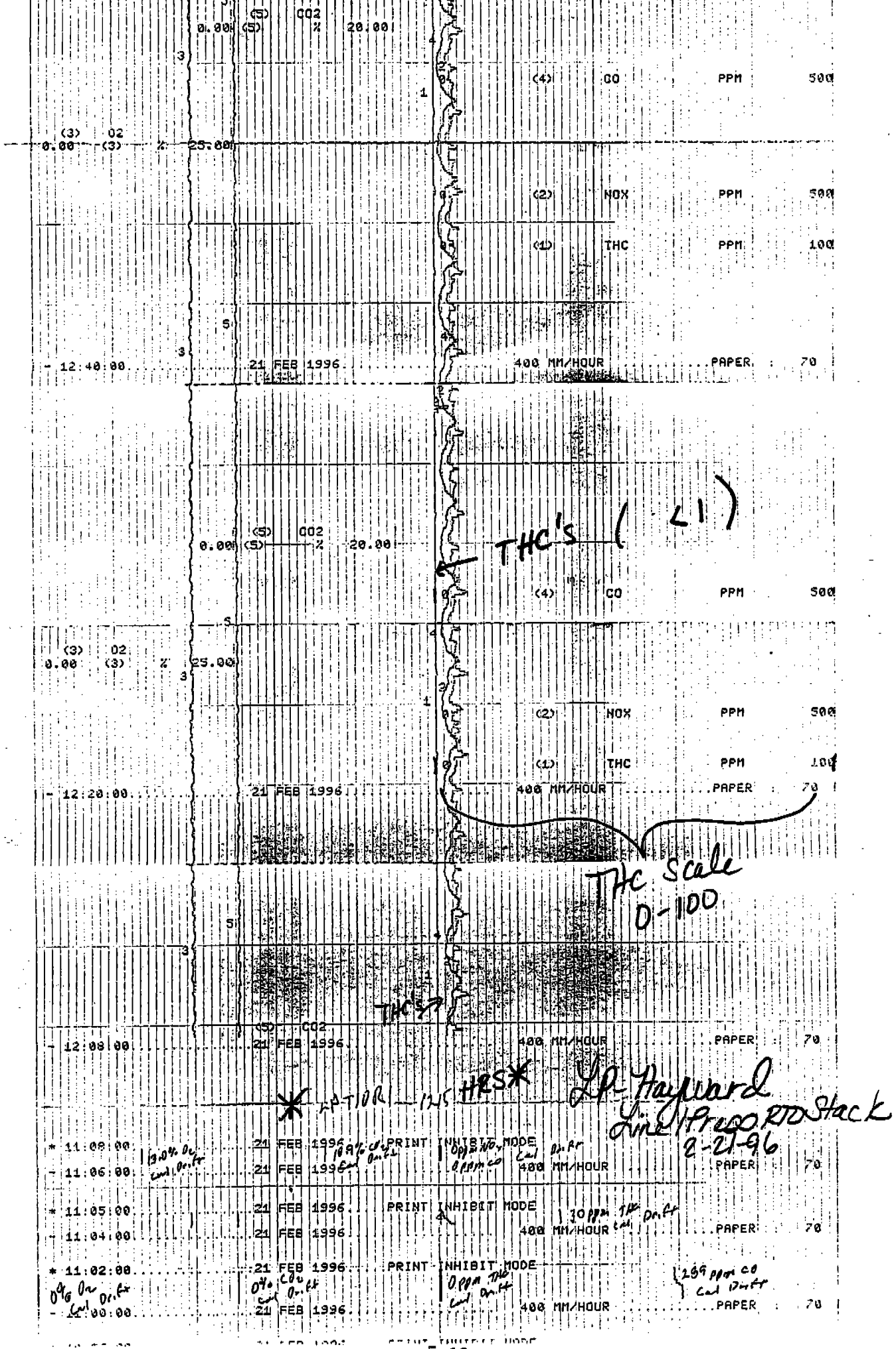

End Run 1
1050HRS
LP-Hayward
Line Surface
Dryer Duct
2-20-96
NOx
(Scale 0-25)
THC's
(Scale 0-1000)
Run 1 Started 950 HRS
CO
NOx
THC

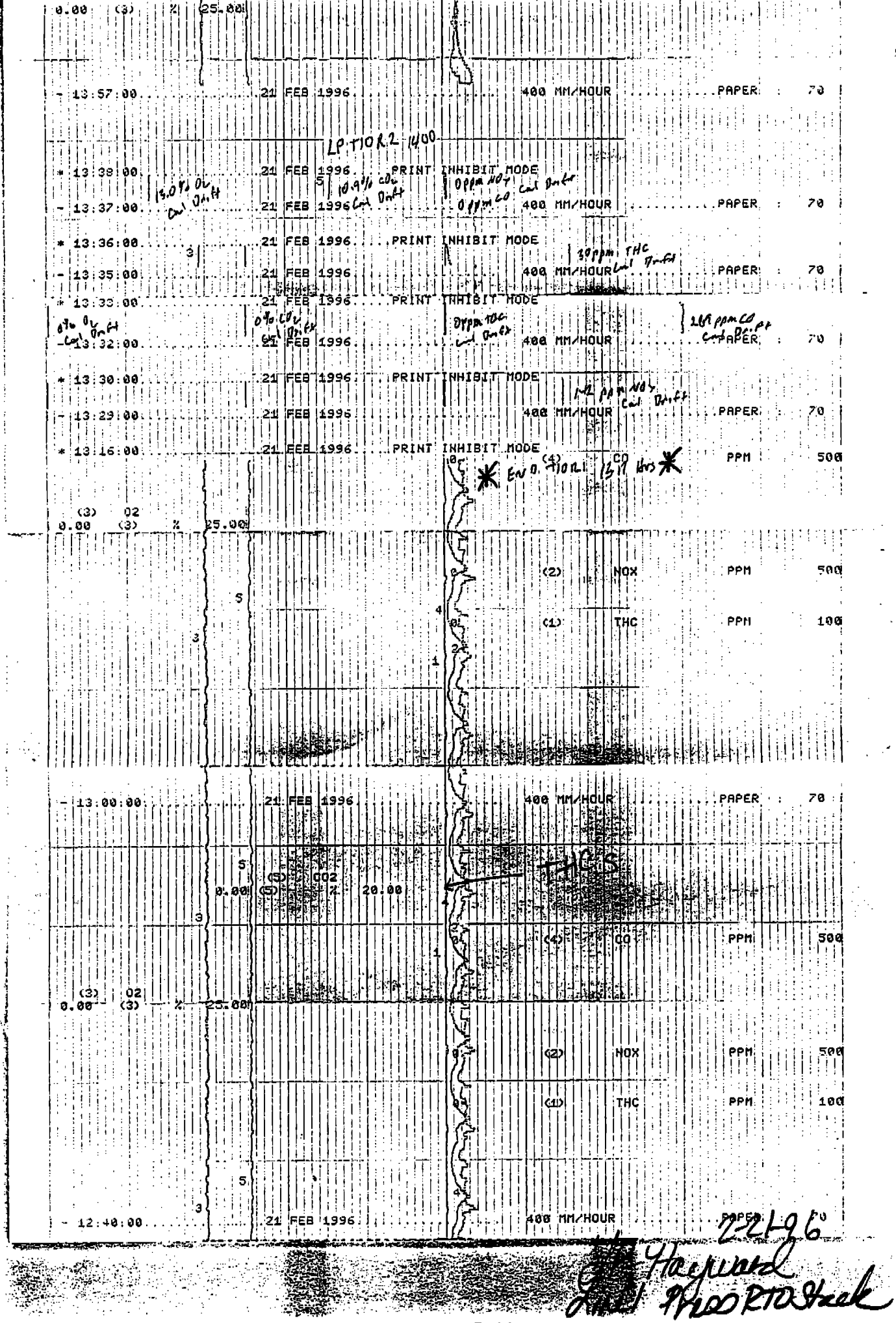


LP-Hayward
Line Surface
Dryer Duct
2-20-96



LP-Hayward
Line Surface Dyer
2-20-96

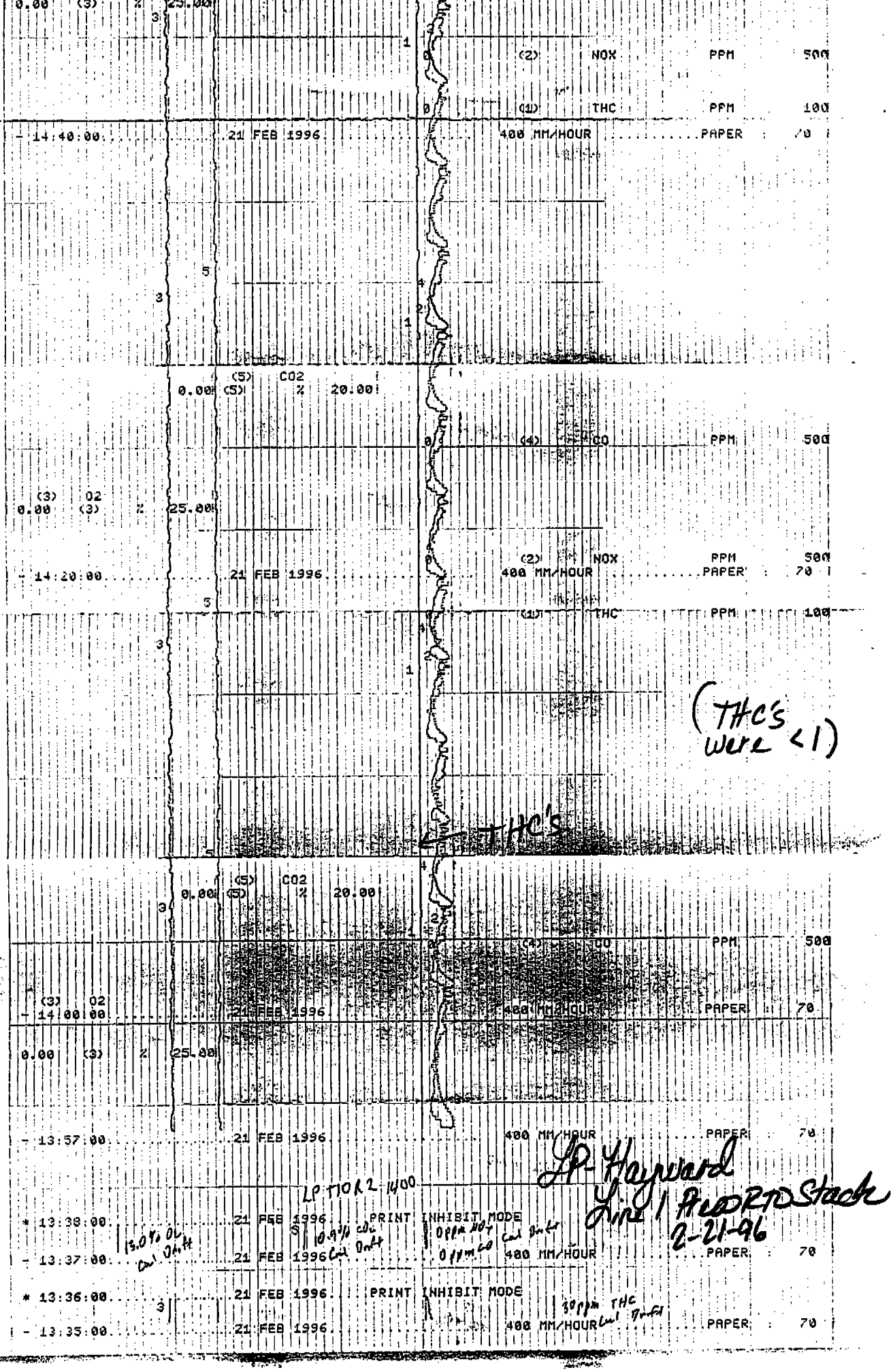

(5) CO2
0.00 (5) % 20.00
(4) CO PPM 500
(3) O2
0.00 (3) % 25.00
(2) NOX PPM 500
(1) THC PPM 100
- 12:40:00 21 FEB 1996 400 MM/HOUR PAPER 70
THC's (21)
- 12:20:00 21 FEB 1996 400 MM/HOUR PAPER 70
THC Scale
0-100
THC's
- 12:08:00 21 FEB 1996 400 MM/HOUR PAPER 70
HES
LP-Hayward
Line 1 Preco RTO Stack
2-21-96
* 11:08:00 21 FEB 1996 PRINT INHIBIT MODE
- 11:06:00 21 FEB 1996 400 MM/HOUR PAPER 70
* 11:05:00 21 FEB 1996 PRINT INHIBIT MODE
- 11:04:00 21 FEB 1996 400 MM/HOUR PAPER 70
* 11:02:00 21 FEB 1996 PRINT INHIBIT MODE
- 11:00:00 21 FEB 1996 400 MM/HOUR PAPER 70

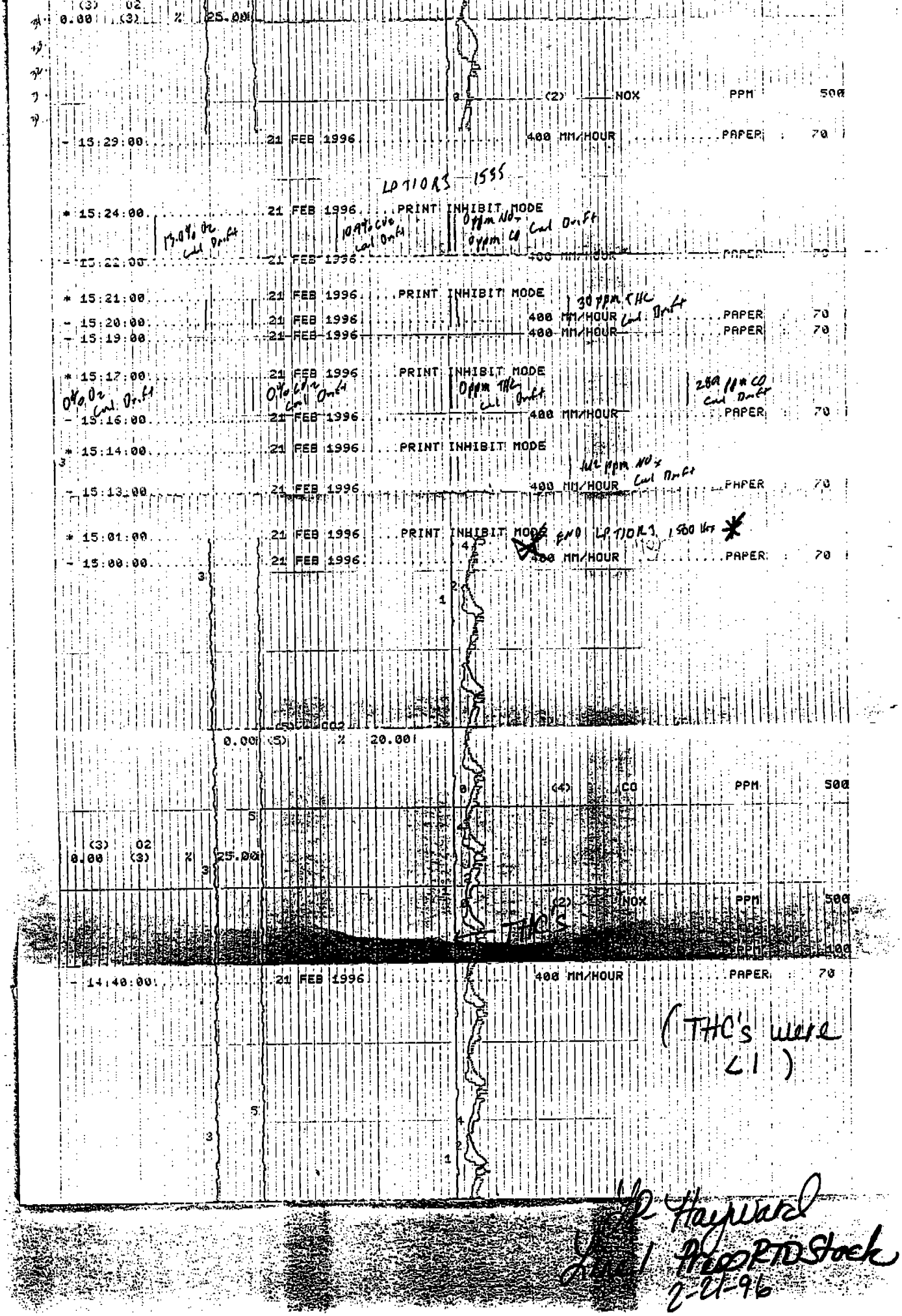


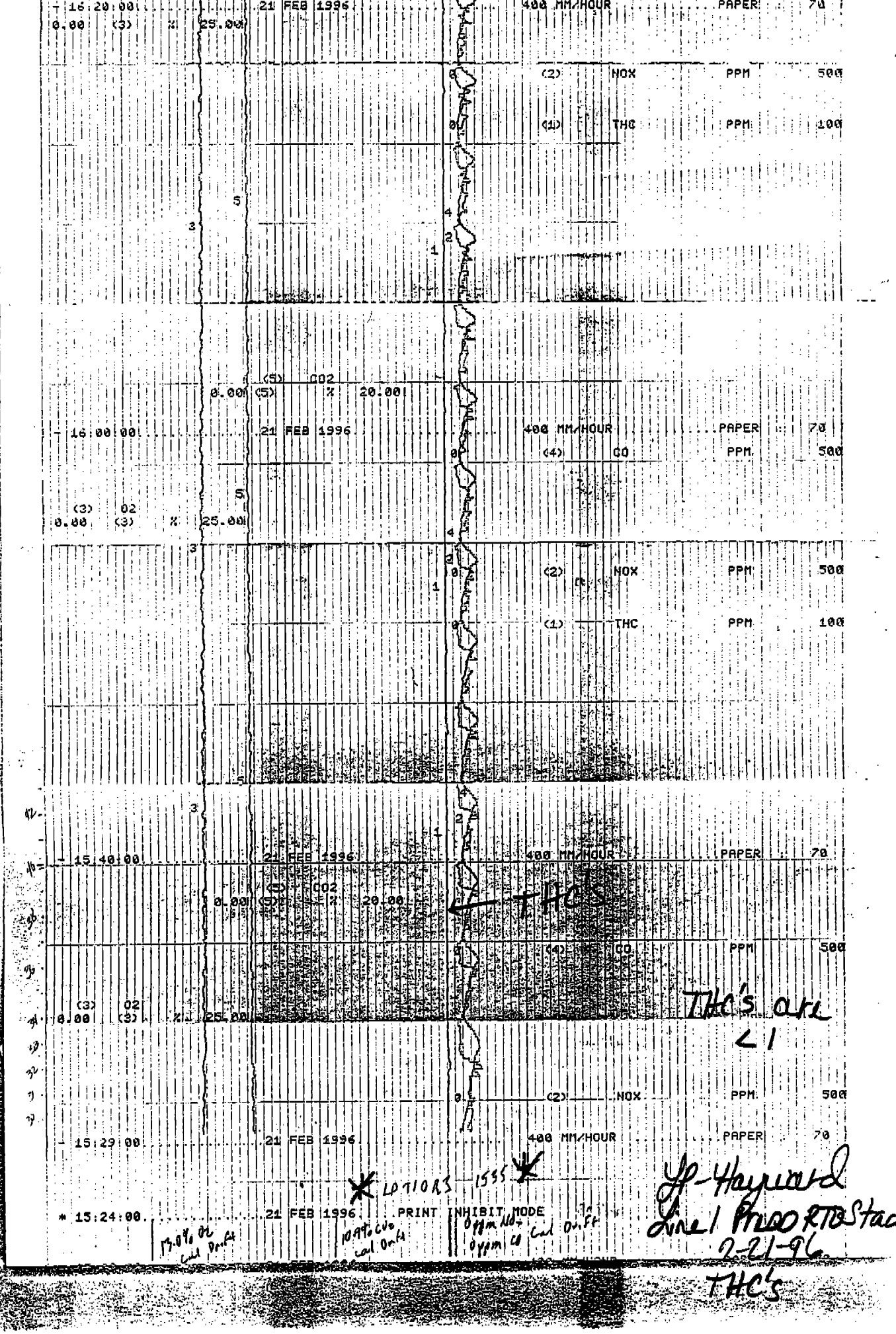
7-24-96

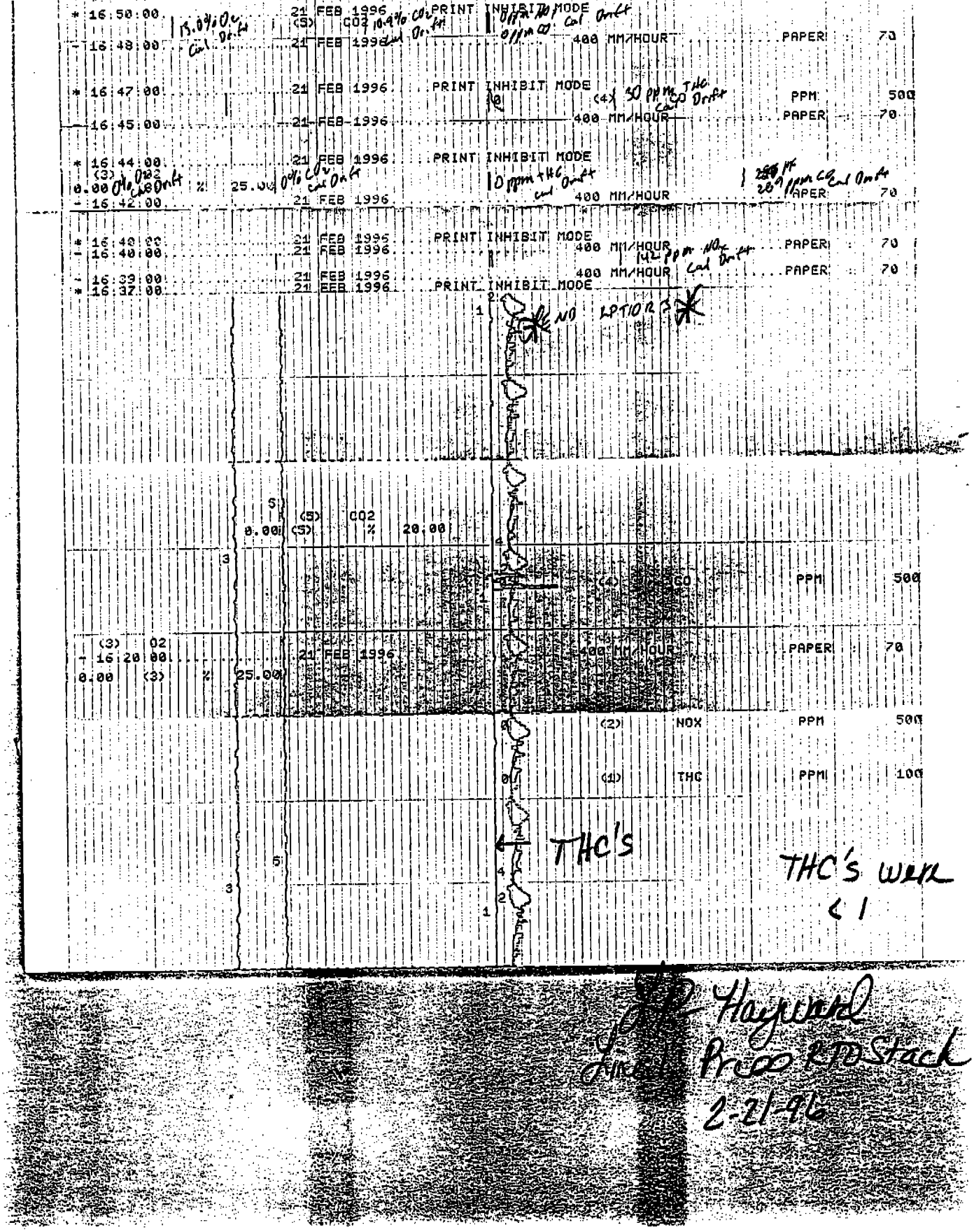
Hayward

E-13


(2) NOX PPM 500
(1) THC PPM 100
- 14:40:00 21 FEB 1996 400 MM/HOUR PAPER 70
(5) CO2
0.00 (5) % 20.00
(4) CO PPM 500
(3) O2
0.00 (3) % 25.00
(2) NOX PPM 500
- 14:20:00 21 FEB 1996 400 MM/HOUR PAPER 70
(1) THC PPM 100
(THC's were <1)
THC's
(5) CO2
0.00 (5) % 20.00
(4) CO PPM 500
(3) O2
- 14:00:00 21 FEB 1996 400 MM/HOUR PAPER 70
0.00 (3) % 25.00
- 13:57:00 21 FEB 1996 400 MM/HOUR PAPER 70
LP Hayward
Unit 1 Aux RPD Stack
2-21-96
LP T10A2-1400
* 13:38:00 21 FEB 1996 PRINT INHIBIT MODE
- 13:37:00 21 FEB 1996 400 MM/HOUR PAPER 70
* 13:36:00 21 FEB 1996 PRINT INHIBIT MODE
- 13:35:00 21 FEB 1996 400 MM/HOUR PAPER 70


(3) O2
0.00 (3) % 25.00
(2) NOX PPM 500
- 15:29:00 21 FEB 1996 400 MM/HOUR PAPER 70
LOTIOR3 - 1555
* 15:24:00 21 FEB 1996 PRINT INHIBIT MODE
19.0% O2 Cal Drift
10.9% CO Cal Drift
0ppm NO Cal Drift
0ppm CO Cal Drift
- 15:22:00 21 FEB 1996 400 MM/HOUR PAPER 70
* 15:21:00 21 FEB 1996 PRINT INHIBIT MODE
30 ppm CHC Cal Drift
- 15:20:00 21 FEB 1996 400 MM/HOUR PAPER 70
- 15:19:00 21 FEB 1996 400 MM/HOUR PAPER 70
* 15:17:00 21 FEB 1996 PRINT INHIBIT MODE
0% O2 Cal Drift
0ppm THC Cal Drift
280 11 ppm CO Cal Drift
- 15:16:00 21 FEB 1996 400 MM/HOUR PAPER 70
* 15:14:00 21 FEB 1996 PRINT INHIBIT MODE
102 ppm NO Cal Drift
- 15:13:00 21 FEB 1996 400 MM/HOUR PAPER 70
* 15:01:00 21 FEB 1996 PRINT INHIBIT MODE END LOTIOR3 1500 Hrs
- 15:00:00 21 FEB 1996 400 MM/HOUR PAPER 70
CO2
0.00 (5) % 20.00
(4) CO PPM 500
(3) O2
0.00 (3) % 25.00
(2) NOX PPM 500
THC PPM 100
- 14:40:00 21 FEB 1996 400 MM/HOUR PAPER 70
(THC's were <1)
Ed Hayward
Unit 1 PRPRTD Stack
2-21-96


21 FEB 1996
400 MM/HOUR
PAPER
(2) NOX PPM
(1) THC PPM
(5) CO2 %
(4) CO PPM
(3) O2 %
THC's are < 1
LOTIORS
1555
PRINT INHIBIT MODE
Yp-Hayward
Line 1 RTO Stack
2-21-96
THC's


21 FEB 1996 PRINT INHIBIT MODE
400 MM/HOUR PAPER 70
(5) CO2 %
(4) CO PPM 500
(3) O2 %
(2) NOX PPM 500
(1) THC PPM 100
THC's
THC's were < 1
Hayward Proc ED Stack
2-21-96

APPENDIX F

NO_x AND CO DATALOGGER PRINTOUTS

LP/HAYWARD
Line 1 Dryer RTO Stack
Test 6 Run 1

DATE	TIME	NOX	O2	CO	CO2
2/20/96	9:51:27 AM	22.732	16.248	155.156	4.106
2/20/96	9:52:27 AM	21.85	16.459	138.594	4.009
2/20/96	9:53:27 AM	22.365	16.429	164.531	4.032
2/20/96	9:54:27 AM	22.438	16.187	147.5	4.167
2/20/96	9:55:27 AM	22.585	16.196	174.531	4.167
2/20/96	9:56:27 AM	21.923	16.381	172.812	4.073
2/20/96	9:57:27 AM	22.438	16.248	163.75	4.16
2/20/96	9:58:27 AM	22.365	16.226	165.781	4.125
2/20/96	9:59:27 AM	22.659	16.269	159.219	4.106
2/20/96	10:00:27 AM	22.291	16.364	187.812	4.07
2/20/96	10:01:27 AM	21.997	16.36	150.469	4.054
2/20/96	10:02:27 AM	22.217	16.209	176.875	4.164
2/20/96	10:03:27 AM	22.07	16.403	154.062	3.974
2/20/96	10:04:27 AM	22.217	16.476	184.687	3.99
2/20/96	10:05:27 AM	22.144	16.295	141.25	4.122
2/20/96	10:06:27 AM	22.438	16.135	178.281	4.17
2/20/96	10:07:27 AM	21.923	16.334	162.969	4.102
2/20/96	10:08:27 AM	22.806	16.291	198.594	4.186
2/20/96	10:09:27 AM	22.07	16.187	169.375	4.202
2/20/96	10:10:27 AM	22.217	16.261	190.469	4.115
2/20/96	10:11:27 AM	21.702	16.42	250.156	3.986
2/20/96	10:12:27 AM	21.629	16.343	259.375	4.093
2/20/96	10:13:27 AM	21.482	16.222	224.219	4.093
2/20/96	10:14:27 AM	21.555	16.312	171.562	4.067
2/20/96	10:15:27 AM	20.967	16.545	175.625	3.941
2/20/96	10:16:27 AM	21.187	16.368	152.031	4.077
2/20/96	10:17:27 AM	21.04	16.261	182.969	4.151
2/20/96	10:18:27 AM	21.187	16.243	169.375	4.099
2/20/96	10:19:27 AM	20.599	16.416	211.094	4.054
2/20/96	10:20:27 AM	20.673	16.261	157.969	4.131
2/20/96	10:21:27 AM	20.746	16.282	186.094	4.054
2/20/96	10:22:27 AM	20.452	16.481	155.781	3.98
2/20/96	10:23:27 AM	20.305	16.528	202.187	3.967
2/20/96	10:24:27 AM	20.746	16.343	162.187	4.102
2/20/96	10:25:27 AM	20.673	16.286	200.781	4.119
2/20/96	10:26:27 AM	20.305	16.394	185.625	4.048
2/20/96	10:27:27 AM	20.673	16.282	202.656	4.151
2/20/96	10:28:27 AM	20.231	16.183	184.062	4.144
2/20/96	10:29:27 AM	21.04	16.222	189.531	4.206
2/20/96	10:30:27 AM	20.084	16.506	201.094	3.99
2/20/96	10:31:27 AM	20.305	16.459	177.656	4.006
2/20/96	10:32:27 AM	20.231	16.429	196.094	4.015
2/20/96	10:33:27 AM	20.893	16.381	177.187	4.032
2/20/96	10:34:27 AM	20.746	16.399	218.437	4.035
2/20/96	10:35:27 AM	20.525	16.274	165.781	4.119
2/20/96	10:36:27 AM	20.673	16.265	193.125	4.093
2/20/96	10:37:27 AM	20.673	16.489	160.625	3.941

LP/HAYWARD
Line 1 Dryer RTO Stack
Test 6 Run 1

2/20/96	10:38:27 AM	20.746	16.472	211.25	4.022
2/20/96	10:39:27 AM	20.746	16.317	178.281	4.131
2/20/96	10:40:27 AM	20.525	16.351	211.875	4.054
2/20/96	10:41:27 AM	20.746	16.463	183.75	4.022
2/20/96	10:42:27 AM	20.82	16.274	211.562	4.157
2/20/96	10:43:27 AM	20.746	16.135	181.562	4.164
2/20/96	10:44:27 AM	21.335	16.261	199.219	4.112
2/20/96	10:45:27 AM	20.452	16.511	198.906	3.951
2/20/96	10:46:27 AM	20.378	16.485	184.531	3.99
2/20/96	10:47:27 AM	20.673	16.386	199.219	4.054
2/20/96	10:48:27 AM	21.187	16.334	191.25	4.051
2/20/96	10:49:27 AM	20.967	16.412	218.906	4.044
2/20/96	10:50:27 AM	20.967	16.196	176.094	4.196
AVERAGES		**21.3**	**16.3**	**183.3**	**4.1**

LP/HAYWARD
Line 1 Dryer RTO Stack
Test 6 Run 2

DATE	TIME	NOX	O2	CO	CO2
2/20/96	11:41:47 AM	18.245	16.821	220.469	3.468
2/20/96	11:42:47 AM	17.803	16.847	272.812	3.422
2/20/96	11:43:47 AM	17.803	16.882	290.625	3.429
2/20/96	11:44:47 AM	17.73	16.843	304.062	3.445
2/20/96	11:45:47 AM	17.73	16.89	282.031	3.413
2/20/96	11:46:47 AM	17.509	16.916	262.344	3.384
2/20/96	11:47:47 AM	17.583	16.856	241.719	3.403
2/20/96	11:48:47 AM	17.362	16.821	228.75	3.416
2/20/96	11:49:47 AM	17.362	16.826	220.469	3.384
2/20/96	11:50:47 AM	17.656	16.912	224.844	3.358
2/20/96	11:51:47 AM	17.068	16.851	218.75	3.41
2/20/96	11:52:47 AM	17.583	16.86	226.875	3.416
2/20/96	11:53:47 AM	17.068	16.92	216.094	3.368
2/20/96	11:54:47 AM	17.141	16.933	230	3.381
2/20/96	11:55:47 AM	17.509	16.787	221.094	3.477
2/20/96	11:56:47 AM	17.068	16.748	230.469	3.477
2/20/96	11:57:47 AM	16.994	16.895	226.562	3.364
2/20/96	11:58:47 AM	16.7	16.895	230.156	3.303
2/20/96	11:59:47 AM	16.773	16.834	212.812	3.364
2/20/96	12:00:47 PM	17.362	16.774	221.25	3.435
2/20/96	12:01:47 PM	17.215	16.8	218.75	3.387
2/20/96	12:02:47 PM	16.626	16.86	226.875	3.319
2/20/96	12:03:47 PM	16.921	16.895	192.344	3.29
2/20/96	12:04:47 PM	17.288	16.834	194.844	3.297
2/20/96	12:05:47 PM	16.921	16.864	202.344	3.31
2/20/96	12:06:47 PM	17.362	16.864	214.687	3.332
2/20/96	12:07:47 PM	17.215	16.817	213.281	3.368
2/20/96	12:08:47 PM	17.509	16.795	217.656	3.377
2/20/96	12:09:47 PM	17.436	16.813	229.375	3.374
2/20/96	12:10:47 PM	17.362	16.8	215.625	3.384
2/20/96	12:11:47 PM	17.141	16.817	214.219	3.371
2/20/96	12:12:47 PM	17.362	16.908	206.25	3.332
2/20/96	12:13:47 PM	16.847	17.015	220.312	3.255
2/20/96	12:14:47 PM	17.288	16.946	198.75	3.261
2/20/96	12:15:47 PM	17.803	16.869	213.437	3.281
2/20/96	12:16:47 PM	17.215	16.942	220	3.245
2/20/96	12:17:47 PM	16.847	16.994	271.875	3.226
2/20/96	12:18:47 PM	17.288	16.869	206.406	3.261
2/20/96	12:19:47 PM	16.921	16.826	211.406	3.323
2/20/96	12:20:47 PM	17.215	16.791	218.75	3.419
2/20/96	12:21:47 PM	17.215	16.774	294.219	3.468
2/20/96	12:22:47 PM	16.847	16.791	378.437	3.387
2/20/96	12:23:47 PM	16.773	16.83	363.437	3.377
2/20/96	12:24:47 PM	17.141	16.8	299.844	3.403
2/20/96	12:25:47 PM	17.141	16.757	249.062	3.4
2/20/96	12:26:47 PM	17.141	16.679	234.062	3.432
2/20/96	12:27:47 PM	17.509	16.739	225.781	3.448

LP/HAYWARD
Line 1 Dryer RTO Stack
Test 6 Run 2

2/20/96	12:28:47 PM	17.362	16.808	218.281	3.432
2/20/96	12:29:47 PM	16.921	16.839	225.781	3.374
2/20/96	12:30:47 PM	17.509	16.808	223.906	3.342
2/20/96	12:31:47 PM	16.994	16.839	225.781	3.335
2/20/96	12:32:47 PM	16.921	16.877	228.594	3.313
2/20/96	12:33:47 PM	17.215	16.821	210.156	3.316
2/20/96	12:34:47 PM	17.362	16.864	215.312	3.31
2/20/96	12:35:47 PM	16.847	16.972	210.469	3.248
2/20/96	12:36:47 PM	16.847	17.024	213.125	3.232
2/20/96	12:37:47 PM	17.288	16.951	209.062	3.248
2/20/96	12:38:47 PM	17.73	16.895	215.469	3.258
2/20/96	12:39:47 PM	18.245	16.89	219.219	3.297
2/20/96	12:40:47 PM	18.171	16.843	217.187	3.297
AVERAGES		**17.3**	**16.9**	**232.8**	**3.4**

LP/HAYWARD
Line 1 Dryer RTO Stack
Test 6 Run 3

DATE	TIME	NOX	O2	CO	CO2
2/20/96	1:21:43 PM	20.305	16.187	197.344	4.215
2/20/96	1:22:43 PM	20.525	16.105	184.062	4.254
2/20/96	1:23:43 PM	20.967	16.114	223.906	4.28
2/20/96	1:24:43 PM	21.261	15.937	176.719	4.357
2/20/96	1:25:43 PM	21.261	16.364	179.219	4.038
2/20/96	1:26:43 PM	19.937	16.118	162.969	4.247
2/20/96	1:27:43 PM	19.863	16.239	230.156	4.244
2/20/96	1:28:43 PM	20.305	16.097	183.437	4.305
2/20/96	1:29:43 PM	20.158	16.135	212.5	4.228
2/20/96	1:30:43 PM	19.569	16.274	182.656	4.148
2/20/96	1:31:43 PM	19.863	16.183	210.469	4.247
2/20/96	1:32:43 PM	19.495	15.881	188.594	4.399
2/20/96	1:33:43 PM	20.305	15.954	206.25	4.389
2/20/96	1:34:43 PM	19.495	16.261	203.594	4.189
2/20/96	1:35:43 PM	19.275	16.282	185.781	4.183
2/20/96	1:36:43 PM	19.79	16.187	201.406	4.257
2/20/96	1:37:43 PM	19.495	16.123	197.5	4.318
2/20/96	1:38:43 PM	19.569	16.11	243.125	4.334
2/20/96	1:39:43 PM	19.422	16.002	185.625	4.405
2/20/96	1:40:43 PM	20.673	15.937	218.281	4.421
2/20/96	1:41:43 PM	18.833	16.153	246.094	4.173
2/20/96	1:42:43 PM	18.465	16.317	433.75	4.173
2/20/96	1:43:43 PM	18.465	16.2	315	4.264
2/20/96	1:44:43 PM	19.569	16.123	300.937	4.273
2/20/96	1:45:43 PM	19.716	16.239	176.406	4.238
2/20/96	1:46:43 PM	19.275	16.157	211.406	4.293
2/20/96	1:47:43 PM	18.686	16.131	176.25	4.222
2/20/96	1:48:43 PM	18.465	16.23	182.031	4.183
2/20/96	1:49:43 PM	18.245	16.455	180.156	4.057
2/20/96	1:50:43 PM	18.613	16.338	175.156	4.183
2/20/96	1:51:43 PM	18.907	16.265	198.281	4.231
2/20/96	1:52:43 PM	18.318	16.213	186.875	4.222
2/20/96	1:53:43 PM	18.613	16.338	221.562	4.141
2/20/96	1:54:43 PM	18.613	16.304	167.812	4.193
2/20/96	1:55:43 PM	18.098	16.295	192.812	4.17
2/20/96	1:56:43 PM	18.171	16.424	162.812	4.067
2/20/96	1:57:43 PM	18.392	16.537	210	4.067
2/20/96	1:58:43 PM	19.275	16.317	162.5	4.202
2/20/96	1:59:43 PM	18.907	16.217	204.219	4.209
2/20/96	2:00:43 PM	18.98	16.347	180	4.151
2/20/96	2:01:43 PM	18.76	16.373	212.656	4.183
2/20/96	2:02:43 PM	19.201	16.058	183.125	4.351
2/20/96	2:03:43 PM	19.643	16.144	206.875	4.322
2/20/96	2:04:43 PM	19.128	16.373	202.656	4.209
2/20/96	2:05:43 PM	19.422	16.265	195.469	4.312
2/20/96	2:06:43 PM	19.275	16.213	213.281	4.318
2/20/96	2:07:43 PM	19.422	16.2	200.937	4.302

LP/HAYWARD
Line 1 Dryer RTO Stack
Test 6 Run 3

2/20/96	2:08:43 PM	19.128	16.317	234.219	4.247
2/20/96	2:09:43 PM	18.98	16.157	187.812	4.344
2/20/96	2:10:43 PM	19.054	16.153	220.625	4.37
2/20/96	2:11:43 PM	18.907	16.321	189.844	4.206
2/20/96	2:12:43 PM	18.392	16.424	235.312	4.189
2/20/96	2:13:43 PM	19.348	16.157	184.219	4.305
2/20/96	2:14:43 PM	18.98	16.028	223.281	4.299
2/20/96	2:15:43 PM	18.465	16.157	200.625	4.228
2/20/96	2:16:43 PM	18.539	16.2	225.781	4.193
2/20/96	2:17:43 PM	18.833	16.101	185.469	4.212
2/20/96	2:18:43 PM	19.054	16.166	192.344	4.164
2/20/96	2:19:43 PM	18.465	16.355	202.656	4.083
2/20/96	2:20:43 PM	19.054	16.33	185.781	4.109
AVERAGES		**19.3**	**16.2**	**205.7**	**4.2**

LP/HAYWARD
Line 1 Core Dryer Outlet
Test 7 Run 1

DATE	TIME	THC	NOX	O2	CO	CO2
2/20/96	9:50:59 AM	87.484	36.743	16.29	621.989	4.644
2/20/96	9:51:59 AM	90.413	36.418	16.273	636.068	4.67
2/20/96	9:52:59 AM	85.449	36.723	16.377	618.164	4.561
2/20/96	9:53:59 AM	85.937	36.479	16.309	633.789	4.632
2/20/96	9:54:59 AM	83.984	36.54	16.432	616.211	4.502
2/20/96	9:55:59 AM	87.24	36.051	16.419	583.984	4.513
2/20/96	9:56:59 AM	90.007	36.601	16.309	615.723	4.639
2/20/96	9:57:59 AM	88.135	36.723	16.335	627.441	4.587
2/20/96	9:58:59 AM	88.867	36.357	16.424	582.031	4.528
2/20/96	9:59:59 AM	97.493	36.112	16.263	648.519	4.73
2/20/96	10:00:59 AM	92.692	36.011	16.263	688.151	4.639
2/20/96	10:01:59 AM	93.424	36.54	16.388	645.02	4.575
2/20/96	10:02:59 AM	90.82	35.929	16.303	664.307	4.587
2/20/96	10:03:59 AM	88.135	35.238	16.557	579.346	4.365
2/20/96	10:04:59 AM	91.715	35.97	16.481	569.01	4.504
2/20/96	10:05:59 AM	93.506	34.851	16.337	657.715	4.582
2/20/96	10:06:59 AM	100.667	35.116	16.258	660.645	4.683
2/20/96	10:07:59 AM	99.528	35.441	16.248	711.914	4.683
2/20/96	10:08:59 AM	108.236	35.197	16.138	736.409	4.805
2/20/96	10:09:59 AM	99.04	34.912	16.364	731.527	4.539
2/20/96	10:10:59 AM	99.202	35.522	16.396	649.577	4.517
2/20/96	10:11:59 AM	97.005	36.092	16.436	621.175	4.494
2/20/96	10:12:59 AM	97.982	35.706	16.447	639.486	4.495
2/20/96	10:13:59 AM	95.622	35.055	16.476	628.581	4.463
2/20/96	10:14:59 AM	90.332	34.465	16.578	636.23	4.338
2/20/96	10:15:59 AM	101.644	34.729	16.517	608.561	4.471
2/20/96	10:16:59 AM	107.91	34.79	16.282	719.564	4.645
2/20/96	10:17:59 AM	114.909	34.627	16.29	743.815	4.655
2/20/96	10:18:59 AM	109.375	34.261	16.398	726.318	4.53
2/20/96	10:19:59 AM	111.898	34.648	16.322	749.593	4.626
2/20/96	10:20:59 AM	103.516	34.566	16.504	741.943	4.396
2/20/96	10:21:59 AM	107.503	33.712	16.595	656.169	4.37
2/20/96	10:22:59 AM	101.807	34.607	16.572	656.413	4.393
2/20/96	10:23:59 AM	103.19	33.366	16.51	653.971	4.414
2/20/96	10:24:59 AM	110.433	34.831	16.424	699.056	4.486
2/20/96	10:25:59 AM	110.026	35.421	16.514	694.987	4.448
2/20/96	10:26:59 AM	120.768	35.583	16.301	742.757	4.639
2/20/96	10:27:59 AM	126.058	37.109	16.21	802.653	4.718
2/20/96	10:28:59 AM	114.827	37.191	16.385	750.488	4.593
2/20/96	10:29:59 AM	114.014	36.458	16.388	752.767	4.505
2/20/96	10:30:59 AM	108.968	36.214	16.531	688.639	4.401
2/20/96	10:31:59 AM	108.968	36.601	16.468	685.954	4.427
2/20/96	10:32:59 AM	110.352	37.252	16.504	641.276	4.417
2/20/96	10:33:59 AM	110.596	37.292	16.404	672.526	4.492
2/20/96	10:34:59 AM	113.688	37.476	16.487	691.976	4.453
2/20/96	10:35:59 AM	109.701	38.696	16.398	689.616	4.499
2/20/96	10:36:59 AM	106.527	38.472	16.574	647.868	4.39

LP/HAYWARD
Line 1 Core Dryer Outlet
Test 7 Run 1

2/20/96	10:37:59 AM	112.386	37.354	16.479	636.556	4.458
2/20/96	10:38:59 AM	115.723	36.947	16.453	688.802	4.489
2/20/96	10:39:59 AM	111.003	36.316	16.504	700.114	4.398
2/20/96	10:40:59 AM	109.538	36.112	16.576	638.021	4.355
2/20/96	10:41:59 AM	122.152	36.133	16.424	650.146	4.52
2/20/96	10:42:59 AM	119.629	36.235	16.44	703.288	4.481
2/20/96	10:43:59 AM	111.084	36.58	16.586	661.702	4.328
2/20/96	10:44:59 AM	113.851	36.336	16.578	625.732	4.36
2/20/96	10:45:59 AM	111.654	36.54	16.544	662.923	4.375
2/20/96	10:46:59 AM	117.432	36.56	16.508	649.821	4.45
2/20/96	10:47:59 AM	119.059	36.133	16.504	677.246	4.414
2/20/96	10:48:59 AM	115.804	35.807	16.495	664.062	4.438
2/20/96	10:49:59 AM	116.374	36.011	16.479	666.911	4.486
AVERAGES		**104.1**	**36**	**16.4**	**667.4**	**4.5**
ppmc,w =		**312.3**				

LP/HAYWARD

Line 1 Core Dryer Outlet

Test 7 Run 2

DATE	TIME	THC	NOX	O2	CO	CO2
2/20/96	11:39:57 AM	120.85	35.889	16.197	889.242	4.754
2/20/96	11:40:57 AM	122.884	35.746	16.222	876.221	4.712
2/20/96	11:41:57 AM	128.825	36.235	16.108	926.025	4.86
2/20/96	11:42:57 AM	131.836	36.377	16.125	993.896	4.827
2/20/96	11:43:57 AM	124.919	35.868	16.229	954.346	4.699
2/20/96	11:44:57 AM	126.383	35.38	16.216	928.955	4.723
2/20/96	11:45:57 AM	129.964	35.36	16.246	941.162	4.699
2/20/96	11:46:57 AM	125.163	36.011	16.284	939.372	4.668
2/20/96	11:47:57 AM	129.069	36.031	16.248	919.596	4.704
2/20/96	11:48:57 AM	132.975	37.272	16.14	981.12	4.819
2/20/96	11:49:57 AM	128.743	37.211	16.14	1022.298	4.801
2/20/96	11:50:57 AM	125.244	36.377	16.25	966.553	4.686
2/20/96	11:51:57 AM	123.535	36.275	16.307	925.781	4.644
2/20/96	11:52:57 AM	126.383	36.499	16.252	920.573	4.71
2/20/96	11:53:57 AM	130.941	35.706	16.214	969.727	4.733
2/20/96	11:54:57 AM	132.568	36.967	16.174	998.861	4.775
2/20/96	11:55:57 AM	133.138	36.845	16.165	994.466	4.79
2/20/96	11:56:57 AM	132.975	36.845	16.227	999.023	4.697
2/20/96	11:57:57 AM	134.033	38.066	16.267	959.147	4.702
2/20/96	11:58:57 AM	128.906	38.879	16.299	941.243	4.653
2/20/96	11:59:57 AM	135.661	39.429	16.178	979.411	4.797
2/20/96	12:00:57 PM	130.534	38.554	16.28	1001.546	4.678
2/20/96	12:01:57 PM	128.988	37.903	16.265	955.729	4.679
2/20/96	12:02:57 PM	132.812	38.371	16.252	932.21	4.736
2/20/96	12:03:57 PM	138.997	38.879	16.053	1036.458	4.914
2/20/96	12:04:57 PM	143.717	38.676	16.098	1092.529	4.863
2/20/96	12:05:57 PM	140.462	38.656	16.112	1086.589	4.855
2/20/96	12:06:57 PM	136.556	39.001	16.275	1011.882	4.689
2/20/96	12:07:57 PM	138.509	39.53	16.222	974.609	4.702
2/20/96	12:08:57 PM	133.789	39.876	16.201	983.643	4.736
2/20/96	12:09:57 PM	129.639	39.286	16.366	952.474	4.58
2/20/96	12:10:58 PM	118.164	38.208	16.553	851.074	4.398
2/20/96	12:11:57 PM	112.793	38.249	16.612	810.872	4.344
2/20/96	12:12:57 PM	113.688	38.188	16.531	773.682	4.408
2/20/96	12:13:57 PM	113.2	38.269	16.527	798.991	4.421
2/20/96	12:14:57 PM	118.408	38.31	16.504	787.435	4.466
2/20/96	12:15:57 PM	121.826	38.249	16.472	810.791	4.551
2/20/96	12:16:57 PM	120.524	38.737	16.402	877.523	4.543
2/20/96	12:17:57 PM	126.953	38.432	16.354	859.538	4.603
2/20/96	12:18:57 PM	132.08	38.676	16.297	903.727	4.66
2/20/96	12:19:57 PM	130.452	38.005	16.343	922.282	4.626
2/20/96	12:20:57 PM	132.812	37.516	16.265	945.231	4.674
2/20/96	12:21:57 PM	128.255	37.577	16.39	924.479	4.569
2/20/96	12:22:57 PM	134.928	38.432	16.235	942.79	4.717
2/20/96	12:23:57 PM	134.115	38.371	16.254	970.378	4.692
2/20/96	12:24:58 PM	137.858	38.656	16.235	971.029	4.71
2/20/96	12:25:58 PM	139.242	38.615	16.208	983.154	4.73

LP/HAYWARD
Line 1 Core Dryer Outlet
Test 7 Run 2

2/20/96	12:26:57 PM	131.185	38.595	16.347	942.301	4.565
2/20/96	12:27:57 PM	123.617	38.696	16.481	846.68	4.442
2/20/96	12:28:58 PM	127.116	39.429	16.419	801.514	4.533
2/20/96	12:29:57 PM	130.859	39.185	16.413	840.413	4.52
2/20/96	12:30:57 PM	119.629	38.94	16.578	862.874	4.333
2/20/96	12:31:57 PM	127.116	39.408	16.466	783.854	4.513
2/20/96	12:32:57 PM	119.059	39.429	16.618	832.275	4.294
2/20/96	12:33:57 PM	119.71	39.632	16.54	756.673	4.429
2/20/96	12:34:57 PM	104.574	39.042	16.76	772.949	4.163
2/20/96	12:35:57 PM	109.131	38.371	16.764	678.874	4.224
2/20/96	12:36:57 PM	104.574	38.249	16.832	686.035	4.22
2/20/96	12:37:57 PM	115.885	38.981	16.603	696.452	4.368
2/20/96	12:38:58 PM	133.138	38.31	16.542	763.102	4.406
AVERAGES		**127.3**	**37.9**	**16.3**	**907.5**	**4.6**
ppmc,w =		**399.4**				

LP/HAYWARD
Line 1 Core Dryer Outlet
Test 7 Run 3

DATE	TIME	THC	NOX	O2	CO	CO2
2/20/96	1:21:00 PM	113.118	34.546	16.426	759.603	4.572
2/20/96	1:22:00 PM	113.444	34.648	16.479	735.352	4.523
2/20/96	1:22:59 PM	111.979	34.444	16.481	707.031	4.51
2/20/96	1:23:59 PM	116.374	34.424	16.409	712.484	4.629
2/20/96	1:24:59 PM	120.524	34.322	16.288	755.697	4.727
2/20/96	1:25:59 PM	116.699	34.973	16.385	753.255	4.647
2/20/96	1:26:59 PM	123.779	34.241	16.303	778.483	4.709
2/20/96	1:27:59 PM	119.71	34.037	16.352	761.637	4.64
2/20/96	1:29:00 PM	119.059	34.302	16.375	747.233	4.635
2/20/96	1:30:00 PM	118.083	34.22	16.381	713.949	4.624
2/20/96	1:31:00 PM	116.211	34.668	16.424	731.283	4.614
2/20/96	1:31:59 PM	125.488	35.095	16.352	730.713	4.661
2/20/96	1:32:59 PM	126.79	35.929	16.178	795.41	4.852
2/20/96	1:33:59 PM	130.208	36.621	16.1	837.402	4.94
2/20/96	1:35:00 PM	130.859	35.604	16.208	844.971	4.824
2/20/96	1:35:59 PM	133.382	35.217	16.203	854.818	4.792
2/20/96	1:36:59 PM	128.499	34.363	16.421	771.403	4.582
2/20/96	1:37:59 PM	128.581	34.831	16.307	747.152	4.701
2/20/96	1:39:00 PM	135.579	35.034	16.235	783.366	4.779
2/20/96	1:40:00 PM	135.335	37.048	16.11	810.14	4.919
2/20/96	1:41:00 PM	133.626	36.865	16.155	815.267	4.85
2/20/96	1:41:59 PM	135.254	36.764	16.214	791.016	4.81
2/20/96	1:43:00 PM	140.381	35.645	16.21	782.389	4.81
2/20/96	1:44:00 PM	137.614	35.238	16.189	816.732	4.816
2/20/96	1:45:00 PM	131.104	36.011	16.231	773.112	4.79
2/20/96	1:45:59 PM	137.614	36.316	16.212	768.717	4.816
2/20/96	1:47:00 PM	138.346	35.624	16.216	812.744	4.792
2/20/96	1:48:00 PM	128.092	35.441	16.354	757.975	4.632
2/20/96	1:49:00 PM	124.268	34.871	16.413	683.512	4.578
2/20/96	1:50:00 PM	120.524	34.363	16.432	681.722	4.595
2/20/96	1:50:59 PM	122.314	34.078	16.33	682.454	4.687
2/20/96	1:51:59 PM	125.326	34.302	16.396	693.848	4.629
2/20/96	1:52:59 PM	126.628	33.915	16.324	718.262	4.714
2/20/96	1:53:59 PM	125	34.546	16.36	718.506	4.678
2/20/96	1:54:59 PM	125.977	34.546	16.288	708.984	4.72
2/20/96	1:56:00 PM	122.314	34.078	16.417	699.219	4.588
2/20/96	1:57:00 PM	121.257	34.465	16.29	714.681	4.717
2/20/96	1:58:00 PM	124.105	35.116	16.297	712.321	4.762
2/20/96	1:59:00 PM	126.546	35.095	16.121	770.915	4.894
2/20/96	2:00:00 PM	121.419	35.421	16.273	759.684	4.779
2/20/96	2:01:00 PM	116.862	33.752	16.307	729.899	4.678
2/20/96	2:01:59 PM	117.106	34.078	16.267	730.957	4.727
2/20/96	2:02:59 PM	118.083	34.342	16.167	743.734	4.678
2/20/96	2:03:59 PM	112.142	34.749	16.199	729.248	4.691
2/20/96	2:05:00 PM	119.792	35.522	16.064	751.383	4.819
2/20/96	2:06:00 PM	122.396	36.336	15.924	841.878	4.948
2/20/96	2:07:00 PM	119.303	35.868	16.083	806.234	4.81

LP/HAYWARD
Line 1 Core Dryer Outlet
Test 7 Run 3

2/20/96	2:08:00 PM	121.175	36.275	16.024	825.439	4.834
2/20/96	2:08:59 PM	123.291	35.421	16.127	778.239	4.748
2/20/96	2:09:59 PM	130.046	36.214	15.99	831.38	4.891
2/20/96	2:11:00 PM	129.883	36.112	16.047	871.826	4.803
2/20/96	2:11:59 PM	128.906	36.641	16.106	828.206	4.748
2/20/96	2:12:59 PM	125.488	36.458	16.1	822.021	4.744
2/20/96	2:14:00 PM	128.662	36.743	16.019	906.982	4.844
2/20/96	2:15:00 PM	133.382	37.17	16.015	908.529	4.863
2/20/96	2:16:00 PM	128.662	36.56	16.062	901.286	4.79
2/20/96	2:17:00 PM	121.745	36.56	16.201	840.169	4.647
2/20/96	2:18:00 PM	119.141	36.296	16.153	792.155	4.717
2/20/96	2:19:00 PM	124.919	37.17	16.161	809.489	4.723
2/20/96	2:20:00 PM	121.175	37.821	16.07	834.88	4.784
AVERAGES		**124.9**	**35.4**	**16.2**	**774.6**	**4.7**
ppmc,w =		**374.7**				

LP/HAYWARD
Line 1 Press RTO Stack
Test 10 Run 1

DATE	TIME	NOX	O2	CO	CO2
2/21/96	12:16:04 PM	28.23	20.156	21.891	0.562
2/21/96	12:17:04 PM	27.852	20.03	27.303	0.601
2/21/96	12:18:04 PM	25.543	20.05	16.235	0.581
2/21/96	12:19:04 PM	23.008	20.105	16.317	0.534
2/21/96	12:20:04 PM	29.29	20.116	22.705	0.575
2/21/96	12:21:04 PM	27.587	19.995	24.455	0.625
2/21/96	12:22:04 PM	27.208	20.035	14.486	0.612
2/21/96	12:23:04 PM	22.932	20.184	16.235	0.514
2/21/96	12:24:04 PM	29.971	20.156	23.682	0.583
2/21/96	12:25:04 PM	26.641	20.019	20.63	0.62
2/21/96	12:26:04 PM	23.008	20.129	13.265	0.544
2/21/96	12:27:04 PM	24.749	20.224	18.229	0.534
2/21/96	12:28:04 PM	30.841	20.085	25.106	0.605
2/21/96	12:29:04 PM	25.695	20.054	16.805	0.586
2/21/96	12:30:04 PM	23.992	20.162	12.98	0.547
2/21/96	12:31:04 PM	27.133	20.221	19.002	0.55
2/21/96	12:32:04 PM	27.246	20.107	24.78	0.588
2/21/96	12:33:04 PM	25.278	20.136	14.282	0.57
2/21/96	12:34:04 PM	22.251	20.182	14.201	0.518
2/21/96	12:35:04 PM	28.798	20.186	20.711	0.547
2/21/96	12:36:04 PM	26.981	20.076	23.722	0.602
2/21/96	12:37:04 PM	23.878	20.129	12.614	0.571
2/21/96	12:38:04 PM	21.267	20.254	14.608	0.492
2/21/96	12:39:04 PM	29.138	20.175	22.217	0.56
2/21/96	12:40:04 PM	25.657	20.065	20.142	0.599
2/21/96	12:41:04 PM	22.932	20.158	12.207	0.535
2/21/96	12:42:04 PM	24.635	20.257	16.317	0.531
2/21/96	12:43:04 PM	30.273	20.131	23.844	0.601
2/21/96	12:44:04 PM	24.9	20.12	16.032	0.566
2/21/96	12:45:04 PM	21.986	20.23	11.597	0.518
2/21/96	12:46:04 PM	26.641	20.254	17.375	0.544
2/21/96	12:47:04 PM	27.889	20.125	24.902	0.586
2/21/96	12:48:04 PM	25.354	20.149	13.346	0.563
2/21/96	12:49:04 PM	21.683	20.217	12.695	0.503
2/21/96	12:50:04 PM	27.927	20.241	18.758	0.539
2/21/96	12:51:04 PM	27.057	20.131	22.38	0.604
2/21/96	12:52:04 PM	24.03	20.14	11.475	0.557
2/21/96	12:53:04 PM	21.873	20.265	13.062	0.496
2/21/96	12:54:04 PM	29.1	20.206	20.671	0.57
2/21/96	12:55:04 PM	26.3	20.072	19.694	0.605
2/21/96	12:56:04 PM	22.554	20.199	10.579	0.535
2/21/96	12:57:04 PM	23.689	20.301	14.893	0.509
2/21/96	12:58:04 PM	29.63	20.156	23.071	0.592
2/21/96	12:59:04 PM	24.976	20.145	15.055	0.568
2/21/96	1:00:04 PM	22.592	20.213	10.376	0.537
2/21/96	1:01:04 PM	26.83	20.23	15.747	0.545
2/21/96	1:02:04 PM	27.927	20.136	23.397	0.586

LP/HAYWARD

Line 1 Press RTO Stack

Test 10 Run 1

2/21/96	1:03:04 PM	25.089	20.184	12.329	0.571
2/21/96	1:04:04 PM	21.608	20.243	11.719	0.509
2/21/96	1:05:04 PM	28.268	20.239	17.782	0.539
2/21/96	1:06:04 PM	27.36	20.116	21.851	0.607
2/21/96	1:07:04 PM	23.008	20.171	10.783	0.547
2/21/96	1:08:04 PM	20.851	20.342	12.207	0.48
2/21/96	1:09:04 PM	29.971	20.215	20.386	0.568
2/21/96	1:10:04 PM	26.111	20.09	19.979	0.588
2/21/96	1:11:04 PM	22.516	20.226	10.091	0.527
2/21/96	1:12:04 PM	24.332	20.314	14.608	0.514
2/21/96	1:13:04 PM	31.447	20.149	23.234	0.601
2/21/96	1:14:04 PM	25.013	20.158	15.218	0.566
2/21/96	1:15:04 PM	21.418	20.285	10.295	0.503
AVERAGES		**25.7**	**20.2**	**17.4**	**0.6**

LP/HAYWARD
Line 1 Press RTO Stack
Test 10 Run 2

DATE	TIME	NOX	O2	CO	CO2
2/21/96	2:00:20 PM	17.18	20.109	28.158	0.526
2/21/96	2:01:20 PM	23.84	20.006	21.81	0.602
2/21/96	2:02:20 PM	31.03	19.885	28.849	0.662
2/21/96	2:03:20 PM	24.9	19.989	36.214	0.579
2/21/96	2:04:20 PM	17.067	20.112	23.885	0.532
2/21/96	2:05:20 PM	25.808	19.956	22.095	0.622
2/21/96	2:06:20 PM	30.273	19.931	29.256	0.641
2/21/96	2:07:20 PM	22.667	19.982	33.244	0.615
2/21/96	2:08:20 PM	24.067	19.868	21.484	0.64
2/21/96	2:09:20 PM	29.592	19.879	22.786	0.697
2/21/96	2:10:20 PM	30.992	19.956	29.338	0.643
2/21/96	2:11:20 PM	15.288	20.114	28.727	0.518
2/21/96	2:12:20 PM	18.164	20.105	19.491	0.537
2/21/96	2:13:20 PM	27.435	19.96	23.397	0.645
2/21/96	2:14:20 PM	27.776	19.962	32.756	0.609
2/21/96	2:15:20 PM	22.705	19.945	26.164	0.643
2/21/96	2:16:20 PM	24.673	19.958	19.491	0.643
2/21/96	2:17:20 PM	31.257	19.835	25.269	0.68
2/21/96	2:18:20 PM	24.976	20.01	31.576	0.57
2/21/96	2:19:20 PM	15.515	20.129	22.38	0.503
2/21/96	2:20:20 PM	23.916	19.989	20.833	0.589
2/21/96	2:21:20 PM	30.652	19.958	27.71	0.627
2/21/96	2:22:20 PM	20.208	20.037	32.878	0.56
2/21/96	2:23:20 PM	18.694	20.052	21.2	0.549
2/21/96	2:24:20 PM	28.722	19.936	23.275	0.643
2/21/96	2:25:20 PM	31.598	19.94	30.518	0.638
2/21/96	2:26:20 PM	16.726	20.065	30.518	0.526
2/21/96	2:27:20 PM	19.753	20.079	20.06	0.55
2/21/96	2:28:20 PM	29.365	19.927	23.722	0.661
2/21/96	2:29:20 PM	29.781	19.914	32.633	0.62
2/21/96	2:30:20 PM	16.158	20.112	27.873	0.506
2/21/96	2:31:20 PM	22.97	20.008	20.549	0.597
2/21/96	2:32:20 PM	31.068	19.883	27.669	0.653
2/21/96	2:33:20 PM	26.906	19.973	35.156	0.584
2/21/96	2:34:20 PM	18.051	20.079	24.862	0.522
2/21/96	2:35:20 PM	26.868	19.96	22.42	0.614
2/21/96	2:36:20 PM	34.436	19.936	30.192	0.641
2/21/96	2:37:20 PM	21.532	20.032	34.749	0.55
2/21/96	2:38:20 PM	18.959	20.059	23.153	0.537
2/21/96	2:39:20 PM	28.608	19.956	24.251	0.623
2/21/96	2:40:20 PM	33.566	19.938	32.186	0.643
2/21/96	2:41:20 PM	18.77	20.019	32.552	0.542
2/21/96	2:42:20 PM	20.397	20.046	21.2	0.553
2/21/96	2:43:20 PM	30.992	19.898	24.74	0.674
2/21/96	2:44:20 PM	31.901	19.925	34.505	0.646
2/21/96	2:45:20 PM	16.688	20.105	29.012	0.513
2/21/96	2:46:20 PM	23.121	20.026	21.606	0.576

LP/HAYWARD
Line 1 Press RTO Stack
Test 10 Run 2

2/21/96	2:47:20 PM	31.749	19.872	28.402	0.666
2/21/96	2:48:20 PM	27.511	19.982	35.522	0.597
2/21/96	2:49:20 PM	17.937	20.035	25.024	0.531
2/21/96	2:50:20 PM	27.095	19.881	22.664	0.63
2/21/96	2:51:20 PM	33.49	19.811	30.436	0.648
2/21/96	2:52:20 PM	21.835	19.885	36.499	0.573
2/21/96	2:53:20 PM	19.753	19.874	24.902	0.566
2/21/96	2:54:20 PM	30.046	19.745	26.978	0.671
2/21/96	2:55:20 PM	33.944	19.767	35.197	0.664
2/21/96	2:56:20 PM	19.224	19.813	35.685	0.553
2/21/96	2:57:20 PM	21.418	19.839	24.699	0.578
2/21/96	2:58:20 PM	31.219	19.668	28.809	0.688
2/21/96	2:59:20 PM	30.652	19.718	38.534	0.61
AVERAGES		**25.0**	**20.0**	**27.5**	**0.6**

LP/HAYWARD
Line 1 Press RTO Stack
Test 10 Run 3

DATE	TIME	NOX	O2	CO	CO2
2/21/96	3:35:57 PM	20.00	19.50	24.00	0.60
2/21/96	3:36:57 PM	19.80	19.80	33.00	0.40
2/21/96	3:37:57 PM	20.10	19.60	22.00	0.50
2/21/96	3:38:57 PM	28.00	19.60	25.00	0.60
2/21/96	3:39:57 PM	20.00	19.80	34.00	0.50
2/21/96	3:40:57 PM	21.00	19.60	30.00	0.50
2/21/96	3:41:57 PM	27.00	19.50	22.00	0.60
2/21/96	3:42:57 PM	25.00	19.50	34.00	0.40
2/21/96	3:43:57 PM	31.787	19.958	31.779	0.64
2/21/96	3:44:56 PM	20.851	20.145	39.266	0.54
2/21/96	3:45:56 PM	22.554	20.076	25.92	0.599
2/21/96	3:46:56 PM	29.517	19.94	27.913	0.643
2/21/96	3:47:56 PM	30.576	20.074	34.058	0.605
2/21/96	3:48:56 PM	19.072	20.167	36.662	0.534
2/21/96	3:49:56 PM	24.938	20.006	25.024	0.612
2/21/96	3:50:56 PM	29.29	20.008	28.32	0.612
2/21/96	3:51:56 PM	28.608	20.092	36.906	0.579
2/21/96	3:52:56 PM	19.602	20.129	32.023	0.539
2/21/96	3:53:56 PM	27.322	20	25.269	0.622
2/21/96	3:54:56 PM	30.917	20.017	30.192	0.632
2/21/96	3:55:56 PM	24.219	20.107	38.574	0.532
2/21/96	3:56:56 PM	20.624	20.118	27.262	0.545
2/21/96	3:57:56 PM	28.041	19.991	25.065	0.641
2/21/96	3:58:56 PM	30.5	20.028	29.948	0.596
2/21/96	3:59:56 PM	22.327	20.16	38.818	0.532
2/21/96	4:00:56 PM	23.765	20.061	24.862	0.589
2/21/96	4:01:56 PM	28.76	19.986	26.001	0.623
2/21/96	4:02:56 PM	29.479	20.085	31.698	0.575
2/21/96	4:03:56 PM	19.148	20.173	35.807	0.527
2/21/96	4:04:56 PM	24.635	20.037	24.251	0.591
2/21/96	4:05:56 PM	28.722	20.032	26.733	0.605
2/21/96	4:06:56 PM	27.776	20.116	35.075	0.566
2/21/96	4:07:56 PM	19.905	20.138	32.023	0.527
2/21/96	4:08:56 PM	27.511	19.997	24.577	0.628
2/21/96	4:09:56 PM	29.744	20.024	28.605	0.62
2/21/96	4:10:56 PM	23.5	20.171	37.313	0.513
2/21/96	4:11:56 PM	21.154	20.16	27.059	0.55
2/21/96	4:12:56 PM	27.7	19.971	23.885	0.64
2/21/96	4:13:56 PM	28.306	20.074	28.158	0.581
2/21/96	4:14:56 PM	22.024	20.188	38.086	0.514
2/21/96	4:15:56 PM	23.538	20.074	24.902	0.597
2/21/96	4:16:56 PM	27.397	20.05	24.984	0.596
2/21/96	4:17:56 PM	29.138	20.129	30.355	0.581
2/21/96	4:18:56 PM	20.889	20.153	36.458	0.54
2/21/96	4:19:56 PM	25.392	20.057	24.089	0.604
2/21/96	4:20:56 PM	28.949	20.063	25.431	0.605
2/21/96	4:21:56 PM	26.224	20.136	33.407	0.547

LP/HAYWARD
Line 1 Press RTO Stack
Test 10 Run 3

2/21/96	4:22:56 PM	20.435	20.142	31.82	0.524
2/21/96	4:23:56 PM	26.906	20.035	24.089	0.623
2/21/96	4:24:56 PM	28.533	20.035	27.425	0.604
2/21/96	4:25:56 PM	24.635	20.162	36.906	0.524
2/21/96	4:26:56 PM	22.251	20.14	26.774	0.568
2/21/96	4:27:56 PM	27.057	20	23.356	0.617
2/21/96	4:28:56 PM	27.625	20.127	27.425	0.571
2/21/96	4:29:56 PM	22.629	20.21	38.045	0.513
2/21/96	4:30:56 PM	24.181	20.072	24.74	0.596
2/21/96	4:31:56 PM	27.17	20.041	24.089	0.594
2/21/96	4:32:56 PM	28.987	20.138	29.744	0.566
2/21/96	4:33:56 PM	20.927	20.169	36.255	0.537
2/21/96	4:34:56 PM	25.43	20.072	23.6	0.594
AVERAGES		**25.2**	**20.0**	**29.6**	**0.6**

LP/HAYWARD
Line 1 Press RTO Inlet
Test 13 Run 1

DATE	TIME	THC	NOX	O2	CO	CO2
2/21/96	12:16:20 PM	15.161	11.727	21.199	14.852	0.127
2/21/96	12:17:20 PM	6.877	10.368	20.714	13.672	0.094
2/21/96	12:18:20 PM	4.346	10.303	20.859	12.98	0.091
2/21/96	12:19:20 PM	8.325	11.108	21.008	14.282	0.107
2/21/96	12:20:20 PM	14.697	11.621	21.037	14.893	0.122
2/21/96	12:21:20 PM	5.558	10.539	21.051	14.364	0.103
2/21/96	12:22:20 PM	4.15	10.872	21.043	13.672	0.103
2/21/96	12:23:20 PM	9.106	11.768	21.021	12.736	0.119
2/21/96	12:24:20 PM	14.185	11.89	21.033	12.777	0.117
2/21/96	12:25:20 PM	4.655	10.905	21.031	12.248	0.101
2/21/96	12:26:20 PM	5.103	11.548	21.023	13.102	0.098
2/21/96	12:27:20 PM	12.435	12.459	20.959	14.486	0.129
2/21/96	12:28:20 PM	10.327	11.816	20.959	16.52	0.101
2/21/96	12:29:20 PM	4.24	11.344	20.962	16.642	0.094
2/21/96	12:30:20 PM	6.047	12.28	20.98	16.968	0.096
2/21/96	12:31:20 PM	14.494	13.241	20.955	16.642	0.12
2/21/96	12:32:20 PM	6.901	11.784	20.962	15.218	0.094
2/21/96	12:33:20 PM	3.882	11.963	20.959	13.916	0.099
2/21/96	12:34:20 PM	7.658	12.785	20.955	15.015	0.098
2/21/96	12:35:20 PM	14.144	13.452	20.949	15.299	0.117
2/21/96	12:36:20 PM	5.298	12.118	20.978	13.59	0.091
2/21/96	12:37:20 PM	3.768	12.378	20.943	12.288	0.091
2/21/96	12:38:20 PM	8.049	13.184	20.941	12.37	0.104
2/21/96	12:39:20 PM	13.883	13.363	20.941	12.533	0.109
2/21/96	12:40:20 PM	4.395	12.321	20.931	11.963	0.096
2/21/96	12:41:20 PM	4.313	12.76	20.957	11.637	0.096
2/21/96	12:42:20 PM	10.254	13.745	20.964	11.515	0.107
2/21/96	12:43:20 PM	10.628	13.102	20.959	11.353	0.101
2/21/96	12:44:20 PM	3.597	12.581	20.98	10.254	0.096
2/21/96	12:45:20 PM	5.192	12.996	20.976	9.806	0.101
2/21/96	12:46:20 PM	13.721	14.054	20.962	9.277	0.127
2/21/96	12:47:20 PM	6.763	12.508	20.964	9.562	0.101
2/21/96	12:48:20 PM	3.483	12.606	20.968	8.83	0.093
2/21/96	12:49:20 PM	6.795	13.192	20.955	8.789	0.099
2/21/96	12:50:20 PM	13.826	13.639	20.949	8.301	0.12
2/21/96	12:51:20 PM	5.062	12.28	20.966	7.365	0.098
2/21/96	12:52:20 PM	3.215	12.451	20.945	7.324	0.091
2/21/96	12:53:20 PM	7.479	13.216	20.909	7.568	0.101
2/21/96	12:54:20 PM	13.77	13.298	20.927	7.69	0.112
2/21/96	12:55:20 PM	4.02	12.248	20.931	4.801	0.081
2/21/96	12:56:20 PM	4.053	12.614	20.925	6.104	0.091
2/21/96	12:57:20 PM	9.66	13.656	20.941	5.656	0.116
2/21/96	12:58:20 PM	11.556	12.899	20.931	5.778	0.104
2/21/96	12:59:20 PM	3.516	12.313	20.931	5.493	0.093
2/21/96	1:00:20 PM	4.85	12.939	20.9	7.039	0.099
2/21/96	1:01:20 PM	13.411	14.087	20.941	7.853	0.122
2/21/96	1:02:20 PM	7.21	12.508	20.937	7.284	0.093

LP/HAYWARD
Line 1 Press RTO Inlet
Test 13 Run 1

2/21/96	1:03:20 PM	3.288	12.557	20.937	6.592	0.093
2/21/96	1:04:20 PM	6.852	13.281	20.953	5.493	0.099
2/21/96	1:05:20 PM	13.737	14.087	20.931	5.371	0.111
2/21/96	1:06:20 PM	4.907	12.467	20.943	4.598	0.103
2/21/96	1:07:20 PM	3.06	12.736	20.941	6.022	0.091
2/21/96	1:08:20 PM	7.422	13.615	20.937	6.673	0.117
2/21/96	1:09:20 PM	14.771	13.761	20.9	6.999	0.111
2/21/96	1:10:20 PM	4.207	12.492	20.925	6.185	0.09
2/21/96	1:11:20 PM	4.126	13.029	20.919	5.9	0.091
2/21/96	1:12:20 PM	10.278	14.079	20.927	6.063	0.116
2/21/96	1:13:20 PM	12.581	13.298	20.915	5.656	0.104
2/21/96	1:14:20 PM	3.654	12.606	20.898	4.924	0.08
2/21/96	1:15:20 PM	5.526	13.298	20.87	4.761	0.091
AVERAGES		**7.8**	**12.6**	**21**	**10.1**	**0.1**
ppmc.w =		**23.4**				

LP/HAYWARD

Line 1 Press RTO Inlet

Test 13 Run 2

DATE	TIME	THC	NOX	O2	CO	CO2
2/21/96	2:01:00 PM	4.639	2.979	21.462	7.812	0.06
2/21/96	2:02:00 PM	8.252	3.76	21.47	8.016	0.073
2/21/96	2:03:00 PM	17.521	4.46	21.493	8.789	0.094
2/21/96	2:04:00 PM	6.812	2.808	21.48	8.667	0.06
2/21/96	2:05:00 PM	4.932	2.979	21.47	8.057	0.054
2/21/96	2:06:00 PM	9.505	3.841	21.466	8.301	0.073
2/21/96	2:07:00 PM	15.275	3.971	21.446	9.033	0.078
2/21/96	2:08:00 PM	5.404	2.913	21.46	8.952	0.06
2/21/96	2:09:00 PM	5.518	3.312	21.446	9.277	0.055
2/21/96	2:10:00 PM	11.092	4.199	21.458	9.074	0.08
2/21/96	2:11:00 PM	13.322	3.809	21.456	8.545	0.068
2/21/96	2:12:00 PM	4.663	3.06	21.46	7.853	0.054
2/21/96	2:13:00 PM	5.688	3.491	21.478	7.243	0.054
2/21/96	2:14:00 PM	15.324	4.769	21.442	7.324	0.088
2/21/96	2:15:00 PM	9.163	3.377	21.464	6.632	0.059
2/21/96	2:16:00 PM	4.468	3.524	21.499	6.104	0.049
2/21/96	2:17:00 PM	7.275	4.134	21.46	6.348	0.068
2/21/96	2:18:00 PM	16.512	4.883	21.456	6.388	0.083
2/21/96	2:19:00 PM	6.877	3.442	21.458	6.388	0.049
2/21/96	2:20:00 PM	4.793	3.646	21.464	5.208	0.06
2/21/96	2:21:00 PM	9.147	4.541	21.444	4.842	0.08
2/21/96	2:22:00 PM	16.178	4.679	21.448	5.534	0.083
2/21/96	2:23:00 PM	5.599	3.597	21.44	4.801	0.063
2/21/96	2:24:00 PM	5.77	4.061	21.452	4.761	0.054
2/21/96	2:25:00 PM	11.597	5.037	21.448	5.086	0.091
2/21/96	2:26:00 PM	14.119	4.631	21.438	5.493	0.085
2/21/96	2:27:00 PM	4.997	3.931	21.44	5.168	0.059
2/21/96	2:28:00 PM	5.892	4.451	21.417	5.33	0.067
2/21/96	2:29:00 PM	16.243	5.672	21.409	5.819	0.094
2/21/96	2:30:00 PM	10.563	4.289	21.407	5.819	0.072
2/21/96	2:31:00 PM	5.135	4.248	21.409	5.127	0.063
2/21/96	2:32:00 PM	8.512	4.98	21.448	5.168	0.085
2/21/96	2:33:00 PM	18.156	5.868	21.45	6.836	0.103
2/21/96	2:34:00 PM	8.122	4.557	21.446	8.464	0.068
2/21/96	2:35:00 PM	5.754	4.81	21.44	10.417	0.065
2/21/96	2:36:00 PM	10.482	5.754	21.411	11.922	0.08
2/21/96	2:37:00 PM	17.668	5.916	21.417	12.126	0.086
2/21/96	2:38:00 PM	6.372	4.94	21.421	10.62	0.057
2/21/96	2:39:00 PM	6.079	5.339	21.289	9.603	0.06
2/21/96	2:40:00 PM	12.215	6.234	21.171	9.033	0.085
2/21/96	2:41:00 PM	15.194	5.68	21.159	8.748	0.067
2/21/96	2:42:00 PM	5.371	4.94	21.2	7.731	0.065
2/21/96	2:43:00 PM	6.299	5.404	21.155	7.284	0.076
2/21/96	2:44:00 PM	16.699	6.543	21.155	7.121	0.096
2/21/96	2:45:00 PM	11.385	5.233	21.171	7.08	0.063
2/21/96	2:46:00 PM	5.501	5.119	21.177	6.429	0.068
2/21/96	2:47:00 PM	8.781	5.957	21.143	7.65	0.08

LP/HAYWARD
Line 1 Press RTO Inlet
Test 13 Run 2

2/21/96	2:48:00 PM	18.197	6.689	21.161	8.83	0.099
2/21/96	2:49:00 PM	7.812	5.111	21.145	8.586	0.067
2/21/96	2:50:00 PM	5.566	5.412	21.183	8.301	0.054
2/21/96	2:51:00 PM	10.62	6.185	21.149	8.179	0.093
2/21/96	2:52:00 PM	17.684	6.396	21.155	8.789	0.073
2/21/96	2:53:00 PM	6.616	5.192	21.163	8.708	0.059
2/21/96	2:54:00 PM	6.624	5.648	21.161	8.911	0.067
2/21/96	2:55:00 PM	13.232	6.51	21.167	8.911	0.096
2/21/96	2:56:00 PM	15.454	5.957	21.149	8.219	0.078
2/21/96	2:57:00 PM	5.615	5.176	21.155	6.795	0.057
2/21/96	2:58:00 PM	6.608	5.623	21.153	6.429	0.067
2/21/96	2:59:00 PM	17.301	6.86	21.139	6.226	0.094
2/21/96	3:00:00 PM	12.101	5.566	21.136	5.981	0.063
AVERAGES		**9.8**	**4.8**	**21.3**	**7.5**	**0.1**
ppmc,w =		**29.4**				

LP/HAYWARD
Line 1 Press RTO Inlet
Test 13 Run 3

DATE	TIME	THC	NOX	O2	CO	CO2
2/21/96	3:36:38 PM	21.126	4.191	21.236	5.412	0.103
2/21/96	3:37:38 PM	10.75	2.344	21.257	4.72	0.073
2/21/96	3:38:38 PM	5.697	2.458	21.259	4.191	0.057
2/21/96	3:39:38 PM	11.174	3.605	21.244	4.801	0.078
2/21/96	3:40:38 PM	21.916	4.134	21.248	5.615	0.096
2/21/96	3:41:38 PM	7.878	2.563	21.224	5.046	0.065
2/21/96	3:42:38 PM	5.77	2.848	21.263	4.354	0.083
2/21/96	3:43:38 PM	12.85	3.988	21.273	4.232	0.104
2/21/96	3:44:38 PM	23.242	4.232	21.263	4.069	0.112
2/21/96	3:45:38 PM	7.08	2.686	21.285	3.377	0.08
2/21/96	3:46:38 PM	7.373	3.141	21.259	3.784	0.086
2/21/96	3:47:38 PM	16.447	4.427	21.254	4.557	0.101
2/21/96	3:48:38 PM	19.922	3.597	21.254	5.046	0.098
2/21/96	3:49:38 PM	6.266	2.694	21.244	4.476	0.08
2/21/96	3:50:38 PM	8.577	3.296	21.254	4.476	0.081
2/21/96	3:51:38 PM	22.925	4.574	21.246	4.883	0.104
2/21/96	3:52:38 PM	12.459	3.027	21.254	4.883	0.08
2/21/96	3:53:38 PM	6.356	2.865	21.24	4.15	0.075
2/21/96	3:54:38 PM	11.548	3.524	21.23	3.988	0.076
2/21/96	3:55:38 PM	23.722	4.232	21.214	4.272	0.099
2/21/96	3:56:38 PM	8.683	2.604	21.23	4.15	0.057
2/21/96	3:57:38 PM	5.924	2.783	21.214	3.784	0.063
2/21/96	3:58:38 PM	12.362	3.646	21.228	4.15	0.09
2/21/96	3:59:38 PM	24.959	4.012	21.244	4.191	0.09
2/21/96	4:00:38 PM	7.365	2.596	21.24	3.703	0.067
2/21/96	4:01:38 PM	7.121	2.938	21.214	2.93	0.067
2/21/96	4:02:38 PM	15.885	3.866	21.232	2.93	0.088
2/21/96	4:03:38 PM	21.908	3.434	21.228	2.889	0.085
2/21/96	4:04:38 PM	6.592	2.515	21.234	2.238	0.063
2/21/96	4:05:38 PM	8.545	3.084	21.216	2.36	0.072
2/21/96	4:06:38 PM	22.811	4.224	21.208	2.726	0.096
2/21/96	4:07:38 PM	14.079	2.873	21.216	2.808	0.078
2/21/96	4:08:38 PM	6.527	2.604	21.212	1.912	0.062
2/21/96	4:09:38 PM	11.239	3.296	21.21	2.035	0.078
2/21/96	4:10:38 PM	24.479	4.028	21.226	1.79	0.094
2/21/96	4:11:38 PM	9.399	2.515	21.21	1.79	0.07
2/21/96	4:12:38 PM	5.99	2.637	21.216	1.383	0.063
2/21/96	4:13:38 PM	11.41	3.361	21.204	1.465	0.076
2/21/96	4:14:38 PM	25.708	3.971	21.198	1.668	0.096
2/21/96	4:15:38 PM	7.959	2.441	21.198	1.953	0.065
2/21/96	4:16:38 PM	7.259	2.816	21.208	1.79	0.072
2/21/96	4:17:38 PM	14.982	3.695	21.191	1.668	0.076
2/21/96	4:18:38 PM	21.883	3.459	21.2	1.994	0.083
2/21/96	4:19:38 PM	6.828	2.62	21.189	1.383	0.072
2/21/96	4:20:38 PM	8.081	3.068	21.212	1.383	0.065
2/21/96	4:21:38 PM	20.809	3.931	21.21	1.587	0.09
2/21/96	4:22:38 PM	14.998	3.092	21.185	2.116	0.076

LP/HAYWARD
Line 1 Press RTO Inlet
Test 13 Run 3

2/21/96	4:23:38 PM	6.527	2.873	21.2	2.035	0.057
2/21/96	4:24:38 PM	10.352	3.556	21.195	2.97	0.072
2/21/96	4:25:38 PM	23.503	4.329	21.193	3.337	0.096
2/21/96	4:26:38 PM	9.595	2.84	21.193	2.563	0.065
2/21/96	4:27:38 PM	5.851	3.019	21.198	2.116	0.062
2/21/96	4:28:38 PM	10.994	3.743	21.173	2.238	0.08
2/21/96	4:29:38 PM	24.202	4.183	21.202	2.238	0.094
2/21/96	4:30:38 PM	7.764	2.759	21.187	1.75	0.055
2/21/96	4:31:38 PM	6.519	3.133	21.202	1.261	0.065
2/21/96	4:32:38 PM	13.558	4.102	21.2	1.831	0.091
2/21/96	4:33:38 PM	21.387	3.743	21.198	2.319	0.083
2/21/96	4:34:38 PM	6.437	2.686	21.169	0.977	0.059
2/21/96	4:35:38 PM	7.658	3.174	21.185	1.139	0.063
AVERAGES		**12.9**	**3.3**	**21.2**	**3**	**0.1**
ppmc,w =		**38.7**				

LP/HAYWARD
Line 1 Thermal Oil Heater
Test 18 Run 1

DATE	TIME	NOX	O2	CO	CO2
2/22/96	9:00:20 AM	98.612	12.651	40.812	8.013
2/22/96	9:01:20 AM	97.799	12.919	40.568	7.816
2/22/96	9:02:20 AM	90.535	12.437	100.464	8.252
2/22/96	9:03:20 AM	85.693	12.124	212.118	8.569
2/22/96	9:05:00 AM	90.983	12.97	479.167	7.653
2/22/96	9:06:00 AM	88.969	13.934	106.934	6.696
2/22/96	9:07:00 AM	84.839	14.518	114.095	6.19
2/22/96	9:08:00 AM	82.703	15.074	197.591	5.685
2/22/96	9:09:00 AM	82.987	15.186	248.291	5.563
2/22/96	9:10:00 AM	75.358	15.719	327.311	5.005
2/22/96	9:11:00 AM	74.707	15.928	489.909	4.824
2/22/96	9:12:00 AM	79.325	15.651	440.104	5.133
2/22/96	9:13:00 AM	85.856	14.939	321.696	5.884
2/22/96	9:14:00 AM	89.925	13.824	141.764	6.865
2/22/96	9:15:02 AM	87.992	13.588	114.909	6.971
2/22/96	9:16:02 AM	91.349	14.087	109.863	6.593
2/22/96	9:17:02 AM	91.349	13.999	81.299	6.667
2/22/96	9:18:02 AM	86.995	14.311	93.424	6.367
2/22/96	9:19:02 AM	87.667	14.577	159.017	6.147
2/22/96	9:20:02 AM	88.623	14.585	125.326	6.117
2/22/96	9:21:02 AM	83.944	15.096	140.381	5.64
2/22/96	9:22:02 AM	82.214	15.12	181.234	5.695
2/22/96	9:23:02 AM	86.324	14.838	181.315	5.952
2/22/96	9:24:02 AM	89.437	14.606	187.826	6.087
2/22/96	9:25:02 AM	86.182	15.106	195.557	5.664
2/22/96	9:26:02 AM	96.7	14.229	264.974	6.522
2/22/96	9:27:02 AM	95.601	13.67	101.969	6.956
2/22/96	9:28:02 AM	93.608	13.731	121.501	6.912
2/22/96	9:29:02 AM	91.39	14.183	160.726	6.491
2/22/96	9:30:02 AM	89.742	14.276	257.08	6.462
2/22/96	9:31:02 AM	92.651	13.357	253.255	7.345
* 2/22/96	9:32:02 AM	22.746	19.371	124.268	1.683
2/22/96	9:33:02 AM	85.449	14.665	136.23	6.125
2/22/96	9:34:02 AM	83.13	14.903	257.975	5.84
2/22/96	9:35:02 AM	82.072	15.255	231.934	5.527
2/22/96	9:36:02 AM	86.629	14.836	245.687	5.973
2/22/96	9:37:02 AM	91.634	13.812	151.204	6.87
2/22/96	9:38:02 AM	91.512	13.936	130.29	6.706
2/22/96	9:39:02 AM	87.728	14.51	152.588	6.143
2/22/96	9:40:02 AM	83.049	15.442	188.395	5.335
2/22/96	9:41:02 AM	84.005	15.363	257.324	5.402
2/22/96	9:42:02 AM	79.793	15.562	282.796	5.21
2/22/96	9:43:02 AM	79.224	15.576	322.184	5.187
2/22/96	9:44:02 AM	82.581	15.558	306.966	5.257
2/22/96	9:45:02 AM	88.114	15.324	198.161	5.496
2/22/96	9:46:02 AM	98.694	14.292	168.701	6.504
2/22/96	9:47:02 AM	101.807	13.312	73.324	7.282

LP/HAYWARD

Line 1 Thermal Oil Heater

Test 18 Run 1

2/22/96	9:48:02 AM	97.961	13.93	88.46	6.639
2/22/96	9:49:02 AM	92.631	14.779	128.662	5.949
2/22/96	9:50:02 AM	96.334	14.577	208.903	6.172
2/22/96	9:51:02 AM	91.41	14.901	190.592	5.807
2/22/96	9:52:02 AM	94.889	14.156	255.941	6.621
2/22/96	9:53:02 AM	90.495	13.536	96.273	7.051
2/22/96	9:54:02 AM	93.262	13.936	94.401	6.74
2/22/96	9:55:02 AM	99.731	13.574	90.007	7.064
2/22/96	9:56:02 AM	101.664	13.595	98.145	7.031
2/22/96	9:57:02 AM	105.103	13.255	86.751	7.384
2/22/96	9:58:02 AM	98.165	13.548	97.412	7.07
2/22/96	9:59:02 AM	93.852	14.103	94.808	6.584
2/22/96	10:00:02 AM	99.264	14.052	90.82	6.629
2/22/96	10:01:02 AM	96.212	14.178	95.866	6.514
2/22/96	10:02:02 AM	102.458	13	89.925	7.772
2/22/96	10:03:02 AM	100.932	12.392	81.217	8.317
2/22/96	10:04:02 AM	96.395	11.991	167.074	8.732
AVERAGES		**90.3**	**14.2**	**177.0**	**6.5**
* Port Change - Data Not Used in Calculation of Averages					

LP/HAYWARD
Line 1 Thermal Oil Heater
Test 18 Run 2

DATE	TIME	NOX	O2	CO	CO2
2/22/96	10:53:30 AM	83.476	13.942	55.013	6.313
2/22/96	10:54:30 AM	88.013	13.405	66.488	6.88
2/22/96	10:55:30 AM	91.288	12.506	83.577	7.76
2/22/96	10:56:30 AM	92.529	12.712	77.148	7.539
2/22/96	10:57:30 AM	95.154	12.02	76.009	8.332
2/22/96	10:58:30 AM	94.137	11.912	139.811	8.343
2/22/96	10:59:30 AM	100.444	11.452	253.581	8.887
2/22/96	11:00:30 AM	100.749	10.848	194.661	9.427
2/22/96	11:01:30 AM	99.121	10.718	194.255	9.52
2/22/96	11:02:30 AM	84.961	10.846	1003.906	9.25
2/22/96	11:03:30 AM	80.566	11.194	2009.603	8.823
2/22/96	11:04:30 AM	96.069	11.886	1348.389	8.324
2/22/96	11:05:30 AM	100.301	12.28	154.053	7.899
2/22/96	11:06:30 AM	104.533	11.8	71.94	8.587
2/22/96	11:07:30 AM	102.987	11.058	106.283	9.211
2/22/96	11:08:30 AM	102.478	11.41	152.588	8.768
2/22/96	11:09:30 AM	100.199	12.406	70.638	7.775
2/22/96	11:10:30 AM	103.455	12.335	86.995	8.032
2/22/96	11:11:30 AM	103.048	11.051	330.16	9.183
2/22/96	11:12:30 AM	105.042	11.31	170.41	8.984
2/22/96	11:13:30 AM	105.896	11.503	81.787	8.714
2/22/96	11:14:30 AM	106.588	11.072	83.74	9.194
2/22/96	11:15:30 AM	98.348	11.279	157.715	8.867
2/22/96	11:16:30 AM	94.584	11.743	118.083	8.527
2/22/96	11:17:30 AM	92.428	12.567	94.808	7.443
2/22/96	11:18:30 AM	101.379	13.013	97.738	7.241
2/22/96	11:19:30 AM	103.088	12.614	92.773	7.588
2/22/96	11:20:30 AM	102.437	12.683	68.604	7.454
2/22/96	11:21:30 AM	103.516	12.596	77.393	7.765
2/22/96	11:22:30 AM	107.259	11.058	105.794	9.22
2/22/96	11:23:30 AM	101.664	10.168	96.598	10.07
2/22/96	11:24:30 AM	95.683	10.077	283.61	10.05
2/22/96	11:25:30 AM	19.328	16.99	1009.521	2.692
2/22/96	11:26:30 AM	97.778	13.865	86.67	7.116
2/22/96	11:27:30 AM	88.603	12.878	110.921	7.214
2/22/96	11:28:30 AM	89.823	13.208	76.497	6.943
2/22/96	11:29:30 AM	95.133	12.531	55.42	7.798
2/22/96	11:30:30 AM	96.497	12.201	71.615	8.021
2/22/96	11:31:30 AM	104.614	11.542	69.824	8.781
2/22/96	11:32:30 AM	104.899	11.416	84.229	8.783
2/22/96	11:33:30 AM	99.223	12.197	97.005	7.868
2/22/96	11:34:30 AM	95.459	12.61	110.352	7.664
2/22/96	11:35:30 AM	96.069	12.225	65.837	7.876
2/22/96	11:36:30 AM	99.569	12.488	84.798	7.775
2/22/96	11:37:30 AM	102.478	11.631	76.904	8.581
2/22/96	11:38:30 AM	102.234	12.244	70.719	7.952
2/22/96	11:39:30 AM	102.437	11.646	73.975	8.639

LP/HAYWARD
Line 1 Thermal Oil Heater
Test 18 Run 2

2/22/96	11:40:30 AM	97.168	10.445	399.333	9.85
2/22/96	11:41:30 AM	101.929	10.687	377.686	9.357
2/22/96	11:42:30 AM	101.156	11.359	93.831	8.895
2/22/96	11:43:30 AM	103.231	11.473	64.046	8.74
2/22/96	11:44:30 AM	102.336	11.251	83.333	8.963
2/22/96	11:45:30 AM	103.658	11.076	251.872	9.199
2/22/96	11:46:30 AM	101.44	10.626	84.391	9.578
2/22/96	11:47:30 AM	102.254	11.043	126.709	9.102
2/22/96	11:48:30 AM	101.99	11.558	79.997	8.59
2/22/96	11:49:30 AM	100.199	12.122	60.547	8.097
2/22/96	11:50:30 AM	99.325	11.914	55.257	8.325
2/22/96	11:51:30 AM	100.118	10.836	67.627	9.471
2/22/96	11:52:30 AM	100.932	10.439	318.115	9.652
2/22/96	11:53:30 AM	92	10.671	1491.862	9.321
2/22/96	11:54:30 AM	100.586	10.659	1880.778	9.502
2/22/96	11:55:30 AM	105.123	11.279	357.585	8.893
2/22/96	11:56:30 AM	99.386	12.044	83.415	8.055
2/22/96	11:57:30 AM	100.728	12.484	72.184	7.733
AVERAGES		**97.7**	**11.8**	**247.6**	**8.4**

LP/HAYWARD
Line 1 Thermal Oil Heater
Test 18 Run 3

DATE	TIME	NOX	O2	CO	CO2
2/22/96	1:03:44 PM	71.94	15.057	93.343	5.719
2/22/96	1:04:44 PM	69.906	15.23	91.553	5.557
2/22/96	1:05:44 PM	72.225	15.19	92.041	5.649
2/22/96	1:06:44 PM	70.618	15.2	83.496	5.583
2/22/96	1:07:44 PM	71.96	15.42	107.666	5.443
2/22/96	1:08:44 PM	77.677	15.035	107.666	5.773
2/22/96	1:09:44 PM	78.023	14.921	89.274	5.851
2/22/96	1:10:44 PM	78.918	14.96	93.587	5.881
2/22/96	1:11:44 PM	82.967	14.421	79.102	6.367
2/22/96	1:12:44 PM	77.189	14.671	60.059	6.061
2/22/96	1:13:44 PM	84.249	14.463	81.299	6.382
2/22/96	1:14:44 PM	88.684	13.662	78.695	7.15
2/22/96	1:15:44 PM	88.562	12.148	352.865	8.543
2/22/96	1:16:44 PM	88.46	13.017	282.064	7.505
2/22/96	1:17:44 PM	83.618	13.863	72.021	6.8
2/22/96	1:18:44 PM	90.495	13.143	62.256	7.699
2/22/96	1:19:44 PM	96.639	11.979	73.812	8.669
2/22/96	1:20:44 PM	91.227	12.667	64.372	7.979
2/22/96	1:21:44 PM	93.811	12.233	110.352	8.522
2/22/96	1:22:44 PM	89.722	12.762	93.587	7.837
2/22/96	1:23:44 PM	90.759	12.933	56.396	7.79
2/22/96	1:24:44 PM	90.312	12.988	71.777	7.707
2/22/96	1:25:44 PM	87.992	13.133	62.174	7.513
2/22/96	1:26:44 PM	85.164	13.507	68.115	7.126
2/22/96	1:27:44 PM	87.321	13.552	75.195	7.134
2/22/96	1:28:44 PM	91.064	13.188	52.653	7.505
2/22/96	1:29:44 PM	92.021	12.644	49.723	8.029
2/22/96	1:30:44 PM	96.008	12.887	61.849	7.842
2/22/96	1:31:44 PM	93.933	12.168	148.763	8.53
2/22/96	1:32:44 PM	90.963	13.017	230.713	7.643
2/22/96	1:33:44 PM	88.481	13.098	91.797	7.541
2/22/96	1:34:44 PM	43.62	15.843	96.68	4.396
2/22/96	1:35:44 PM	78.084	15.761	41.341	6.025
2/22/96	1:36:44 PM	96.415	11.619	167.725	9.132
2/22/96	1:37:44 PM	96.354	11.637	857.015	8.856
2/22/96	1:38:44 PM	89.05	13.082	230.225	7.531
2/22/96	1:39:44 PM	92.244	13.021	77.962	7.669
2/22/96	1:40:44 PM	93.689	12.828	68.278	7.904
2/22/96	1:41:44 PM	98.287	12.17	68.441	8.547
2/22/96	1:42:44 PM	98.124	11.963	67.22	8.781
2/22/96	1:43:44 PM	95.479	11.613	259.766	8.978
2/22/96	1:44:44 PM	90.698	12.201	109.782	8.499
2/22/96	1:45:44 PM	93.018	11.961	63.558	8.77
2/22/96	1:46:44 PM	99.487	11.945	61.279	8.765
2/22/96	1:47:44 PM	101.054	11.326	134.277	9.386
2/22/96	1:48:44 PM	97.026	11.652	433.024	8.931
2/22/96	1:49:44 PM	94.442	11.82	108.724	8.869

LP/HAYWARD
Line 1 Thermal Oil Heater
Test 18 Run 3

2/22/96	1:50:44 PM	94.686	11.934	129.15	8.7
2/22/96	1:51:44 PM	98.674	12.433	71.208	8.201
2/22/96	1:52:44 PM	95.072	13.131	63.639	7.585
2/22/96	1:53:44 PM	97.921	12.394	75.114	8.312
2/22/96	1:54:44 PM	98.124	12.433	58.675	8.304
2/22/96	1:55:44 PM	97.717	11.851	59.001	8.88
2/22/96	1:56:44 PM	98.999	11.568	57.699	9.115
2/22/96	1:57:44 PM	94.666	12.164	52.165	8.449
2/22/96	1:58:44 PM	96.598	12.268	59.896	8.429
2/22/96	1:59:44 PM	96.517	12.413	62.174	8.289
2/22/96	2:00:44 PM	97.209	12.309	68.522	8.496
2/22/96	2:01:44 PM	100.301	10.895	78.613	9.744
2/22/96	2:02:44 PM	103.109	11.422	62.581	9.124
2/22/96	2:03:44 PM	103.943	11.753	71.859	8.952
AVERAGES		**89.7**	**13.0**	**114.0**	**7.7**

APPENDIX G

MEASUREMENT SYSTEM PERFORMANCE SPECIFICATIONS

INTERPOLL LABORATORIES, INC
(612) 786-6020

EPA Method 25 A
Calibration Error Check & Drift Determination

Job L.P. / Hayward, WI

Test 1 Run 0 Date 2-19-96

Operator M. Kaehler

THC Calibration (Low Range): **Time (HRS)**_____

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	0	0	0	100	0
Low Level	30.4	30	.4	100	.4
Mid Level	300	295	5	1,000	.5
High Level	2990	3029	39	10,000	.39

THC Calibration (High Range): **Time (HRS)**_____

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	0				
Span					

O_2 Calibration: **Time (HRS)**_____

***	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	Percent of Span
Zero Gas	0				
Mid Level					
High Level					

CO_2 Calibration: **Time: (HRS)**_____

***	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	Percent of Span
Zero Gas	0				
Mid Level					
High Level					

Must be within 2% of the span for each calibration gas.

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: G.P./Hammond, WI
Source: RTO Dryer / Stack
Test: 6 Run 0 Date 2-20-96
Stack Dimen.: 81.5 IN.
Dry Bulb: ____ °F Wet bulb: ____ °F
Manometer: ☐ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: ____ IN.HG
Static Pressure: ____ IN.WC
Operators: M. Kaufhold & T. Lorenz
Pitot No.: INST C_p NA

Drawing of Test Site

Cross-section View	Elevation View

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 6.25 IN.		Time Start: NA HRS	
1	1/6	13.58	19.83		
2	3/6	40.75	47.00		
3	5/6	67.92	74.17		
	ALL RUNS SIMULTANEOUS				
	WITH PARTICULATE				

INTERPOLL LABORATORIES, INC
(612) 786-6020

NOx Cal Drift Check

Job L.P. / Hayward, WI
Test 6 Run 1, 2, 3 Date 2-20-96
Operator M. Koehler

Source Dryer RTO
Site Stack

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Analyzer Resp (PPM) Final	C_o	C_m	C_{gas}
1	21.3	Zero Gas	0	0	2	1		20.7
		Upscale	142	142	139		140.5	
2	17.3	Zero Gas	0	2	1	1.5		18.1
		Upscale	142	139	140		139.5	
3	19.3	Zero Gas	0	1	MK 2-1	0		20.2
		Upscale	142	MK 2140	144		142	
4		Zero Gas	0					
		Upscale						
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

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INTERPOLL LABORATORIES, INC
(612) 786-6020

CO Cal Drift Check

Job L.P. / Hayward, WI
Test 6 Run 1, 2, 3 Date 2-20-96
Operator M. Kaehler

Source Dryer RTO
Site Stack

Run	C̄	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Analyzer Resp (PPM) Final	C_o	C_m	C_{gas}
1	193.3	Zero Gas	0	0	6	3		
		Upscale	289	290	298		294	179
2	232.8	Zero Gas	0	6	2	4		
		Upscale	289	298	302		300	225
3	205.7	Zero Gas	0	2	4	3		
		Upscale	289	296	290		293	203
4		Zero Gas	0					
		Upscale						
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

INTERPOLL LABORATORIES, INC
(612) 786-6020

CO_2 Cal Drift Check

Job: K.P. / Hammond, WI — Source: Dryer RTO
Test: G — Run: 1, 2, 3 — Date: 2-20-96 — Site: Stack
Operator: M. Kaeckler

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		C_o	C_m	C_{gas}
				Initial	Final			
1	4.1	Zero Gas	0	0.0	0.2	0.1		4.2
		Upscale	10.9	10.9	10.8		10.65	
2	3.4	Zero Gas	0	0.2	0.1	0.15		3.5
		Upscale	10.9	10.8	10.7		10.75	
3	4.2	Zero Gas	0	0.1	0.2	0.15		4.2
		Upscale	10.9	10.7	11.2		10.95	
4		Zero Gas	0					
		Upscale						
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

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INTERPOLL LABORATORIES, INC
(612) 786-6020

O2 Cal Drift Check

Job L.P. / Hayward, WI
Test 6 Run 1, 2, 3 Date 2-20-96
Operator M. Kuehler

Source Dryer RTO / Stack
Site Stack

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		C_o	C_m	C_{gas}
				Initial	Final			
1	16.3	Zero Gas	0	0.0	-0.2	-0.1		16.2
		Upscale	13.0	13.0	13.2		13.1	
2	16.9	Zero Gas	0	0.0	0.0	0.0		16.9
		Upscale	13.0	13.1	12.9		13.0	
3	16.2	Zero Gas	0	0.0	~~-0.1~~ 0.0	-0.05		16.3
		Upscale	13.0	12.9	13.0		12.95	
4		Zero Gas	0					
		Upscale						
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

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INTERPOLL LABORATORIES, INC
(612) 786-6020

System Bias Check

Job L.P. / Hayward, WI Source Dryer- RTO / Stack
Test 6 Run 0 Date 2-20-96 Site Stack
Operator M. Koehler

Instrument	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		Diff. CE-SB (PPM)	Span Val. (PPM)	% of Span
			Cal. Err.	Sys. Bias			
O_2	Zero Gas	0	0.0	.1	.1	25.0	.40
	Upscale	13.0	13.0	13.0	0	25.0	0
CO_2	Zero Gas	0	0.0	.1	.1	20.0	.50
	Upscale	10.9	11.0	11.0	0	20.0	0
CO	Zero Gas	0	0	0	0	1000	0
	Upscale	289	289	286	3	1.000	.30
NOx	Zero Gas	0	1	2	1	500	.20
	Upscale	142	142	135	7	500	1.40
THC	Zero Gas	0	0	0	0	100	0
	Upscale	30.4	30	29	1	100	.1
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Calibration Error Check

Job LP HAYWARD

Test 7 Run _____ Date 2-20-96

Operator S. BAINVILLE

SO_2 Calibration: Time (HRS)_____

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	ø				
Mid Level					
High Level					

NO_x Calibration: Time (HRS)_____

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	ø	.41	.41	500	.0008
Mid Level	145	149.34	.66	500	.0013
High Level	240	239.66	.34	500	.0067

O_2 Calibration: Time (HRS)_____

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	ø	.08	.08	25	.003
Mid Level	13.1	13.0	.1	25	.004
High Level	21.0	20.96	.04	25	.002

CO_2 Calibration Time (HRS)_____

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	ø	.02	.02	20	.001
Mid Level	10.5	10.35	.15	20	.008
High Level	16.8	16.83	.03	20	.002

CO Calibration Time (HRS)_____

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	ø	.51	.51	1000	.0005
Mid Level	147.	143.30	3.7	1000	.0037
High Level	299.	300.5	1.5	1000	.0015

INTERPOLL LABORATORIES, INC.
(6120 786-6020

EPA Method 6C/7E Response Time

Job U.P. / Hayward, WI
Source RTO Dryer / Stack
Date of Test 2-20-96

Technician Mark Gaebler
System Flow Rate 4000 cc/min

Moisture removal: Via Model MK-1 Condenser

	Response Time (secs)		
Analyzer Type	~~SO_2~~/NO_x	O_2	CO_2
Analyzer S/N			
Analyzer Range	500	25.0	20.0
High Level Span Gas Conc. (PPM or %)	142	13.0	10.9
Upscale 1	57	59	63
Upscale 2	55	52	65
Upscale 3	61	55	60
Average	57.67	55.33	62.67
Downscale 1	51	58	63
Downscale 2	60	50	68
Downscale 3	64	55	65
Average	58.33	54.33	65.33

System response time 58.94 seconds

1. Introduce gases at the 3-way valve on the probe. Use zero and stack gas for the upscale tests and high-level span gas and stack gas for the downscale tests. Alternatively, use zero and high-level gases for a more stringent test. Record the time in seconds from the moment of introduction until a stable response is achieved.
2. The response time test need only be conducted prior to the initial field use of the measurement system.
3. Attach a copy of the flow system schematic to this test.

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Calibration Error Check

Job L.P. / Hayward, WI

Test 6 Run 0 Date 2-19-96

Operator M. Kuehler

SO_2 Calibration: Time (HRS) _____

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	ø				
Mid Level					
High Level					

NO_x Calibration: Time (HRS) 2000

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	ø	1.0	1	500	.20
Mid Level	142	142	0	500	0
High Level	239	242	3	500	.60

O_2 Calibration: Time (HRS) 2000

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	ø	0.0	0	25.0	0
Mid Level	13.0	13.0	0	25.0	0
High Level	21.0	21.0	0	25.0	0

CO_2 Calibration Time (HRS) 2000

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	ø	0.0	0	20.0	0
Mid Level	10.9	11.0	.1	20.0	.01
High Level	17.0	17.0	0	20.0	0

CO Calibration Time (HRS) 2000

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	ø	0	0	1,000	0
Mid Level	209	209	0	1,000	0
High Level	620	612	8	1,000	.80

INTERPOLL LABORATORIES, INC
(612) 786-6020

T/HC Cal Drift Check

Job L.P. / Hayward, Wi. Source Dryer RTO
Test 6 Run 1, 2, 3 Date 2-20-96 Site Stack
Operator M. Knehler

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		C_o	C_m	C_{gas}
				Initial	Final			
1		Zero Gas	0	0	0	0		
		Upscale	30.4	30	32		31	
2		Zero Gas	0	0	-1	-0.5		
		Upscale	30.4	30	32		31	
3		Zero Gas	0	0	-1	-0.5		
		Upscale	30.4	30	31		30.5	
4		Zero Gas	0					
		Upscale						
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

INTERPOLL LABORATORIES, INC
(612) 786-6020

NOX Cal Drift Check

Job LP/HAYWARD
Test 7 Run _____ Date 2-20-96
Operator _____

Source LINE No. 1 CORE DRYER
Site OUTLET

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		C_o	C_m	C_{gas}
				Initial	Final			
1	36.0	Zero Gas	0	2.14	2.54	234		
		Upscale	240	239.87	247.03		243.45	35.3
2	37.9	Zero Gas	0	2.54	1.27	1.88		
		Upscale	240	240.46	245.97		243.23	37.9
3	35.4	Zero Gas	0	1.27	0	.61		
		Upscale	240	241.70	241.70		241.70	35.7
4		Zero Gas	0					
		Upscale						
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC
(612) 786-6020

CO Cal Drift Check

Job LP/MAYWOOD
Test 3 Run ____ Date 2-20-96
Operator I-BAINVILLE
Source INC NO 1 CONC DRYER
Site OUTLET

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Analyzer Resp (PPM) Final	C_o	C_m	C_{gas}
1	667.4	Zero Gas	0	1.02	1.22	1.12		668.7
		Upscale	299	299.07	297.85		298.46	
2	907.5	Zero Gas	0	1.22	0	.61		909.8
		Upscale	299	297.85	297.85		297.85	
3	774.6	Zero Gas	0	0	0	0		777.6
		Upscale	299	297.85	297.85		897.85	
4		Zero Gas	0					
		Upscale						
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

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INTERPOLL LABORATORIES, INC
(612) 786-6020

CO2 Cal Drift Check

Job: LP / HAY WAND
Test: 7 Run: Date: 2-20-96
Operator: J - BAIR-VILLE
Source: LINE NO 1 CONC DRYER
Site: OUTLET

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		C_o	C_m	C_{gas}
				Initial	Final			
1	4.5	Zero Gas	0	0	.02	.01		4.5
		Upscale	10.5	10.50	10.45		10.47	
2	4.6	Zero Gas	0	.02	0	.01		4.6
		Upscale	10.5	10.45	10.45		10.45	
3	4.7	Zero Gas	0	0	0	0		4.7
		Upscale	10.5	10.45	10.45		10.45	
4		Zero Gas	0					
		Upscale						
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

INTERPOLL LABORATORIES, INC
(612) 786-6020

O2 Cal Drift Check

Job: LD HAYWARD Source: LINE NO. 1 CINCINNATI
Test: 7 Run: Date: 2-20-96 Site: OUTLET
Operator: J. BAI-VILLE

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		C_o	C_m	C_{gas}
				Initial	Final			
1	16.4	Zero Gas	0	.02	.08	.05		16.4
		Upscale	13.1	13.11	13.11		13.11	
2	16.3	Zero Gas	0	.08	C	.04		16.2
		Upscale	13.1	13.11	13.17		13.14	
3	16.2	Zero Gas	0	0	0	0		16.0
		Upscale	13.1	13.17	13.39		13.28	
4		Zero Gas	0					
		Upscale						
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

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INTERPOLL LABORATORIES, INC
(612) 786-6020

THC System Bias Check

Job LP HAYWARD Source ONYX E TUBE INLET

Test _____ Run _____ Date 2-20-96 Site INLET

Operator J. BAINVILLE L. HANSON

Instrument	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		Diff. CE-SB (PPM)	Span Val. (PPM)	% of Span
			Cal. Err.	Sys. Bias			
	Zero Gas	0	1.18	8.54	7.36	1000	0.74
	Upscale	286	289	282	7.00	1000	0.70
	Zero Gas	0	2.44	.98	1.46	1000	0.14
	Upscale	286	281.98	280.27	1.71	1000	0.17
	Zero Gas	0	.98	0	.98	1000	0.1
	Upscale	286	280.27	281.98	1.71	1000	0.17
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						

*** Must be within 5% of the span for the zero or upscale cal. gas.

070595-CASTACK.WP\FORMS\S-362

INTERPOLL LABORATORIES, INC
(612) 786-6020

THC Cal Drift Check

Job LP/HAYWARD
Test 7 Run ____ Date 2-20-96
Operator J.B.

Source LINE No. 1 CORE
Site DRYER OUTLET

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		C_o	C_m	C_{gas}
				Initial	Final			
1		Zero Gas	0	6.5	8.54	7.52		
		Upscale	286	286	281.95		283.99	
2		Zero Gas	0	2.44	.98	1.71		
		Upscale	286	281.95	280.27		281.13	
3		Zero Gas	0	.98	0	.49		
		Upscale	286	280.27	281.98		281.13	
4		Zero Gas	0					
		Upscale						
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC
(612) 786-6020

EPA Method 25 A
Calibration Error Check & Drift Determination

Job LP HAYWARD

Test #7 Run _____ Date 2-20-96

Operator S. BAINVILLE

THC Calibration (Low Range): Time (HRS)_____

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	0	1.18	1.18	100	1.18
Low Level	30.5	31.29	.79	100	.79
Mid Level	286	289	3	1000	.3
High Level	2960	2991	31	10,000	.31

THC Calibration (High Range): Time (HRS)_____

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	0	1.18	1.18	10,000	.01
Span	2960	2991	31	10,000	.31

O_2 Calibration: Time (HRS)_____

***	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	Percent of Span
Zero Gas	0				
Mid Level					
High Level					

CO_2 Calibration: Time: (HRS)_____

***	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	Percent of Span
Zero Gas	0				
Mid Level					
High Level					

Must be within 2% of the span for each calibration gas.

052394-G:\STACK\WP\FORMS\S-420-14

INTERPOLL LABORATORIES, INC
(612) 786-6020

NOX System Bias Check

Job LP/HAYWARD Source LINE 1 SURFACE DRYER
Test 2 Run _____ Date 2-20-96 Site DUCT
Operator E. TROWBRIDGE

Instrument	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		Diff. CE-SB (PPM)	Span Val. (PPM)	% of Span
			Cal. Err.	Sys. Bias			
	Zero Gas	0		0		250	
	Upscale	72.1		72		250	
	Zero Gas	0		.5		250	
	Upscale	72.1		71.5		250	
	Zero Gas	0		1		250	
	Upscale	72.1		71.2		250	
	Zero Gas	0		1		250	
	Upscale	72.1		71.4		250	
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

070595-GRSTACK.WP\FORMS\S-562

INTERPOLL LABORATORIES, INC
612) 786-6020

CO System Bias Check

Job: UP/HAYWARD Source: LINE 1 SURFACE DRYER DUCT
Test: 8 Run Date: 2-20-96 Site:
Operator: [illegible]

Instrument	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		Diff. CE-SB (PPM)	Span Val. (PPM)	% of Span
			Cal. Err.	Sys. Bias			
	Zero Gas	0		0		1000	
	Upscale	600		595		1000	
	Zero Gas	0		2		1000	
	Upscale	600		590		1000	
	Zero Gas	0		1		1000	
	Upscale	600		597		1000	
	Zero Gas	0		2		1000	
	Upscale	600		599		1000	
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

070595-G:\STACK\WP\FORMS\S-562

INTERPOLL LABORATORIES, INC
(612) 786-6020

THC System Bias Check

Job LP/HAYWARD Source Line 1 Surface Drop-down
Test 6 Run ____ Date 2-20-96 Site ____
Operator ET

Instrument	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		Diff. CE-SB (PPM)	Span Val. (PPM)	% of Span
			Cal. Err.	Sys. Bias			
	Zero Gas	0	0	0		1000	
	Upscale	287	259	258		1000	
	Zero Gas	0	0	2		1000	
	Upscale	287	288	284			
	Zero Gas	0	2	0		1000	
	Upscale	287	284	286		1009	
	Zero Gas	0	0	0			
	Upscale	287	286	284			
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

070595-GASTACK\WP\FORMS\S-562

INTERPOLL LABORATORIES, INC
(612) 786-6020

EPA Method 25 A
Calibration Error Check & Drift Determination

Job LP / HAYWARD

Test 2 Run _____ Date 2-19-96

Operator E.T. ROWBRIDGE

THC Calibration (Low Range): Time (HRS) 1845

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	0	0	0	100	0
Low Level	27.9	27.2	.7	100	.07
Mid Level	287	289	02	10000	.12
High Level	3150	3138	12	10,000	.01

THC Calibration (High Range): Time (HRS) _____

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	0				
Span					

O_2 Calibration: Time (HRS) _____

***	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	Percent of Span
Zero Gas	0				
Mid Level					
High Level					

CO_2 Calibration: Time: (HRS) _____

***	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	Percent of Span
Zero Gas	0				
Mid Level					
High Level					

Must be within 2% of the span for each calibration gas.

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INTERPOLL LABORATORIES, INC
(612) 786-6020

NOX System Bias Check

Job EP/Hayward Source Line 1 Surface dryer
Test 6 Run ____ Date 2-20-96 Site Outlet
Operator ET

Instrument	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		Diff. CE-SB (PPM)	Span Val. (PPM)	% of Span
			Cal. Err.	Sys. Bias			
NOX	Zero Gas	0	.2	0			
	Upscale	72.1	72.1	71.6			
THC	Zero Gas	0	1	0			
	Upscale	287	289	284			
CO	Zero Gas	0	1	0			
	Upscale	147	146.6	145.4			
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Calibration Error Check

Job LP/HAYWARD

Test 2 Run _____ Date 2-19-96

Operator E. TRUMBRIDGE

SO_2 Calibration: Time (HRS)_____

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	0				
Mid Level					
High Level					

NO_x Calibration: Time (HRS) 2000

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	0	.2	.2	250	
Mid Level	72.1	72.1	0	250	0
High Level	250	239	1	250	

O_2 Calibration: Time (HRS)_____

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	0				
Mid Level					
High Level					

CO_2 Calibration Time (HRS)_____

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	0				
Mid Level					
High Level					

CO Calibration Time (HRS)_____

***	Cylinder Value (PPM)	Analyzer Response (PPM)	Difference (PPM)	Span Value (PPM)	Percent of Span
Zero Gas	0	1	1	1000	
Mid Level	147	146.6		1000	
High Level	599	590.2		1000	

600 599

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job L.P. / Hayward, WI
Source Process RTO / Stack
Test 10 Run 0 Date 2-21-96
Stack Dimen. > 5.5 IN.
Dry Bulb 24.5 °F Wet bulb 16.5 °F
Manometer ☐ Reg. ☐ Exp ☐ Elec.
Barometric Pressure 29.24 IN.HG
Static Pressure -.48 IN.WC
Operators M. Kaehler & L. Hansen
Pitot No. INST C_p NA

Drawing of Test Site

Cross-section View	Elevation View

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length: 6.25 IN.		Time Start: NA HRS	
1	1/6	12.58	18.83		
2	3/6	37.75	44.00		255
3	5/6	62.92	69.17		

INTERPOLL LABORATORIES, INC
(612) 786-6020

NOx Cal Drift Check

Job L.P. / Hayward, WI
Source Press RTO
Test 10 Run 1, 2, 3 Date 2-21-96
Site Stack
Operator M. Koehler

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		C_o	C_m	C_{gas}
				Initial	Final			
10		Zero Gas	0	0				
		Upscale	142	142				
1	25.7	Zero Gas	0	2	3	2.5		24.4
		Upscale	142	144	150		147	
2	25.0	Zero Gas	0	3	2	2.5		24.1
		Upscale	142	150	150		150	
3	25.2	Zero Gas	0	2	2	2		23.6
		Upscale	142	150	153		151.5	
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

INTERPOLL LABORATORIES, INC
(612) 786-6020

CO Cal Drift Check

Job L.P. / Hayward, WI
Test 10 Run 1, 2, 3 Date 2-21-96
Operator Mr. Kuehler

Source Press RTO
Site Stack

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Final	C_o	C_m	C_{gas}
1		Zero Gas	0	3				
		Upscale	289	291				
2	17.4	Zero Gas	0	1	4	2.5		15.5
		Upscale	289	294	301		297.5	
3	27.5	Zero Gas	0	4	9	6.5		24.4
		Upscale	289	298	300		299	
4	29.6	Zero Gas	0	9	3	6		31.1
		Upscale	289	300	299		299.5	
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

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INTERPOLL LABORATORIES, INC
(612) 786-6020

CO_2 Cal Drift Check

Job: L.P. / Hayward, CA — Source: Press RTO
Test: 10 Run: 1, 2, 3 Date: 2-21-96 — Site: Stack
Operator: M. Kuehler

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Analyzer Resp (PPM) Final	C_o	C_m	C_{gas}
1		Zero Gas	0	0.0				
		Upscale	10.9	10.9				
2	0.6	Zero Gas	0	0.0	-0.1	-0.05		0.7
		Upscale	10.9	10.9	10.7		10.8	
3	0.6	Zero Gas	0	0.0	~~10.7~~ 0.0	0.0		0.6
		Upscale	10.9	10.9	10.6		10.65	
4	0.6	Zero Gas	0	0.0	-0.1	-0.05		0.7
		Upscale	10.9	10.8	10.8		10.8	
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

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INTERPOLL LABORATORIES, INC
(612) 786-6020

O_2 Cal Drift Check

Job: L.P. / Hayward, WI — Source: Cross AFB
Test: 10 Run: 1, 2, 3 Date: 2-21-96 — Site: Stack
Operator: M. Kaehler

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		C_o	C_m	C_{gas}
				Initial	Final			
1		Zero Gas	0	0.0				
		Upscale	13.0	13.0				
2	20.2	Zero Gas	0	0.0	0.2	0.1		20.3
		Upscale	13.0	13.0	12.9		12.95	
3	20.0	Zero Gas	0	0.0	-0.1	-0.05		20.1
		Upscale	13.0	12.9	13.0		12.95	
4	20.0	Zero Gas	0	0.0	0.0	0.0		19.9
		Upscale	13.0	13.0	13.1		13.05	
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

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INTERPOLL LABORATORIES, INC
(612) 786-6020

THC Cal Drift Check

Job L.P. / Hayward, WI — Source Press RTO
Test 10 Run 1, 2, 3 Date 2-21-96 — Site Stack
Operator M. Koehler

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		C_o	C_m	C_{gas}
				Initial	Final			
1		Zero Gas	0	0				
		Upscale	30.4	30				
2		Zero Gas	0	0	0	0		
		Upscale	30.4	30	32		31	
3		Zero Gas	0	0	0	0		
		Upscale	30.4	30	30		30	
4		Zero Gas	0	0	0	0		
		Upscale	30.4	30	30		30	
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job LP/HAYWARD
Source LINE 1 PRESS RTO INLET
Test 1 3 Run Date 2-21-96
Stack Dimen. 53.125 IN.
Dry Bulb ____ °F Wet bulb ____ °F
Manometer ☐ Reg. ☐ Exp ☐ Elec.
Barometric Pressure 29.24 IN.HG
Static Pressure ____ IN.WC
Operators ____
Pitot No. ____ C_p ____

Drawing of Test Site

Cross-section View	Elevation View

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas (°F)
		Port Length:	IN.	Time Start:	HRS
1		17.71			
2		26.56			
3		44.27			

INTERPOLL LABORATORIES, INC
(612) 786-6020

NOx Cal Drift Check

Job: LP HAYWARD
Test: 13 Run: ____ Date: 2-21-96
Operator: ET-JB
Source: LINE 1 PRESS
Site: RTO INLET

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Analyzer Resp (PPM) Final	C_o	C_m	C_{gas}
1		Zero Gas	0	0	0			
		Upscale	72.1	72.1	72.33			
2	12.6	Zero Gas	0	0	2.69			
		Upscale	72.1	72.33	72.14			11.4
3	4.8	Zero Gas	0	.37	0			
		Upscale	72.1	72.14	74			4.9
4	3.3	Zero Gas	0	0	0			
		Upscale	72.1	72.75	71			3.3
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC
(612) 786-6020

CO Cal Drift Check

Job LP/HAYWARD
Test 13 Run 2 Date 2-21-96
Operator

Source LINE 1 PRESS RTO
Site INLET

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Analyzer Resp (PPM) Final	C_o	C_m	C_{gas}
1		Zero Gas	0	0	0			
		Upscale	299	299	298			
2	10.1	Zero Gas	0	0	0			10.2
		Upscale	299	298	296.63			
3	7.5	Zero Gas	0	0	0			7.6
		Upscale	299	296.63	292			
4	3.1	Zero Gas	0	0	0			3.0
		Upscale	299	292	298			
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

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INTERPOLL LABORATORIES, INC
(612) 786-6020

CO2 Cal Drift Check

Job 201 Hayward
Test 13 Run _____ Date 2-21-96
Operator [illegible]

Source Line 1 Kiln
Site RTO Inlet

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Analyzer Resp (PPM) Final	C_o	C_m	C_{gas}
1		Zero Gas	0	0	0			
		Upscale	10.5	10.5	10.45			
2	0.1	Zero Gas	0	0	.02			0.1
		Upscale	10.5	10.5	10.45			
3	0.1	Zero Gas	0	.0	0			0.1
		Upscale	10.5	10.45	10.4			
4	0.1	Zero Gas	0	0	0			0.1
		Upscale	10.5	10.4	10.3			
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

INTERPOLL LABORATORIES, INC
(612) 786-6020

O2 Cal Drift Check

Job LP/Hayward
Test 13 Run _____ Date 2-24-96
Operator T. Trewhella

Source Line 1 Press
Site RTO Inlet

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		C_o	C_m	C_{gas}
				Initial	Final			
1		Zero Gas	0	0	0			
		Upscale	13.1	13.1	13.12			
2		Zero Gas	0	0	.03			
	21.0	Upscale	13.1	13.12	13.00			21.1
3		Zero Gas	0	.03	0			
	21.3	Upscale	13.1	13.18	13.1			21.2
4		Zero Gas	0	0	0			
	21.2	Upscale	13.1	13.1	13.05			21.3
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC
(612) 786-6020

THC Cal Drift Check

Job: LP/HAYWARD
Test: 13 Run: ____ Date: 2-21-96
Operator: G. Trautbeck

Source: LINE 1 PRESS
Site: RTO INLET

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Analyzer Resp (PPM) Final	C_o	C_m	C_{gas}
1		Zero Gas	0	0	0			
		Upscale	30.0	30	30			
2		Zero Gas	0	0	0			
		Upscale	30.0	30	30			
3		Zero Gas	0	0	0			
		Upscale	30.0	30	31			
4		Zero Gas	0	0	0			
		Upscale	30.0	30	29			
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

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INTERPOLL LABORATORIES, INC
(612) 786-6020

NOX Cal Drift Check

Job LP/HAPWAKS Source LINE 1 KONUS
Test 18 Run 1-3 Date 2-22-96 Site STACK
Operator

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		C_o	C_m	C_{gas}
				Initial	Final			
1	90.3	Zero Gas	0	0	2.44			89.9
		Upscale	145	145	144.65			
2	97.7	Zero Gas	0	.31	1			97.5
		Upscale	145	144.65	145.57			
3	89.7	Zero Gas	0	1	1.22			89.3
		Upscale	145	145.57	145.57			
4		Zero Gas	0					
		Upscale						
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

090
105
130

Must be within 5% of the span for the zero or upscale cal. gas.

091595-G:\STACK\WP\FORMS\S-359a

INTERPOLL LABORATORIES, INC
(612) 786-6020

CO Cal Drift Check

Job LP/HAYWARD
Test 18 Run 1-3 Date 2-22-96
Operator

Source CINE 1 KONUS
Site STACK

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		C_o	C_m	C_{gas}
				Initial	Final			
1	177.0	Zero Gas	0	0	1.22			177.0
		Upscale	299	298	299.07			
2	247.6	Zero Gas	0	0	2			247.8
		Upscale	299	299.07	298			
3	114.0	Zero Gas	0	2	2			114.2
		Upscale	299	298	299.07			
4		Zero Gas	0					
		Upscale						
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC
(612) 786-6020

CO_2 Cal Drift Check

Job LP/HAYWARD
Test 18 Run _____ Date 7-22-96
Operator E.I

Source Line 1 Knock
Site Stack

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		C_o	C_m	C_{gas}
				Initial	Final			
1		Zero Gas	0	0	0			
	6.5	Upscale	10.5	10.5	10.45			6.5
2		Zero Gas	0	0	0			
	8.4	Upscale	10.5	10.45	10.4			8.5
3		Zero Gas	0	0	0			
	7.7	Upscale	10.5	10.4	10.4			7.8
4		Zero Gas	0					
		Upscale						
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

INTERPOLL LABORATORIES, INC
(612) 786-6020

O2 Cal Drift Check

Job CP/HAYWARD
Test 18 Run 1-3 Date 2-22-92
Operator ET

Source LINDE KOMOS
Site STACK

Run	$\bar{C}$	***	Cylinder Value (PPM)	Analyzer Resp (PPM) Initial	Analyzer Resp (PPM) Final	C_o	C_m	C_{gas}
1	14.2	Zero Gas	0	0	.1			14.2
		Upscale	13.1	13.1	13.2			
2	11.8	Zero Gas	0	.1	.1			11.8
		Upscale	13.1	13.1	13.1			
3	13.0	Zero Gas	0	.1	-.1			13.0
		Upscale	13.1	13.1	13.1			
4		Zero Gas	0					
		Upscale						
5		Zero Gas	0					
		Upscale						
6		Zero Gas	0					
		Upscale						
7		Zero Gas	0					
		Upscale						
8		Zero Gas	0					
		Upscale						
9		Zero Gas	0					
		Upscale						
10		Zero Gas	0					
		Upscale						
11		Zero Gas	0					
		Upscale						
12		Zero Gas	0					
		Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

091595-G:\STACK\WP\FORMS\S-559a

INTERPOLL LABORATORIES, INC
(612) 786-6020

ALL System Bias Check

Job LP/HAYWARD Source LINE 1 ROMUS
Test 18 Run ____ Date 8-22-96 Site STACK
Operator CT

Instrument	***	Cylinder Value (PPM)	Analyzer Resp (PPM)		Diff. CE-SB (PPM)	Span Val. (PPM)	% of Span
			Cal. Err.	Sys. Bias			
NOx	Zero Gas	0	0	0	0	250	0
	Upscale	145	145	145	0	250	0
CO	Zero Gas	0	0	0	0	1000	0
	Upscale	299	298	298	1	1000	.1
O2	Zero Gas	0	0	0	0	25	0
	Upscale	13.1	13.1	13.1	0	25	0
CO2	Zero Gas	0	0	0	0	20	0
	Upscale	10.5	10.5	10.5	0	20	0
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						
	Zero Gas	0					
	Upscale						

Must be within 5% of the span for the zero or upscale cal. gas.

070595-G:\STACK\WP\FORMS\S-562

APPENDIX H

GAS ANALYZER SPECIFICATIONS

INTERPOLL LABORATORIES
4500 BALL ROAD N.E.
CIRCLE PINES, MN 55014-1819
(612) 786-6020

Servomex

1420
Oxygen Analyser
Instruction Manual

Ref : 01420/001A/0

Order as part No. 01420001A

was (7982-2842)

INTERPOLL LABORATORIES
4500 BALL ROAD N.E.
CIRCLE PINES, MN 55014-1819
(612) 786-6020

1.3 Sampling System

The sampling system of the analyser includes a combination filter/automatic flow control device, designed to keep a constant flow of sample gas through the measuring cell for varying input pressures and to prevent the entrance of particulate matter into the measuring cell. Excess flow is vented to the by-pass.

1.4 Specification

Performance Specification (typical)

Repeatability:	Better than +/-0.2% O2 under constant conditions.
Drift:	Less than 0.2% O2 per week under constant conditions. (Excluding variation due to barometric pressure changes; reading is proportional to barometric pressure.)

Outputs

Display:	3 1/2 digit LCD reading 0.0 to 100.0% oxygen with overrange capability.
Output:	0 to 1V (non-isolated) for 0 to 100% oxygen available on 'D' type connector located on the back panel of the instrument. Output impedance is less than 10 ohms.
Option:	4 - 20mA isolated, Max impedance 500 ohms.
Flow alarm output:	Change over relay contact rated at 3A/115V ac, 1A/240V ac or 1A/28V dc. 4 sets of single pole changeover contacts. Alarm becomes active when sample gas flow through the analyser fails.

Sample requirements

Condition:	Clean, dry gas with dew point 5 deg C below ambient temperature.
Inlet pressure:	0.5 to 3psig (3.5 to 21kPa). Inlet pressure changes within this range will change the reading by less than 0.1% O2. May be operated up to 10psig (70kPa) with degraded stability.
Flowrate:	1.5 to 6 litres/minute approximately depending on sample pressure.
Filtering:	0.6 micron replaceable filter integral to the automatic flow control device.

Response time:	Less than 15 secs. to 90% at an inlet pressure of 3psig (21kPa).
Inlet/vent connections:	1/4 inch OD tube (stainless steel) suitable for 6mm ID flexible tubing or 1/4 inch OD compression fittings.
Materials exposed to the sample:	Stainless steel, Pyrex glass, brass, platinum, epoxy resin, Viton, polypropylene and glass fibre filter.

Physical Characteristics

Case:	Steel and aluminium finished in epoxy powder paint.
Case classification:	IP 20 (IEC 529) when fitted into the Servomex 1400 series 19 inch case.
Dimensions:	See Figure 2.1.
Weight:	10Kg (22lb) approximately.

Electrical

AC Supply:	110 to 120V AC or 220 to 240V AC, +/-10%, 48 to 62Hz. Voltage selected by a voltage selector integral to the IEC supply plug.
Power required:	15VA maximum.

Environmental Limits

Operating ambient temperature:	0 to +40 deg C (32 to 104 deg F)
Storage temp. range:	-20 to +70 deg C (-4 to 158 deg F)
Relative humidity:	0-85%, non-condensing.

SPECIFICATIONS FOR ACS MODEL 3300 CO_2 NDIR

Measuring principle	NDIR single beam method
Measurable gas components and measuring range	0 - 20%
Reproducibility	±0.5% of full scale
Stability	Zero drift; ±% of full scale/24H Span drift; ±% of full scale/24H
Noise	0.5% of full scale
Ambient temperature	-5 to 45°C
Ambient humidity	Less than 90% RH
Response time (90% of final reading)	Electrical system; 2 sec, 3 sec, 5 sec (selectable with connector) Response of actual gas; Within 15 sec (depending on cell length)
Indicator	100 linear division
Output signal	OUTPUT 1; DC 0 - 1 V OUTPUT 2; DC 0 - 10 mV or DC 0 - 100 mV or DC 0 - 1 V or DC 4 - 20 mA (Allowable load resistance 500Ω max.)
Linearity	Better than ±2% of full scale (when linearizer is used)
Power supply	AC 115 V ± 10%, 60 Hz

Power consumption	Approx. 30 VA
Materials of gas-contacting parts	Measuring cell; SUS304 Window; CaF2 Piping; Polyethylene
Sample gas flow rate	1ℓ/min ± 0.5ℓ/min
Sample gas temperature	0 to 55°C
Purging gas flow rate	1ℓ/min (to be flowed as occasion demands)
Warmup time	Approx. 2 hours
External dimensions	200 x 250 x 541 (H x W x D) mm
Weight	Approx. 11 kg
Finish Color	MUNSELL N1.5

Remarks: For combinations of measuring ranges for the dualcomponent analyzer, inquiry should be made to the manufacturer.

SPECIFICATIONS FOR MODEL 10A
ROCK MOUNTED CHEMILUMINESCENT
NO-NO_x GAS ANALYZER

Sensitivity	Each instrument is equipped with the following ranges: 0 - 2.5 ppm 0 - 10 ppm 0 - 25 ppm 0 - 100 ppm 0 - 250 ppm 0 - 1000 ppm 0 - 2500 ppm 0 - 10000 ppm
Accuracy	Derived from the NO or NO_2 calibration gas, ±1% of fullscale
Response time (0-90%) Typical	1.5 seconds - NO Mode 1.7 seconds - NO_x Mode
Output	0 - 10mV and 0 - 10V
Zero Drift	Negligible after 1/2-hour warm-up
Linearity	±1% of full scale
Input Power Requirements	115v/50Hz; 115v/60Hz

SPECIFICATIONS FOR ACS MODEL 3300 CO NDIR

Measuring principle	NDIR single beam method
Operating ranges	0 - 500 ppm 0 - 1000 ppm
Reproducibility	±0.5% of full scale
Stability	Zero drift; ±% of full scale/24H Span drift; ±% of full scale/24H
Noise	0.5% of full scale
Ambient temperature	-5 to 45°C
Ambient humidity	Less than 90% RH
Response time (90% of final reading)	Electrical system; 2 sec, 3 sec, 5 sec (selectable with connector) Response of actual gas; Within 15 sec (depending on cell length)
Indicator	100 linear division
Output signal	OUTPUT 1; DC 0 - 1 V OUTPUT 2; DC 0 - 10 mV or DC 0 - 100 mV or DC 0 - 1 V or DC 4 - 20 mA (Allowable load resistance 500Ω max.)
Linearity	Better than ±2% of full scale (when linearizer is used)
Power supply	AC 115 V ± 10%, 60 Hz

Power consumption	Approx. 30 VA
Materials of gas-contacting parts	Measuring cell; SUS304 Window; CaF2 Piping; Polyethylene
Sample gas flow rate	1ℓ/min ± 0.5ℓ/min
Sample gas temperature	0 to 55°C
Purging gas flow rate	1ℓ/min (to be flowed as occasion demands)
Warmup time	Approx. 2 hours
External dimensions	200 x 250 x 541 (H x W x D) mm
Weight	Approx. 11 kg
Finish Color	MUNSELL N1.5

Remarks: For combinations of measuring ranges for the dualcomponent analyzer, inquiry should be made to the manufacturer.

Ratfisch INSTRUMENTE

TOTAL HYDROCARBON ANALYZER (FLAME IONIZATION
Model RS 55

TECHNICAL DATES

MAINS : 115V/60H
RECORDER OUTPUT : 0 - 5 V / 4-20mA

MODEL: X Manual switching
__ Solenoid valves
HOUSING: __ Case, __ 19"-Rack
MEASURING RANGES:

1 = 0 —	10	C_1-
2 = 0 —	100	C_1
3 = 0 —	1,000	C_1
4 = 0 —	10,000	C_1

SPECIAL OPTIONS:

Flame out alarm .....
1 Alarm .....
Sample line .....
.....

ANALYZER CONDITIONS:

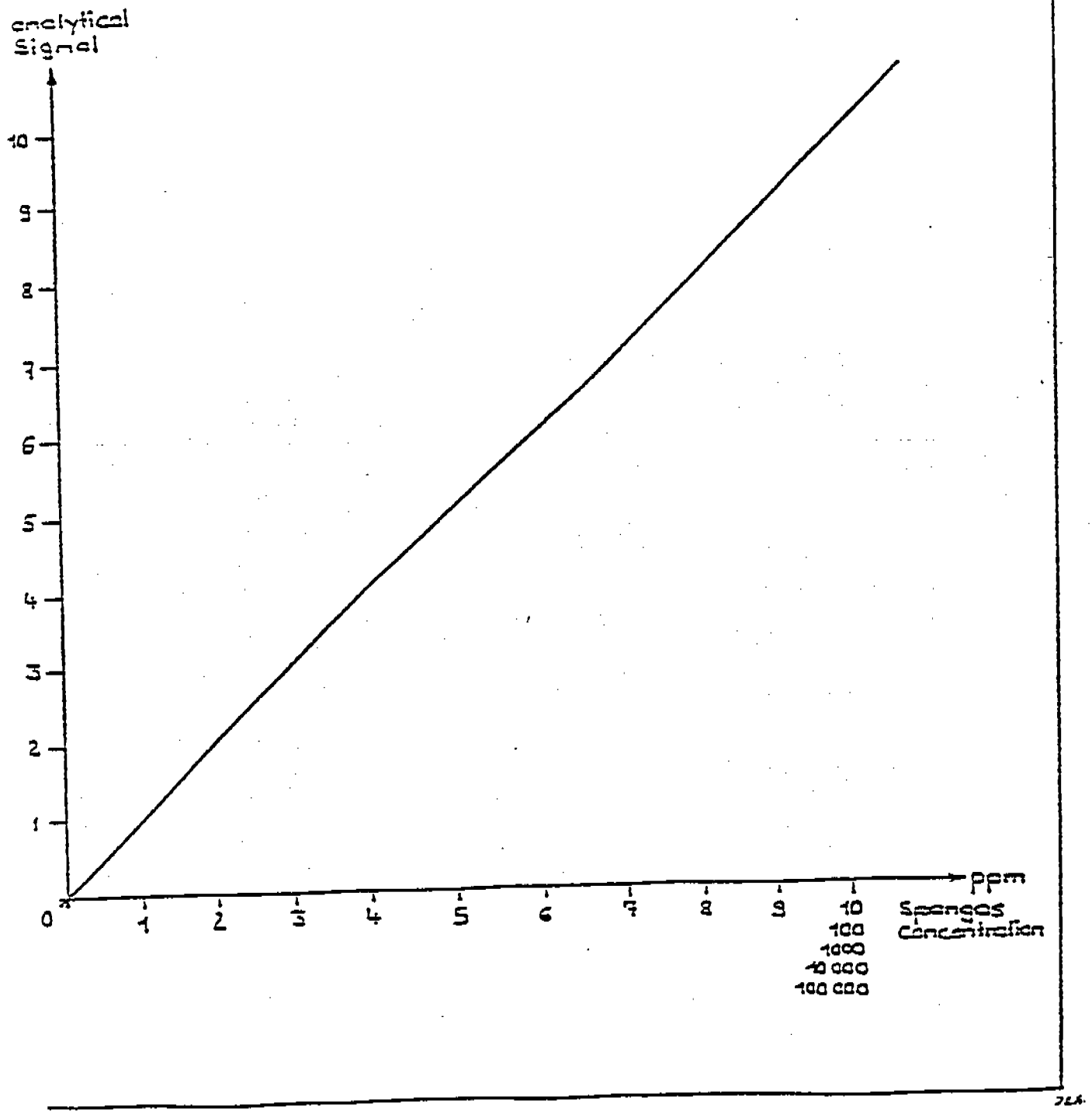
Temperature : 160 °C

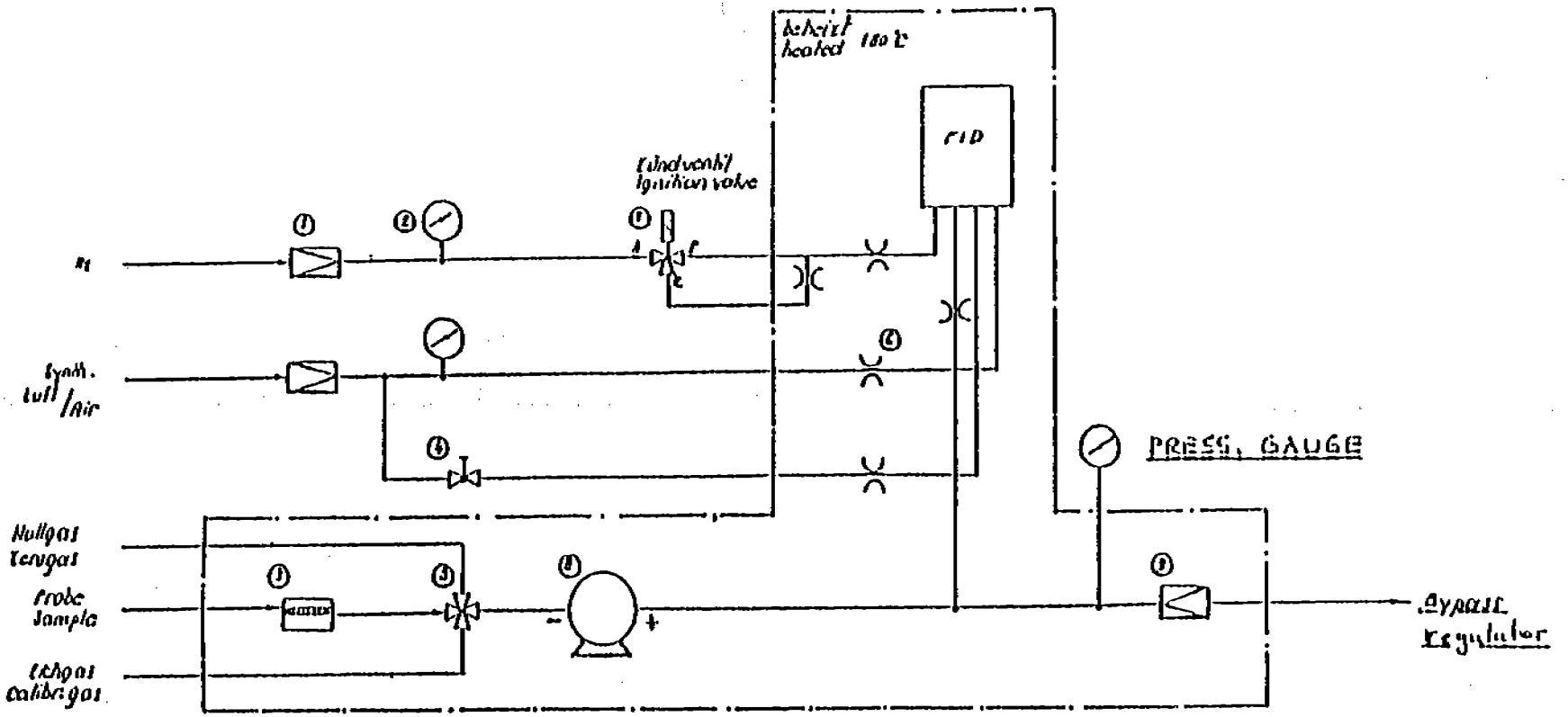
Zero Point : 3,90
Gain : 7,70

Pressure Setting : Sample/Spangas/Zerogas : 200 mbar
Fuel: Hydrogen : 0,35 bar
Combustion Air : 0,80 bar

Span Gases : 300 ppm C_1
24000 ppm C_1

CALIBRATION . DIAGRAMM





1 Druckregler
Pressure regulator
2 Manometer
Gauge
3 Filter
4 Nadelventil
Needle valve
5 3 Wege Ventil
3 way valve
6 Kapillare
capillary
7 Magnet Ventil
solenoid valve
8 Pumpe
pump
9 Bypass druckregler
Bypass pressure regulator

Zündventil
Ignition valve

F-A angezogen
energised

R-A stromlos
at rest

Handumschaltung
Manual switching

Ratfisch Instrumente

FLAMMEN IONISATIONS DETEKTOR
Flame Ionisation Detector

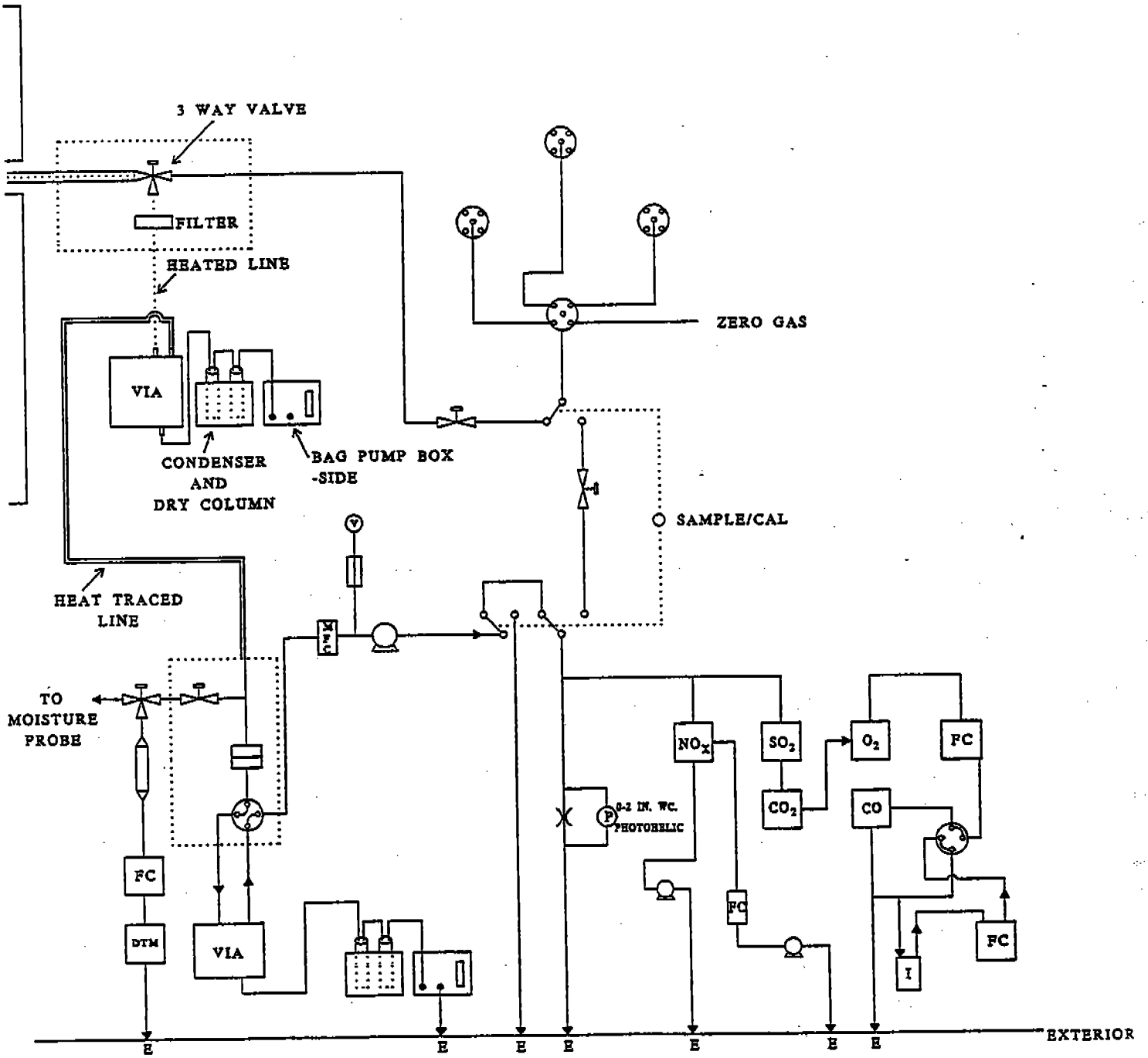
Fließplan
Flowdiagram

RS 55
13.01.88 dr

H-11

Interpoll Laboratories
(612) 786-6020

CEM TRAILER



E = EXHAUST
FC = FLOW CONTROL
I = IMPINGER (METHOD 10s)

CEMTRAIL

APPENDIX I

CALIBRATION GAS CERTIFICATION SHEETS

NATIONAL SPECIALTY GASES•630 UNITED DRIVE•DURHAM, N.C. 27713•(919) 544-3772

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

REFERENCE #: 88-45046 CYLINDER #: CC104374 CYL. PRESSURE:2000PSIG CUSTOMER:TWIN CITY OXYGEN
EXPIRATION DATE: 1/5/98 LAST ANALYSIS DATE: 1/5/96 P.O.#:809089
METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS-SEPTEMBER 1993:G-1.
THIS STANDARD SHOULD NOT BE USED WHEN ITS GAS PRESSURE IS BELOW 1.0 MEGAPASCALS (150PSIG).

COMPONENT:NO
STANDARD:
SRM #: 1684B
CYL. #: CLM8177
CONC.: 96.5PPM
INSTRUMENT:BECK CHEM
MODEL#:951A
SERIAL #:0101572
LAST CAL.:1/2/96

MEAN CONC:72.1PPM +/- 0.72 PPM
REPLICATE CONC.

DATE:12/29/95	DATE: 1/5/96
72.0PPM	71.8PPM
72.2PPM	72.2PPM
72.0PPM	72.4PPM

BALANCE GAS:N2

REPLICATE DATA

DATE: 12/29/95

Z	0	R	310	C	251.9
R	311	Z	0	C	253.3
Z	0	C	251.2	R	310

DATE: 1/5/96

Z	0	R	311.5	C	253.4
R	312	Z	0	C	253.5
Z	0	C	252.3	R	311

COMPONENT:
STANDARD:
SRM #:
CYL. #:
CONC.:
INSTRUMENT:
MODEL #:
SERIAL #:
LAST CAL.:

MEAN CONC: NO2 1.04PPM
REPLICATE CONC.
DATE: DATE:

REPLICATE DATA
DATE:

Z	R	C
R	Z	C
Z	C	R

DATE:

Z	R	C
R	Z	C
Z	C	R

COMPONENT:
STANDARD:
SRM #:
CYL. #:
CONC.:
INSTRUMENT:
MODEL #:
SERIAL #:
LAST CAL.:

MEAN CONC:
REPLICATE CONC.
DATE: DATE:

REPLICATE DATA
DATE:

Z	R	C
R	Z	C
Z	C	R

DATE:

Z	R	C
R	Z	C
Z	C	R

Z=ZERO C=CANDIDATE R=REFERENCE

ANALYST: Jim Bowe APPROVED BY: Laura Thornton

"THIS REPORT STATED ACCURATELY THE RESULTS OF THE INVESTIGATION MADE UPON THE MATERIAL SUBMITTED TO THE ANALYTICAL LABORATORY. EVERY EFFORT HAS BEEN MADE TO DETERMINE OBJECTIVELY THE INFORMATION REQUESTED; HOWEVER, IN CONNECTION WITH ITS RENDERING OF THIS REPORT, NATIONAL SPECIALTY GASES SHALL HAVE NO LIABILITY IN EXCESS OF ITS ESTABLISHED CHARGE FOR THE SERVICE."

Air Products and Chemicals, Inc.
SPECIALTY G. DEPARTMENT
12722 S. WENTWORTH AVENUE
CHICAGO, IL 60628

Certificate of Analysis - EPA Protocol Gas Standard

PERFORMED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS (PROCEDURE #G1)

Customer:
AIR PRODUCTS & CHEMICALS, INC.
373 CANTERBURY ROAD
SHAKOPEE MN 55379

Notes:

PO: Rel:

Order No: CSS-320132-01
Batch No: 861-29294

Cylinder No: SG9168051BAL
Cylinder Pressure*: 2000 psig
Certification Date: 12/11/95
Expiration Date: 12/11/97

*** Certified Concentration ***		********** Reference Standards **********			************** Analytical Instrumentation **************			
Component	Certified Concentration	Cylinder #	Standard Number	Concentration	Instrument Make/Model	Serial Number	Last Calibration	Measurement Principal
NITRIC OXIDE	240 ±1.0 PPM	SG9151438BAL	GMIS	244.8000 PPM	Rosemount 951a	0101877	11/20/95	CHEMILUMINESCENCE

Balance Gas: NITROGEN

Contaminent
Nitrogen Dioxide 3.80 PPM

* Standard should not be used below 150 psig

I-2

Analyst: Joe Estafanous

Approved By: Richard Fry
Richard Fry

Air Products and Chemicals, Inc.
P.O. BOX 351
R.D. #1
MAHAQUA, PA 18252

Certificate of Analysis - EPA Protocol Gas Standard

PERFORMED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS (PROCEDURE #G1)

Customer:
AIR PRODUCTS & CHEMICALS
CAROL PORTER
FREEPORT RD, ROUTE 28
CREIGHTON PA 15030

Notes:

PO: 055-94 Rel:

Order No: 148-012359-03
Batch No: 255-58321

Cylinder No: SG9120705BAL
Cylinder Pressure*: 2000 psig
Certification Date: 11/13/94
Expiration Date: 11/13/96

*** Certified Concentration ***		********* Reference Standards *********			********** Analytical Instrumentation **********			
Component	Certified Concentration	Cylinder #	Standard Number	Concentration	Instrument Make/Model	Serial Number	Last Calibration	Measurement Principal
CARBON MONOXIDE	299 ±1.47 PPM	SG9113535BAL	GMIS	506.5000 PPM	Hewlett Packar	2518A052	10/14/94	GC-FID

Balance Gas: Nitrogen

* Standard should not be used below 150 psig

I-3

Analyst: Michael Wagner
Micha Wagner

Approved By: Ken Roubik

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC
27713
(919)544-3772

CERTIFICATE OF ANALYSIS - EPA PROTOCOL MIXTURES

REFERENCE #:	88-44358	CYLINDER #:	CC117373	CYL. PRESSURE:	2000 PSIG	P. O./CODE #	20388
EXP. DATE:	11/30/98	LAST ANALYSIS DATE:	11/30/95	CUSTOMER:	TWIN CITY OXYGEN		

METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS-SEPTEMBER 1993;G-1 THIS STANDARD SHOULD NOT BE USED WHEN ITS GAS PRESSURE IS BELOW 1.0 MEGAPASCALS (150 PSIG).

COMPONENT:	CARBON MONOXIDE
STANDARD	
SRM #:	1681B
CYL. #:	CLM 4470
CONC:	975 PPM
INSTRUMENT:	ROSEMOUNT NDIR
MODEL #:	880A
SERIAL #:	2000172
LAST CAL.:	11/8/95 ---

MEAN CONC.: 600 PPM +/- 4.80 PPM

REPLICATE CONC.

DATE: 11/23/95	DATE: 11/30/95
600 PPM	599 PPM
600 PPM	599 PPM
600 PPM	600 PPM

BALANCE GAS: NITROGEN

REPLICATE DATA									REPLICATE DATA									REPLICATE DATA								
DATE:	11/23/95																									
Z	0	R	975	C	600.0																					
R	975	Z	0	C	600.0																					
Z	0	C	600.6	R	976																					
DATE	11/30/95																									
Z	0	R	974	C	598.4																					
R	974	Z	0	C	598.4																					
Z	0	C	600.0	R	975																					

Z= ZERO C=CANDIDATE R=REFERENCE

ANALYST: Mary A. Savage APPROVED BY: Jim Moore

THIS REPORT STATED ACCURATELY THE RESULTS OF THE INVESTIGATION MADE UPON THE MATERIAL SUBMITTED TO THE ANALYTICAL LABORATORY. EVERY EFFORT HAS BEEN MADE TO DETERMINE OBJECTIVELY THE INFORMATION REQUESTED; HOWEVER, IN CONNECTION WITH THIS REPORT, NATIONAL SPECIALTY GASES SHALL HAVE NO LIABILITY IN EXCESS OF ITS ESTABLISHED CHARGE FOR THE SERVICE.

ASSAYED AT: NATIONAL SPECIALTY GASES, 630 UNITED DRIVE, DURHAM, NC 27713. (919)544-3772

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC 27713
(919) 544-3772

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

REFERENCE #: 88-28604 CYLINDER #:CC92831 CYL. PRESSURE:2000PSIG
EXPIRATION DATE:12/29/96 LAST ANALYSIS DATE:12/29/93
CUSTOMER:TWIN CITY OXYGEN P.O.# 7980
METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS-SEPTEMBER 1993:G-1

STANDARD:
SRM #:1667B

CYL #:CLM5046

CONC.:47.3PPM

INSTRUMENT:
BECKMAN
COMPONENT: THC

MODEL #: 400

SERIAL #: 1003052

LAST CAL.: 12/1/93

COMPONENT: C3H8
MEAN CONC: 27.9PPM

REPLICATE CONC.
DATE: 12/29/93 DATE:
27.8PPM
27.9PPM
28.0PPM

COMPONENT:
MEAN CONC:

REPLICATE CONC.
DATE: DATE:

COMPONENT:
MEAN CONC:

REPLICATE CONC.
DATE: DATE:

BALANCE GAS:AIR

Air Produc and Chemicals, Inc.
SPECIALTY GA. DEPARTMENT
12722 S. WENTWORTH AVENUE
CHICAGO, IL 60628

Certificate of Analysis - EPA Protocol Gas Standard

PERFORMED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS (PROCEDURE #G1)

Customer:
AIR PRODUCTS & CHEMICALS, INC.
373 CANTERBURY ROAD
SHAKOPEE MN 55379

Notes:

Order No: CSS-320133-01
Batch No: 861-29310

Cylinder No: SG9165627BAL
Cylinder Pressure*: 2000 psig
Certification Date: 12/04/95
Expiration Date: 12/04/98

PO: Rel:

*** Certified Concentration ***			********** Reference Standards **********			************ Analytical Instrumentation ************			
Component	Certified Concentration	Cylinder #	Standard Number	Concentration	Instrument Make/Model	Serial Number	Last Calibration	Measurement Principal	
PROPANE	287 ±3.2 PPM	SG9128611BAL	GMIS	351.5000 PPM	Gow-Mac 750	59405U	11/14/95	GC-FID	

Balance Gas: AIR
Oxygen Concentration 20.2 %

* Standard should not be used below 150 psig

I-6

Analyst: Richard Van Dyke
Richard VanDyke

Approved By: Richard Fry

NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC 27713
(919)544-3772

CERTIFICATE OF ANALYSIS-EPA PROTOCOL MIXTURES

REFERENCE #: 88-33698 CYLINDER #:CC97981 CYL. PRESSURE:2000PSIG
EXPIRATION DATE: 9/9/97 LAST ANALYSIS DATE:9/9/94
CUSTOMER: TWIN CITY OXYGEN P.O.# 12399

METHOD: ANALYZED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS-SEPTEMBER 1993:G-1

STANDARD:
SRM #: 2649
CYL #: CAL2624
CONC.: 9814PPM

INSTRUMENT:VARIAN
MODEL #:3400
SERIAL #:3400-10056
LAST CAL.:8/1/94

COMPONENT:C3H8	COMPONENT:	COMPONENT:
MEAN CONC:3150PPM	MEAN CONC:	MEAN CONC:
REPLICATE CONC.	REPLICATE CONC.	REPLICATE CONC.
DATE:9/9/94 DATE:	DATE: DATE:	DATE: DATE:
3150PPM		
3151PPM		
3150PPM		

BALANCE GAS:AIR

REPLICATE DATA

COMPONENT:C3H8

DATE: 9/9/94

Z	0	R	500.1	C	160.5				Z	R	C
R	500.2	Z	0	C	160.6				R	Z	C
Z	0	C	160.6	R	500.3				Z	C	R

REPLICATE DATA

COMPONENT:

DATE:

Z		R		C					Z	R	C
R		Z		C					R	Z	C
Z		C		R					Z	C	R

REPLICATE DATA

COMPONENT:

DATE:

Z		R		C					Z	R	C
R		Z		C					R	Z	C
Z		C		R					Z	C	R

Z=ZERO C=CANDIDATE R=REFERENCE

ANALYST: APPROVED BY: Laura Chambers

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NATIONAL SPECIALTY GASES
630 UNITED DRIVE
DURHAM, NC
27713

CERTIFICATE OF ANALYSIS

CERTIFIED MIXTURE

CUSTOMER: TWIN CITY OXYGEN

REFERENCE #: 88-43732
CYLINDER #: CC47482
DATE REPORTED: 11/1/95

MATERIAL SUBMITTED: OXYGEN AND CARBON DIOXIDE IN NITROGEN

INFORMATION REQUESTED: RATIO ANALYSIS

COMPONENT	SPECIFICATION	CONCENTRATION	METHOD
OXYGEN	13.5%	13.1%	OXYGEN ANALYZER
CARBON DIOXIDE	11%	10.5%	INFRARED ANALYZER
NITROGEN	BALANCE		

James D. Koss
AUTHORIZED SIGNATURE

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ir Products and Chemicals, Inc.
.O. BOX 351
.D. #1
AMAQUA, PA 18252

Certificate of Analysis - EPA Protocol Gas Standard

ERFORMED ACCORDING TO EPA TRACEABILITY PROTOCOL FOR ASSAY AND CERTIFICATION OF GASEOUS CALIBRATION STANDARDS (PROCEDURE #G1)

ustomer:
AIR PRODUCTS & CHEMICALS
CAROL PORTER
FREEPORT RD, ROUTE 28
CREIGHTON PA 15030

PO: 055-94 Rel:

Notes:

Order No: 148-012359-03
Batch No: 255-58321

Cylinder No: SG9120705BAL
Cylinder Pressure*: 2000 psig
Certification Date: 11/13/94
Expiration Date: 11/13/96

** Certified Concentration *** ********* Reference Standards ********* ********** Analytical Instrumentation **********

Component	Certified Concentration	Cylinder #	Standard Number	Concentration	Instrument Make/Model	Serial Number	Last Calibration	Measurement Principal
ARBON MONOXIDE	299 ±1.47 PPM	SG9113535BAL	GMIS	506.5000 PPM	Hewlett Packar	2518A052	10/14/94	GC-FID

alance Gas: Nitrogen

---

* Standard should not be used below 150 psig

1-9

nalyst: Micha Wagner

Approved By: Ken Roubik

APPENDIX J

PROCEDURES

Particulate Loading and Emission Rates

The particulate emission rates were determined per EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1992). In this procedure, a preliminary velocity profile of the gases in the flue is obtained by means of a temperature and velocity traverse. On the basis of these values, sampling nozzles of appropriate diameter are selected to allow isokinetic sampling, a necessary prerequisite for obtaining a representative sample.

The sampling train consists of a heated glass or stainless steel-lined sampling probe equipped with a Type S pitot and a thermocouple. The probe is attached to a sampling module which houses the all-glass in line filter holder in a temperature controlled oven. In addition, the sampling module also houses the impinger case and a Drierite drying column. The sampling module is connected by means of an umbilical cord to the control module which houses the dry test gas meter, the calibrated orifice, a leakless pump, two inclined manometers, and all controls required for operating the sampling train.

Particulate samples were collected as follows: The sample gas was drawn in through the sampling probe isokinetically and passed through a 4-inch diameter Gelman Type A/E glass fiber filter. The particulates were removed at this point and collected on the filter. The gases then passed through an ice-cooled impinger train and a desiccant-packed drying column which quantitatively absorb all moisture from the sample gas stream after which the sample gas passes through the pump and the dry test gas meter which integrates the sample gas flow throughout the course of the test. A calibrated orifice attached to the outlet of the gas meter provides instantaneous flow rate data.

A representative particulate sample was acquired by sampling for equal periods of time at the centroid of a number of equal area regions in the duct. The sampling rate is adjusted at each site such that an isokinetic sampling condition prevails. Nomographs are used to aid in the rapid determination of the sampling rate.

Particulate Loading and Emission Rates

After sampling is complete, the filter is removed and placed in a clean container. The nozzle and inlet side of the filter holder are quantitatively washed with acetone and the washings are stored in a second container. A brush is often used in the cleaning step to help dislodge deposits. The samples are returned to the laboratory where they are logged in and analyzed. The volume of the acetone rinse ("probe wash") is noted and then the rinse is quantitatively transferred to a tared 120 cc porcelain evaporating dish and the acetone evaporated off at 97-105 °F. This temperature is used to prevent condensation of atmospheric moisture due to the cooling effect induced by the evaporation of acetone. The acetone-free sample is then transferred to an oven and dried at 105 °C for 30 minutes, cooled in a desiccator over Drierite, and then weighed to the nearest .01 mg. The filter sample is quantitatively transferred to a 6-inch watch glass and dried in an oven at 105 °C for two hours. The filter and watch glass are then cooled in a desiccator and the filter weighed to the nearest .01 mg. All weighings are performed in a balance room where the relative humidity is hydrostatted to less than 50% relative humidity. Microscopic examination of the samples is performed if any unusual characteristics are observed. The weight of the acetone rinse is corrected for the acetone blank. The Drierite column is weighed on-site and the water collected by Drierite is added to the condensate so that the total amount of absorbed water may be ascertained.

Integrated flue gas samples for Orsat analysis were collected simultaneously with each pollutant sample. The samples were collected in 15-liter gas sampling bags at a constant flow rate throughout each particulate run. The bags were at a constant flow rate throughout each particulate run. The bags were then returned to the laboratory and analyzed by Orsat analysis. Standard commercially prepared solutions were used in the Orsat analyzer (sat. KOH for carbon dioxide and reduced methylene blue for oxygen).

Condensible Organic Compounds Analysis

(State of Wisconsin - EPA Method 5)

Method II-8672-WI

Equipment: Separatory funnel - 500 cc with Teflon stopcock

Powder funnel - 75 mm ID with a glass wool plug

Evaporating dish(es) - 200 cc or 250 cc beaker

Reagents: Methylene chloride

Sodium sulfate - (ACS) granular anhydrous (purified by heating for four hours in a shallow tray)

SAMPLING

An all-glass impinger assembly is used in the back half of the EPA Method 5 sampling train when an organic wet catch is to be collected. The impinger assembly consists of a modified impinger, a Greenburg Smith impinger followed by another modified impinger. The third impinger should have a temperature measuring device at the outlet upstream of a final impinger or desiccant column to monitor the temperature of the outlet gas stream. Prior to the start of the test, each of the first two impingers should be charged with 100 g of Class I water. The Method 5 train should be operated as provided for in EPA Method 5. Ice should be added to the impinger bath to keep the temperature of the gas at the outlet at or less than 68°F. After the post test leak check, the impinger train is removed and impinger contents poured into a tared all-glass sample bottle and closed with a Teflon-lined cap. The sample bottle is then weighed and the total condensate calculated by subtraction of the bottle tare weight and the weight of initial water added to the impingers (200 g). A label is affixed and the sample is returned to the laboratory for analysis. The sample should be stored at 4°C if the analysis is not conducted within 48 hours.

ANALYSIS

1. Sample bottles are removed from storage and the contents quantitatively transferred to a clean 500 cc separatory funnel equipped with a Teflon stopcock.

2. Rinse the sample container with distilled water and add to separatory funnel.

3. Then rinse the sample container with acetone and pour through sodium sulfate into a tare beaker marked A.

4. The sample is then extracted consecutively with three 50 cc aliquots of methylene chloride. The extraction is performed according to normal laboratory practice observing the customary safety precaution of releasing excess pressure after each shaking.

5. After each of the three extractions are completed, the organic solvent should be dried by passing it through a funnel containing anhydrous sodium sulfate and collecting it and two 50 cc rinses in the tared beaker marked A (the same one used to catch the acetone container rinse).

6. Evaporate to dryness in a hood at 70°F or less. Do not evaporate so quickly as to allow evaporative cooling to lower the temperature of the container below the dew point otherwise water will be condensed in the container.

7. Desiccate for two hours in a sealed desiccator and final weigh. Report all results in grams. All weighings should be made to nearest 0.1 mg (four places).

8. The remaining liquid in the separatory funnel is then transferred to a tared beaker marked B and is evaporated to dryness at 220°F ± 10°F. The analyst may take an aliquot of the sample, transferring it to a tared beaker and evaporate to dryness at 220°F ± 10°F. If an aliquot is used, the weight of the sample and aliquot will have to be taken to correct for the total sample weight.

9. After the drying step, the sample is cooled in a desiccator and weighted to a constant weight to the nearest 0.1 mg.

Calculation (if aliquot is taken):

$$\text{grams} = \frac{(\text{grams recovered from aliquot}) \times (\text{total volume (ml) or grams of sample})}{(\text{aliquot volume (ml) or grams used})}$$

If volume is used, it must be used for both the aliquot and sample. The same goes for using weight.

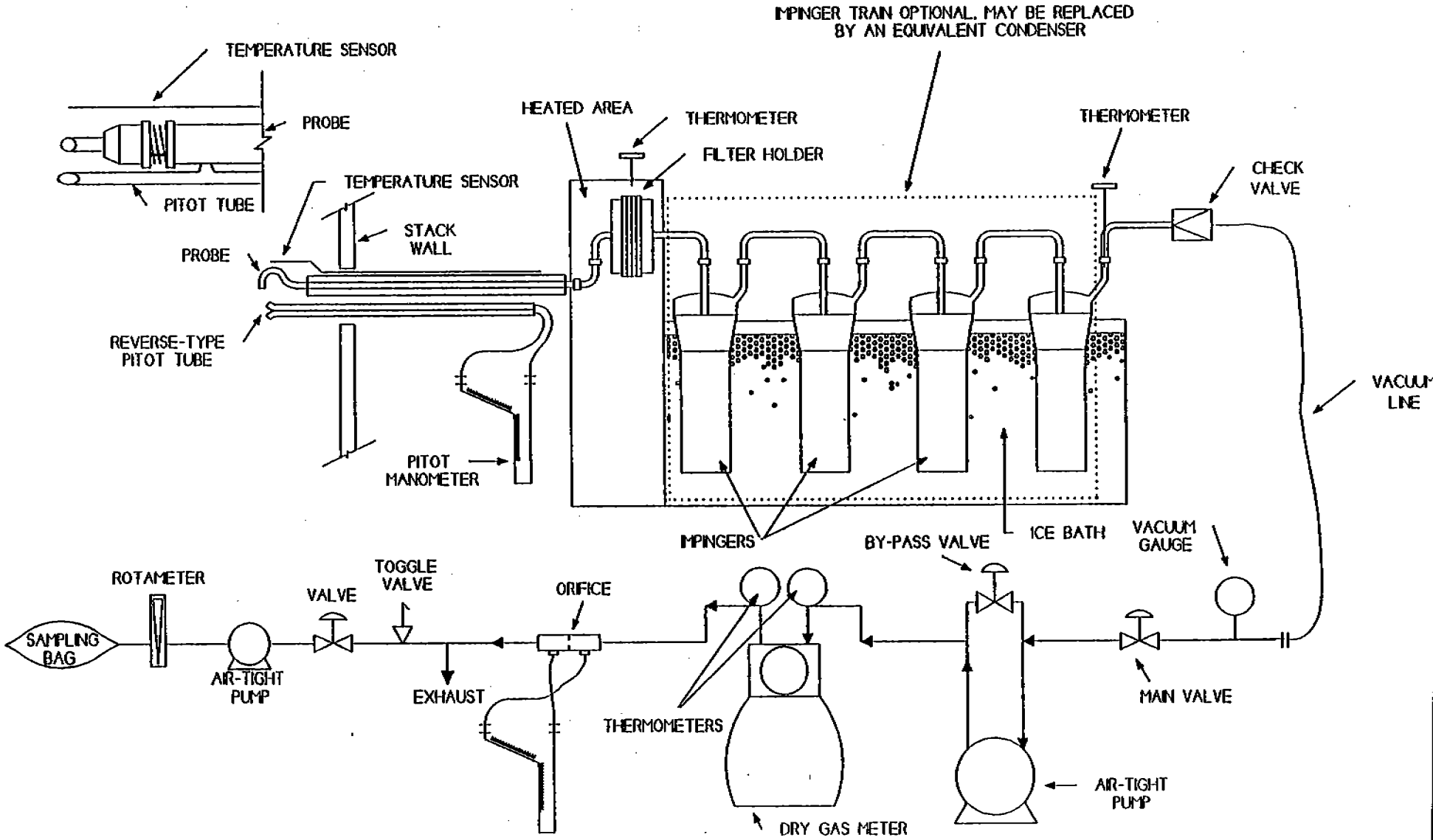
10. A field blank should be analyzed in an identical manner. If a field blank is not submitted, take an aliquot of Class I water equal in volume to the samples and analyze in a similar manner.

11. The results for container A are to be marked in the organic section of Interpoll Form #LSC-03G.

12. The results for container B are to be marked in the inorganic section of Interpoll Form #LSC-03G.

Interpoll Laboratories
(612) 786-6020

PARTICULATE SAMPLING TRAIN



Method 3A——Determination of Oxygen and Carbon Dioxide Concentrations in Emissions From Stationary Sources (Instrumental Analyzer Procedure)

1. Applicability and Principle

1.1 **Applicability.** This method is applicable to the determination of oxygen (O_2) and carbon dioxide (CO_2) concentrations in emissions from stationary sources only when specified within the regulations.

1.2 **Principle.** A sample is continuously extracted from the effluent stream: a portion of the sample stream is conveyed to an instrumental analyzer(s) for determination of O_2 and CO_2 concentration(s). Performance specifications and test procedures are provided to ensure reliable data.

2. Range and Sensitivity

Same as Method 6C, Sections 2.1 and 2.2, except that the span of the monitoring system shall be selected such that the average O_2 or CO_2 concentration is not less than 20 percent of the span.

3. Definitions

3.1 **Measurement System.** The total equipment required for the determination of the O_2 or CO_2 concentration. The measurement system consists of the same major subsystems as defined in Method 6C, Sections 3.1.1, 3.1.2, and 3.1.3.

3.2 Span, Calibration Gas, Analyzer Calibration Error, Sampling System Bias, Zero Drift, Calibration Drift, Response Time, and Calibration Curve. Same as Method 6C, Sections 3.2 through 3.8, and 3.10.

3.3 **Interference Response.** The output response of the measurement system to a component in the sample gas, other than the gas component being measured.

4. Measurement System Performance Specifications

Same as Method 6C, Sections 4.1 through 4.4.

5. Apparatus and Reagents

5.1 **Measurement System.** Any measurement system for O_2 or CO_2 that meets the specifications of this method. A schematic of an acceptable measurement system is shown in Figure 6C-1 of Method 6C. The essential components of the measurement system are described below:

5.1.1 **Sample Probe.** A leak-free probe, of sufficient length to traverse the sample points.

5.1.2 **Sample Line.** Tubing, to transport the sample gas from the probe to the moisture removal system. A heated sample line is not required for systems that measure the O_2 or CO_2 concentration on a dry basis, or transport dry gases.

5.1.3 Sample Transport Line, Calibration Value Assembly, Moisture Removal System, Particulate Filter, Sample Pump, Sample Flow Rate Control, Sample Gas Manifold, and Data Recorder. Same as Method 6C, Sections 5.1.3 through 5.1.9, and 5.1.11, except that the requirements to use stainless steel, Teflon, and nonreactive glass filters do not apply.

5.1.4 **Gas Analyzer.** An analyzer to determine continuously the O_2 or CO_2 concentration in the sample gas stream. The analyzer shall meet the applicable performance specifications of Section 4. A means of controlling the analyzer flow rate and a device for determining proper sample flow rate (e.g., precision rotameter, pressure gauge downstream of all flow controls, etc.) shall be provided at the analyzer. The requirements for measuring and controlling the analyzer flow rate are not applicable if data are presented that demonstrate the analyzer is insensitive to flow variations over the range encountered during the test.

5.2 **Calibration Gases.** The calibration gases for CO_2 analyzers shall be CO_2 in N_2 or CO_2 in air. Alternatively, CO_2/SO_2, O_2/SO_2, or $O_2/CO_2/SO_2$ gas mixtures in N_2 may be used. Three calibration gases, as specified Section 5.3.1 through 5.3.3 of Method 6C, shall be used. For O_2 monitors that cannot analyze zero gas, a calibration gas concentration equivalent to less than 10 percent of the span may be used in place of zero gas.

6. Measurement System Performance Test Procedures

Perform the following procedures before measurement of emissions (Section 7).

6.1 **Calibration Concentration Verification.** Follow Section 6.1 of Method 6C, except if calibration gas analysis is required, use Method 3 and change the acceptance criteria for agreement among Method 3 results to 5 percent (or 0.2 percent by volume, whichever is greater).

6.2 **Interference Response.** Conduct an interference response test of the analyzer prior to its initial use in the field. Thereafter, recheck the measurement system if changes are made in the instrumentation that could alter the interference response (e.g., changes in the type of gas detector). Conduct the interference response in accordance with Section 5.4 of Method 20.

6.3 Measurement System Preparation, Analyzer Calibration Error, and Sampling System Bias Check. Follow Sections 6.2 through 6.4 of Method 6C.

7. Emission Test Procedure

7.1 **Selection of Sampling Site and Sampling Points.** Select a measurement site and sampling points using the same criteria that are applicable to tests performed using Method 3.

7.2 **Sample Collection.** Position the sampling probe at the first measurement point, and begin sampling at the same rate as used during the sampling system bias check. Maintain constant rate sampling (i.e., ± 10 percent) during the entire run. The sampling time per run shall be the same as for tests conducted using Method 3 plus twice the system response time. For each run, use only those measurements obtained after twice the response time of the measurement system has elapsed to determine the average effluent concentration.

7.3 **Zero and Calibration Drift Test.** Follow Section 7.4 of Method 6C.

8. Quality Control Procedures

The following quality control procedures are recommended when the results of this method are used for an emission rate correction factor, or excess air determination. The tester should select one of the following options for validating measurement results:

8.1 If both O_2 and CO_2 are measured using Method 3A, the procedures described in Section 4.4 of Method 3 should be followed to validate the O_2 and CO_2 measurement results.

8.2 If only O_2 is measured using Method 3A, measurements of the sample stream CO_2 concentration should be obtained at the sample by-pass vent discharge using an Orsat or Fyrite analyzer, or equivalent. Duplicate samples should be obtained concurrent with at least one run. Average the duplicate Orsat or Fyrite analysis results for each run. Use the average CO_2 values for comparison with the O_2 measurements in accordance with the procedures described in Section 4.4 of Method 3.

8.3 If only CO_2 is measured using Method 3A, concurrent measurements of the sample stream CO_2 concentration should be obtained using an Orsat or Fyrite analyzer as described in Section 8.2. For each run, differences greater than 0.5 percent between the Method 3A results and the average of the duplicate Fyrite analysis should be investigated.

9. Emission Calculation

For all CO_2 analyzers, and for O_2 analyzers that can be calibrated with zero gas, follow Section 8 of Method 6C, except express all concentrations as percent, rather than ppm.

For O_2 analyzers that use a low-level calibration gas in place of a zero gas, calculate the effluent gas concentration using Equation 3A-1.

$$C_{gas} = \frac{C_{ma} - C_{oa}}{C_m - C_o} - (\overline{C} - C_m) + C_{ma} \quad Eq.\ 3A-1$$

Where:

C_{gas} = Effluent gas concentration, dry basis, percent.
C_{ma} = Actual concentration of the upscale calibration gas, percent.
C_{oa} = Actual concentration of the low-level calibration gas, percent.
C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, percent.
C_o = Average of initial and final system calibration bias check responses for the low-level gas, percent.
$\overline{C}$ = Average gas concentration indicated by the gas analyzer, dry basis, percent.

10. Bibliography

Same as bibliography of Method 6C.

Method 7E—Determination of Nitrogen Oxides Emissions From Stationary Sources (Instrumental Analyzer Procedure)

1. Applicability and Principle

1.1 **Applicability.** This method is applicable to the determination of nitrogen oxides (NO_x) concentrations in emissions from stationary sources only when specified within the regulations.

1.2 **Principle.** A gas simple is continuously extracted from a stack, and a portion of the sample is conveyed to an instrumental chemiluminescent analyzer for determination of NO_x concentration. Performance specifications and test procedures are provided to ensure reliable data.

2. Range and Sensitivity

Same as Method 6C, Sections 2.1 and 2.2.

3. Definitions

3.1 **Measurement System.** The total equipment required for the determination of NO_x concentration. The measurement system consists of the following major subsystems:

3.1.1 **Sample Interface, Gas Analyzer, and Data Recorder.** Same as Method 6C, Sections 3.1.1, 3.1.2, and 3.1.3.

3.1.2 **NO_2 to NO Converter.** A device that converts the nitrogen dioxide (NO_2) in the sample gas to nitrogen oxide (NO).

3.2 Span, Calibration Gas, Analyzer Calibration Error, Sampling System Bias, Zero Drift, Calibration Drift, and Response Time. Same as Method 6C, Sections 3.2 through 3.8.

3.3 **Interference Response.** The output response of the measurement system to a component in the sample gas, other than the gas component being measured.

4. Measurement System Performance Specifications

Same as Method 6C, Sections 4.1 through 4.4.

5. Apparatus and Reagents

5.1 **Measurement System.** Any measurement system for NO_x that meets the specifications of this method. A schematic of an acceptable measurement system is shown in Figure 6C-1 of Method 6C. The essential components of the measurement system are described below:

5.1.1 Sample Probe, Sample Line, Calibration Valve Assembly, Moisture Removal System, Particulate Filter, Sample Pump, Sample Flow Rate Control, Sample Gas Manifold, and Data Recorder. Same as Method 6C, Sections 5.1.1 through 5.1.9, and 5.1.11.

5.1.2 NO_2 **to NO Converter.** That portion of the system that converts the nitrogen dioxide (NO_2) in the sample gas to nitrogen oxide (NO). An NO_2 to NO converter is not necessary if data are presented to demonstrate that the NO_2 portion of the exhaust gas is less than 5 percent of the total NO_x concentration.

5.1.3 NO_x **Analyzer.** An analyzer based on the principles of chemiluminescence, to determine continuously the NO_x concentration in the sample gas stream. The analyzer shall meet the applicable performance specifications of Section 4. A means of controlling the analyzer flow rate and a device for determining proper sample flow rate (e.g., precision rotameter, pressure gauge downstream of all flow controls, etc.) shall be provided at the analyzer.

5.2 NO_x **Calibration Gases.** The calibration gases for the NO_x analyzer shall be NO in N_2. Three calibration gases, as specified in Sections 5.3.1 through 5.3.3. of Method 6C, shall be used. Ambient air may be used for the zero gas.

6. Measurement System Performance Test Procedures

Perform the following procedures before measurement of emissions (Section 7).

6.1 **Calibration Gas Concentration Verification.** Follow Section 6.1 of Method 6C, except if calibration gas analysis is required, use Method 7, and change all 5 percent performance values to 10 percent (or 10 PPM, whichever is greater).

6.2 **Interference Response.** Conduct an interference response test of the analyzer prior to its initial use in the field. Thereafter, recheck the measurement system if changes are made in the instrumentation that could alter the interference response (e.g., changes in the gas detector). Conduct the interference response in accordance with Section 5.4 of Method 20.

6.3 **Measurement System Preparation, Analyzer Calibration Error, and Sample System Bias Check.** Follow Sections 6.2 through 6.4 of Method 6C.

6.4 NO_2 **to NO Conversion Efficiency.** Unless data are presented to demonstrate that the NO_2 concentration within the sample stream is not greater than 5 percent of the NO_x concentration, conduct an NO_2 to NO conversion efficiency test in accordance with Section 5.6 of Method 20.

7. Emission Test Procedure

7.1 **Selection of Sampling Site and Sampling Points.** Select a measurement site and sampling points using the same criteria that are applicable to tests performed using Method 7.

7.2 **Sample Collection.** Position the sampling probe at the first measurement point, and begin sampling at the same rate as used during the system calibration drift test. Maintain constant rate sampling (i.e., ± 10 percent) during the entire run. The sampling time per run shall be the same as the total time required to perform a run using Method 7, plus twice the system response time. For each run, use only those measurements obtained after twice the response time of the measurement system has elapsed, to determine the average effluent concentration.

7.3 **Zero and Calibration Drift Test.** Follow Section 7.4 of Method 6C.

8. Emission Calculation

Follow Section 8 of Method 6C.

9. Bibliography

Same as bibliography of Method 6C.

Method 10—Determination of Carbon Monoxide Emissions From Stationary Sources

1. Principle and Applicability

1.1 **Principle.** An integrated or continuous gas sample is extracted from a sampling point and analyzed for carbon monoxide (CO) content using a Luft-type nondispersive infrared analyzer (NDIR) or equivalent.

1.2 **Applicability.** This method is applicable for the determination of carbon monoxide emissions from stationary sources only when specified by the test procedures for determining compliance with new source performance standards. The test procedure will indicate whether a continuous or an integrated sample is to be used.

2. Range and Sensitivity

2.1 **Range.** 0 to 1,000 PPM.

2.2 **Sensitivity.** Minimum detectable concentration is 20 PPM for a 0 to 1,000 PPM span.

3. Interferences

Any substance having a strong absorption of infrared energy will interfere to some extent. For example, discrimination ratios for water (H_2O) and carbon dioxide (CO_2) are 3.5 percent H_2O per 7 PPM CO and 10 percent CO_2 per 10 PPM CO, respectively, for devices measuring in the 1,500 to 3,000 PPM range. For devices measuring in the 0 to 100 PPM range, interference ratios can be as high as 3.5 percent H_2O per 25 PPM CO and 10 percent CO_2 per 50 PPM CO. The use of silica gel and ascarite traps will alleviate the major interference problems. The measured gas volume must be corrected if these traps are used.

4. Precision and Accuracy

4.1 **Precision.** The precision of most NDIR analyzers is approximately ± 2 percent of span.

4.2 **Accuracy.** The accuracy of most NDIR analyzers is approximately ± 5 percent of span after calibration.

5. Apparatus

5.1 **Continuous Sample** (Figure 10-1).

5.1.1 **Probe.** Stainless steel or sheathed Pyrex\1\ glass, equipped with a filter to remove particulate matter.

5.1.2 **Air-Cooled Condenser or Equivalent.** To remove any excess moisture.

5.2 **Integrated Sample** (Figure 10-2).

5.2.1 **Probe.** Stainless steel or sheathed Pyrex glass, equipped with a filter to remove particulate matter.

5.2.2 **Air-Cooled Condenser or Equivalent.** To remove any excess moisture.

5.2.3 **Valve.** Needle valve, or equivalent, to adjust flow rate.

5.2.4 **Pump.** Leak-free diaphragm type, or equivalent, to transport gas.

5.2.5 **Rate Meter.** Rotameter, or equivalent, to measure a flow range from 0 to 1.0 liter per min (0.035 cfm).

5.2.6 **Flexible Bag.** Tedlar, or equivalent, with a capacity of 60 to 90 liters (2 to 3 ft^3). Leak-test the bag in the laboratory before using by evacuating bag with a pump followed by a dry gas meter. When evacuation is complete, there should be no flow through the meter.

5.2.7 **Pitot Tube.** Type S, or equivalent, attached to the probe so that the sampling rate can be regulated proportional to the stack gas velocity when velocity is varying with the time or a sample traverse is conducted.

5.3 **Analysis** (Figure 10-3).

5.3.1 **Carbon Monoxide Analyzer.** Nondispersive infrared spectrometer, or equivalent. This instrument should be demonstrated, preferably by the manufacturer, to meet or exceed manufacturer's specifications and those described in this method.

5.3.2 **Drying Tube.** To contain approximately 200 g of silica gel.

5.3.3 **Calibration Gas.** Refer to section 6.1.

5.3.4 **Filter.** As recommended by NDIR manufacturer.

|_See_CFR_paper_publication_for_illustration_18A

5.3.5 **CO_2 Removal Tube.** To contain approximately 500 g of ascarite.

5.3.6 **Ice Water Bath.** For ascarite and silica gel tubes.

5.3.7 **Valve.** Needle valve, or equivalent, to adjust flow rate

5.3.8 **Rate Meter.** Rotameter or equivalent to measure gas flow rate of 0 to 1.0 liter per min (0.035 cfm) through NDIR.

5.3.9 **Recorder** (optional). To provide permanent record of NDIR readings.

6. Reagents

6.1 **Calibration Gases.** Known concentration of CO in nitrogen (N_2) for instrument span, prepurified grade of N_2 for zero, and two additional concentrations corresponding approximately to 60 percent and 30 percent span. The span concentration shall not exceed 1.5 times the applicable source performance standard. The calibration gases shall be certified by the manufacturer to be within ± 2 percent of the specified concentration.

|_See_CFR_paper_publication_for_illustration_19A

6.2 **Silica Gel.** Indicating type, 6 to 16 mesh, dried at 175°C (347°F) for 2 hours.

6.3 **Ascarite.** Commercially available.

7. Procedure

7.1 **Sampling.**

7.1.1 **Continuous Sampling.** Set up the equipment as shown in Figure 10-1 making sure all connections are leak free. Place the probe in the stack at a sampling point and purge the sampling line. Connect the analyzer and begin drawing sample into the analyzer. Allow 5 minutes for the system to stabilize, then record the analyzer reading as required by the test procedure. (See section 7.2 and 8). CO_2 content of the gas may be determined by using the Method 3 integrated sample procedure, or by weighing the ascarite CO_2 removal tube and computing CO_2 concentration from the gas volume sampled and the weight gain of the tube.

7.1.2 **Integrated Sampling.** Evacuate the flexible bag. Set up the equipment as shown in Figure 10-2 with the bag disconnected. Place the probe in the stack and purge the sampling line. Connect the bag, making sure that all connections are leak free. Sample at a rate proportional to the stack velocity. CO_2 content of the gas may be determined by using the Method 3 integrated sample procedures, or by weighing the ascarite CO_2 removal tube and computing CO_2 concentration from the gas volume sampled and the weight gain of the tube.

7.2 **CO Analysis.** Assemble the apparatus as shown in Figure 10-3, calibrate the instrument, and perform other required operations as described in section 8. Purge analyzer with N_2 prior to introduction of each sample. Direct the sample stream through the instrument for the test period, recording the readings. Check the zero and span again after the test to assure that any drift or malfunction is detected. Record the sample data on Table 10-1.

8. Calibration

Assemble the apparatus according to Figure 10-3. Generally an instrument requires a warm-up period before stability is obtained. Follow the manufacturer's instructions for specific procedure. Allow a minimum time of 1 hour for warm-up. During this time check the sample conditioning apparatus, i.e., filter, condenser, drying tube, and CO_2 removal tube, to ensure that each component is in good operating condition. Zero and calibrate the instrument according to the manufacturer's procedures using, respectively, nitrogen and the calibration gases.

Table 10-1—Field data

Comments

Location

Test

Date

Operator

Clock time	Rotameter setting, liters per minute (cubic feet per minute)

9. Calculation

Calculate the concentration of carbon monoxide in the stack using Equation 10-1.

CCO stack = CCO NDIR(1-Fco2) Eq. 10-1

Where:

CCO stack = Concentration of CO in stack, PPM by volume (dry basis).
CCO NDIR = Concentration of CO measured by NDIR analyzer, PPM by volume (dry basis).
FCO 2 = Volume fraction of CO_2 in sample, i.e., percent CO_2 from Orsat analysis divided by 100.

10. Alternative Procedures

10.1 **Interference Trap.** The sample conditioning system described in Method 10A, sections 2.1.2 and 4.2, may be used as an alternative to the silica gel and ascarite traps.

11. Bibliography

1. McElroy, Frank, The Intertech NDIR-CO Analyzer, Presented at 11th Methods Conference on Air Pollution, University of California, Berkeley, CA. April 1, 1970.

2. Jacobs, M. B., et al., Continuous Determination of Carbon Monoxide and Hydrocarbons in Air by a Modified Infrared Analyzer, J. Air Pollution Control Association, 9(2): 110-114. August 1959.

3. MSA LIRA Infrared Gas and Liquid Analyzer Instruction Book, Mine Safety Appliances Co., Technical Products Division, Pittsburgh, PA.

4. Models 215A, 315A, and 415A Infrared Analyzers, Beckman Instruments, Inc., Beckman Instructions 1635-B, Fullerton, CA. October 1967.

5. Continuous CO Monitoring System, Model A5611, Intertech Corp., Princeton, NJ.

6. UNOR Infrared Gas Analyzers, Bendix Corp., Ronceverte, WV

Agenda

A. Performance Specifications for NDIR Carbon Monoxide Analyzers

Range (minimum)	0—1000 PPM.
Output (minimum)	0—10mV.
Minimum detectable sensitivity	20 PPM.
Rise time, 90 percent (maximum)	30 seconds.
Fall time, 90 percent (maximum)	30 seconds.
Zero drift (maximum)	10% in 8 hours.
Span drift (maximum)	10% in 8 hours.
Precision (minimum)	± 2% of full scale.
Noise (maximum)	± 1% of full scale.
Linearity (maximum deviation)	2% of full scale.
Interference rejection ratio	CO_2—1000 to 1, H_2O—500 to 1.

B. Definitions of Performance Specifications.

Range——The minimum and maximum measurement limits.

Output——Electrical signal which is proportional to the measurement; intended for connection to readout or data processing devices. Usually expressed as millivolts or milliamps full scale at a given impedance.

Full scale——The maximum measuring limit for a given range.

Minimum detectable sensitivity——The smallest amount of input concentration that can be detected as the concentration approaches zero.

Accuracy——The degree of agreement between a measured value and the true value; usually expressed as ± percent of full scale.
Time to 90 percent response——The time interval from a step change in the input concentration at the instrument inlet to a reading of 90 percent of the ultimate recorded concentration.
Rise Time (90 percent)——The interval between initial response time and time to 90 percent response after a step increase in the inlet concentration.
Fall Time (90 percent)——The interval between initial response time and time to 90 percent response after a step decrease in the inlet concentration.
Zero Drift——The change in instrument output over a stated time period, usually 24 hours, of unadjusted continuous operation when the input concentration is zero; usually expressed as percent full scale.
Span Drift——The change in instrument output over a stated time period, usually 24 hours, of unadjusted continuous operation when the input concentration is a stated upscale value; usually expressed as percent full scale.
Precision——The degree of agreement between repeated measurements of the same concentration, expressed as the average deviation of the single results from the mean.
Noise——Spontaneous deviations from a mean output not caused by input concentration changes.
Linearity——The maximum deviation between an actual instrument reading and the reading predicted by a straight line drawn between upper and lower calibration points.

Method 10A—Determination of Carbon Monoxide Emissions in Certifying Continuous Emission Monitoring Systems at Petroleum Refineries

1. Applicability and Principle

1.1 **Applicability.** This method applies to the measurement of carbon monoxide (CO) at petroleum refineries. This method serves as the reference method in the relative accuracy test for nondispersive infrared (NDIR) CO continuous emission monitoring systems (CEMS's) that are required to be installed in petroleum refineries on fluid catalytic cracking unit catalyst regenerators [40 CFR Part 60.105(a)(2)].

1.2 **Principle.** An integrated gas sample is extracted from the stack, passed through an alkaline permanganate solution to remove sulfur and nitrogen oxides, and collected in a Tedlar bag. The CO concentration in the sample is measured spectrophotometrically using the reaction of CO with p-sulfaminobenzoic acid.

1.3. **Range and Sensitivity.**

1.3.1 **Range.** Approximately 3 to 1800 PPM CO. Samples having concentrations below 400 PPM are analyzed at 425 nm, and samples having concentrations above 400 PPM are analyzed at 600 nm.

1.3.2 **Sensitivity.** The detection limit is 3 PPM based on three times the standard deviation of the mean reagent blank values.

7.4 Adsorption Tube Procedure (Alternative Procedure). It is suggested that the tester refer to the National Institute of Occupational Safety and Health (NIOSH) method for the particular organics to be sampled. The principal interferent will be water vapor. If water vapor is present at concentrations above 3 percent, silica gel should be used in front of the charcoal. Where more than one compound is present in the emissions, then develop relative adsorptive capacity information.

7.4.1 Additional Apparatus. In addition to the equipment listed in the NIOSH method for the particular organic(s) to be sampled, the following items (or equivalent) are suggested.

7.4.1.1 Probe (Optional). Borosilicate glass or stainless steel, approximately 6-mm ID, with a heating system if water condensation is a problem, and a filter (either in-stack or out-stack heated to stack temperature) to remove particulate matter. In most instances, a plug of glass wool is a satisfactory filter.

7.4.1.2 Flexible Tubing. To connect probe to adsorption tubes. Use a material that exhibits minimal sample adsorption.

7.4.1.3 Leakless Sample Pump. Flow controlled, constant rate pump, with a set of limiting (sonic) orifices to provide pumping rates from approximately 10 to 100 cc/min.

7.4.1.4 Bubble-Tube Flowmeter. Volume accuracy within ± 1 percent, to calibrate pump.

7.4.1.5 Stopwatch. To time sampling and pump rate calibration.

7.4.1.6 Adsorption Tubes. Similar to ones specified by NIOSH, except the amounts of adsorbent per primary/backup sections are 800/200 mg for charcoal tubes and 1040/260 mg for silica gel tubes. As an alternative, the tubes may contain a porous polymer adsorbent such as Tenax GC or XAD-2.

7.4.1.7 Barometer. Accurate to 5 mm Hg, to measure atmospheric pressure during sampling and pump calibration.

7.4.1.8 Rotameter. 0 to 100 cc/min, to detect changes in flow rate during sampling.

7.4.2 Sampling and Analysis. It is suggested that the tester follow the sampling and analysis portion of the respective NIOSH method section entitled "Procedure." Calibrate the pump and limiting orifice flow rate through adsorption tubes with the bubble tube flowmeter before sampling. The sample system can be operated as a "recirculating loop" for this operation. Record the ambient temperature and barometric pressure. Then, during sampling, use the ro-

METHOD 18—MEASUREMENT OF GASEOUS ORGANIC COMPOUND EMISSIONS BY GAS CHROMATOGRAPHY

tameter to verify that the pump and orifice sampling rate remains constant.

Use a sample probe, if required, to obtain the sample at the centroid of the duct, or at a point no closer to the walls than 1 m. Minimize the length of flexible tubing between the probe and adsorption tubes. Several adsorption tubes can be connected in series, if the extra adsorptive capacity is needed. Provide the gas sample to the sample system at a pressure sufficient for the limiting orifice to function as a sonic orifice. Record the total time and sample flow rate (or the number of pump strokes), the barometric pressure, and ambient temperature. Obtain a total sample volume commensurate with the expected concentration(s) of the volatile organic(s) present, and recommended sample loading factors (weight sample per weight adsorption media). Laboratory tests prior to actual sampling may be necessary to predetermine this volume. When more than one organic is present in the emissions, then develop relative adsorptive capacity information. If water vapor is present in the sample at concentrations above 2 to 3 percent, the adsorptive capacity may be severely reduced. Operate the gas chromatograph according to the manufacture's instructions. After establishing optimum conditions, verify and document these conditions during all operations. Analyze the audit samples (see Section 7.4.4.3), then the emission samples. Repeat the analysis of each sample until the relative deviation of two consecutive injections does not exceed 5 percent.

7.4.3 Standards and Calibration. The standards can be prepared according to the respective NIOSH method. Use a minimum of three different standards; select the concentrations to bracket the expected average sample concentration. Perform the calibration before and after each day's sample analyses. Prepare the calibration curve by using the least squares method.

7.4.4 Quality Assurance.

7.4.4.1 Determination of Desorption Efficiency. During the testing program, determine the desorption efficiency in the expected sample concentration range for each batch of adsorption media to be used. Use an internal standard. A minimum desorption efficiency of 50 percent shall be obtained. Repeat the desorption determination until the relative deviation of two consecutive determinations does not exceed 5 percent. Use the average desorption efficiency of these two consecutive determinations for the correction specified in Section 7.4.4.5. If the desorption efficiency of the compound(s) of interest is questionable under actual sampling conditions, use of the Method of Standard Additions may be helpful to determine this value.

7.4.4.2 Determination of Sample Collection Efficiency. For the source samples, analyze the primary and backup portions of the adsorption tubes separately. If the backup portion exceeds 10 percent of the total amount (primary and backup), repeat the sampling with a larger sampling portion.

7.4.4.3 Analysis Audit. Immediately before the sample analyses, analyze the two audits in accordance with Section 7.4.2. The analysis audit shall agree with the audit concentration within 10 percent.

7.4.4.4 Pump Leak Checks and Volume Flow Rate Checks. Perform both of these checks immediately after sampling with all sampling train components in place. Perform all leak checks according to the manufacturer's instructions, and record the results. Use the bubble-tube flowmeter to measure the pump volume flow rate with the orifice used in the test sampling, and the result. If it has changed by more than 5 but less than 20 percent, calculate an average flow rate for the test. If the flow rate has changed by more than 20 percent, recalibrate the pump and repeat the sampling.

7.4.4.5 Calculations. All calculations can be performed according to the respective NIOSH method. Correct all sample volumes to standard conditions. If a sample dilution system has been used, multiply the results by the appropriate dilution ratio. Correct all results by dividing by the desorption efficiency (decimal value). Report results as ppm by volume, dry basis.

7.5 Reporting of Results. At the completion of the field analysis portion of the study, ensure that the data sheets shown in Figure 18-11 have been completed. Summarize this data on the data sheets shown in Figure 18-15.

8. *Bibliography*

1. American Society for Testing and Materials. C_1 Through C_5 Hydrocarbons in the Atmosphere by Gas Chromatography. ASTM D 2820-72, Part 23. Philadelphia, Pa. 23:950-958. 1973.

2. Corazon, V. V. Methodology for Collecting and Analyzing Organic Air Pollutants. U.S. Environmental Protection Agency. Publication No. EPA-600/2-79-042. February 1979.

3. Dravnieks, A., B. K. Krotoszynski, J. Whitfield, A. O'Donnell, and T. Burgwald. Environmental Science and Technology. *5*(12):1200-1222. 1971.

4. Eggertsen, F. T., and F. M. Nelsen. Gas Chromatographic Analysis of Engine Exhaust and Atmosphere. Analytical Chemistry. *30*(6): 1040-1043. 1958.

5. Fearheller, W. R., P. J. Marn, D. H. Harris, and D. L. Harris. Technical Manual for Process Sampling Strategies for Organic Materials. U.S. Environmental Protection Agency. Research Triangle Park, NC. Publication No. EPA 600/2-76-122. April 1976. 172 p.

Sampling Equipment. Environmental Protection Agency. Research Triangle Park, N.C. APTD-0576. March, 1972.

4. Smith, W. S., R. T. Shigehara, and W. F. Todd. A Method of Interpreting Stack Sampling Data. Paper Presented at the 63rd Annual Meeting of the Air Pollution Control Association, St. Louis, Mo. June 14-19, 1970.

5. Smith, W. S., et al., Stack Gas Sampling Improved and Simplified with New Equipment. APCA Paper No. 67-119. 1967.

6. Specifications for Incinerator Testing at Federal Facilities. PHS, NCAPC. 1967.

7. Shigehara, R. T., Adjustments in the EPA Nomograph for Different Pitot Tube Coefficients and Dry Molecular Weights. Stack Sampling News 2:4-11. October, 1974.

8. Vollaro, R. F., A Survey of Commercially Available Instrumentation for the Measurement of Low-Range Gas Velocities. U.S. Environmental Protection Agency, Emission Measurement Branch. Research Triangle Park, N.C. November, 1976 (unpublished paper).

9. Annual Book of ASTM Standards. Part 26. Gaseous Fuels; Coal and Coke; Atmospheric Analysis. American Society for Testing and Materials. Philadelphia, Pa. 1974. pp. 617-622.

10. Vollaro, R. F., Recommended Procedure for Sample Traverses in Ducts Smaller than 12 Inches in Diameter. U.S. Environmental Protection Agency, Emission Measurement Branch. Research Triangle Park, N.C. November, 1976.

Method 18—Measurement of Gaseous Organic Compound Emissions by Gas Chromatography

Introduction

This method should not be attempted by persons unfamiliar with the performance characteristics of gas chromatography, nor by those persons who are unfamiliar with source sampling. Particular care should be exercised in the area of safety concerning choice of equipment and operation in potentially explosive atmospheres.

1. *Applicability and Principle*

1.1 Applicability. This method applies to the analysis of approximately 90 percent of the total gaseous organics emitted from an industrial source. It does not include techniques to identify and measure trace amounts of organic compounds, such as those found in building air and fugitive emission sources.

This method will not determine compounds that (1) are polymeric (high molecular weight), (2) can polymerize before analysis, or (3) have very low vapor pressures at stack or instrument conditions.

1.2 Principle.

The major organic components of a gas mixture are separated by gas chromatography (GC) and individually quantified by flame ionization, photoionization, electron capture, or other appropriate detection principles.

The retention times of each separated component are compared with those of known compounds under identical conditions. Therefore, the analyst confirms the identity and approximate concentrations of the organic emission components beforehand. With this information, the analyst then prepares or purchases commercially available standard mixtures to calibrate the GC under conditions identical to those of the samples. The analyst also determines the need for sample dilution to avoid detector saturation, gas stream filtration to eliminate particulate matter, and prevention of moisture condensation.

2. *Range and Sensitivity*

2.1 Range. The range of this method is from about 1 part per million (ppm) to the upper limit governed by GC detector saturation or column overloading. The upper limit can be extended by diluting the stack gases with an inert gas or by using smaller gas sampling loops.

2.2 Sensitivity. The sensitivity limit for a compound is defined as the minimum detectable concentration of that compound, or the concentration that produces a signal-to-noise ratio of three to one. The minimum detectable concentration is determined during the presurvey calibration for each compound.

3. *Precision and Accuracy*

Gas chromatographic techniques typically provide a precision of 5 to 10 percent relative standard deviation (RSD), but an experienced GC operator with a reliable instrument can readily achieve 5 percent RSD. For this method, the following combined GC/operator values are required.

(a) Precision. Duplicate analyses are within 5 percent of their mean value.

(b) Accuracy. Analysis results of prepared audit samples are within 10 percent of preparation values.

4. *Interferences*

Resolution interferences that may occur can be eliminated by appropriate GC column and detector choice or by shifting the retention times through changes in the column flow rate and the use of temperature programming.

The analytical system is demonstrated to be essentially free from contaminants by periodically analyzing blanks that consist of hydrocarbon-free air or nitrogen.

Sample cross-contamination that occurs when high-level and low-level samples or standards are analyzed alternately, is best

Method 25A-Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

1. Applicability and Principle

1.1 **Applicability.** This method applies to the measurement of total gaseous organic concentration of vapors consisting primarily of alkanes, alkenes, and/or arenes (aromatic hydrocarbons). The concentration is expressed in terms of propane (or other appropriate organic calibration gas) or in terms of carbon.

1.2 **Principle.** A gas sample is extracted from the source through a heated sample line, if necessary, and glass fiber filter to a flame ionization analyzer (FIA). Results are reported as volume concentration equivalents of the calibration gas or as carbon equivalents.

2. Definitions

2.1 **Measurement Systems.** The total equipment required for the determination of the gas concentration. The system consists of the following major subsystems:

2.1.1 **Sample Interface.** That portion of the system that is used for one or more of the following: sample acquisition, sample transportation, sample conditioning, or protection of the analyzer from the effects of the stack effluent.

2.1.2 **Organic Analyzer.** That portion of the system that senses organic concentration and generates an output proportional to the gas concentration.

2.2 **Span Value.** The upper limit of a gas concentration measurement range that is specified for affected source categories in the applicable part of the regulations. The span value is established in the applicable regulation and is usually 1.5 to 2.5 times the applicable emission limit. If no span value is provided, use a span value equivalent to 1.5 to 2.5 times the expected concentration. For convenience, the span value should correspond to 100 percent of the recorder scale.

2.3 **Calibration Gas.** A known concentration of a gas in an appropriate diluent gas.

2.4 **Zero Drift.** The difference in the measurement system response to a zero level calibration gas before and after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

2.5 **Calibration drift.** The difference in the measurement system response to a midlevel calibration gas before and after a stated period of operation during which no unscheduled maintenance, repair or adjustment took place.

2.6 **Response Time.** The time interval from a step change in pollutant concentration at the inlet to the emission measurement system to the time at which 95 percent of the corresponding final value is reached as displayed on the recorder.

2.7 **Calibration Error.** The difference between the gas concentration indicated by the measurement system and the known concentration of the calibration gas.

3. Apparatus

A schematic of an acceptable measurement system is shown in Figure 25A-1. The essential components of the measurement system are described below:

3.1 **Organic Concentration Analyzer.** A flame ionization analyzer (FIA) capable of meeting or exceeding the specifications in this method.

3.2 **Sample Probe.** Stainless steel, or equivalent, three-hole rake type. Sample holes shall be 4 mm in diameter or smaller and located at 16.7, 50, and 83.3 percent of the equivalent stack diameter. Alternatively, a single opening probe may be used so that a gas sample is collected from the centrally located 10 percent area of the stack cross-section.

3.3 **Sample Line.** Stainless steel or Teflon * tubing to transport the sample gas to the analyzer. The sample line should be heated, if necessary, to prevent condensation in the line.

3.4 **Calibration Valve Assembly.** A three way valve assembly to direct the zero and calibration gases to the analyzers is recommended. Other methods, such as quick-connect lines, to route calibration gas to the analyzers are applicable.

3.5 **Particulate Filter.** An in-stack or an out-of-stack glass fiber filter is recommended if exhaust gas particulate loading is significant. An out-of-stack filter should be heated to prevent any condensation.

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* Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

3.6 **Recorder.** A strip-chart recorder, analog computer, or digital recorder for recording measurement data. The minimum data recording requirement is one measurement value per minute, Note: This method is often applied in highly explosive areas. Caution and care should be exercised in choice of equipment and installation.

4. Calibration and Other Gases.

Gases used for calibrations, fuel, and combustion air (if required) are contained in compressed gas cylinders. Preparation of calibration gases shall be done according to the procedure in Protocol No. 1, listed in Citation 2 of Bibliography. Additionally, the manufacturer of the cylinder should provide a recommended shelf life for each calibration gas cylinder over which the concentration does not change more than ± 2 percent from the certified value. For calibration gas values not generally available (i.e., organics between 1 and 10 percent by volume), alternative methods for preparing calibration gas mixtures, such as dilution systems, may be used with prior approval of the Administrator.

Calibration gases usually consist of propane in air or nitrogen and are determined in terms of the span value. Organic compounds other than propane can be used following the above guidelines and making the appropriate corrections for response factor.

4.1 **Fuel.** A 40 percent H_2/60 percent N_2 gas mixture is recommended to avoid an oxygen synergism effect that reportedly occurs when oxygen concentration varies significantly from a mean value.

4.2 **Zero Gas.** High purity air with less than 0.1 parts per million by volume (PPMv) of organic material (propane or carbon equivalent) or less than 0.1 percent of the span value, whichever is greater.

4.3 **Low-level Calibration Gas.** An organic calibration gas with a concentration equivalent to 25 to 35 percent of the applicable span value.

4.4 **Mid-level Calibration Gas.** An organic calibration gas with a concentration equivalent to 45 to 55 percent of the applicable span value.

4.5 **High-level Calibration Gas.** An organic calibration gas with a concentration equivalent to 80 to 90 percent of the applicable span value.

5. Measurement System Performance Specifications

5.1 **Zero Drift.** Less than ± 3 percent of the span value.

5.2 **Calibration Drift.** Less than ± 3 percent of span value.

5.3 **Calibration Error.** Less than ± 5 percent of the calibration gas value.

6. Pretest Preparations

6.1 **Selection of Sampling Site.** The location of the sampling site is generally specified by the applicable regulation or purpose of the test; i.e., exhaust stack, inlet line, etc. The sample port shall be located at least 1.5 meters or 2 equivalent diameters upstream of the gas discharge to the atmosphere.

6.2 **Location of Sample Probe.** Install the sample probe so that the probe is centrally located in the stack, pipe, or duct and is sealed tightly at the stack port connection.

6.3 **Measurement System Preparation.** Prior to the emission test, assemble the measurement system following the manufacturer's written instructions in preparing the sample interface and the organic analyzer. Make the system operable.

FIA equipment can be calibrated for almost any range of total organics concentrations. For high concentrations of organics (> 1.0 percent by volume as propane) modifications to most commonly available analyzers are necessary. One accepted method of equipment modification is to decrease the size of the sample to the analyzer through the use of a smaller diameter sample capillary. Direct and continuous measurement of organic concentration is a necessary consideration when determining any modification design.

6.4 **Calibration Error Test.** Immediately prior to the test series, (within 2 hours of the start of the test) introduce zero gas and high-level calibration gas at the calibration valve assembly. Adjust the analyzer output to the appropriate levels, if necessary. Calculate the predicted response for the low-level and mid-level gases based on a linear response line between the zero and high-level responses. Then introduce low-level and mid-level calibration gases successively to the measurement system. Record the analyzer responses for low-level and mid-level calibration gases and determine the differences between the measurement system responses and the predicted responses. These differences must be less than 5 percent of the respective calibration gas value. If not, the measurement system is not acceptable and must be replaced or repaired prior to testing. No adjustments to the measurement system shall be conducted after the calibration and before the drift check (Section 7.3). If adjustments are necessary before the completion of the test series, perform the drift checks prior to the required adjustments and repeat the calibration following the adjustments. If multiple electronic ranges are to be used, each additional range must be checked with a mid-level calibration gas to verify the multiplication factor.

6.5 **Response Time Test.** Introduce Zero gas into the measurement system at the calibration valve assembly. When the system output has stabilized, switch quickly to the high-level calibration gas. Record the time from the concentration change to the measurement system response equivalent to 95 percent of the step change. Repeat the test three times and average the results.

7. Emission Measurement Test Procedure

7.1 **Organic Measurement.** Begin sampling at the start of the test period, recording time and any required process information as appropriate. In particular, note on the recording chart periods of process interruption or cyclic operation.

7.2 **Drift Determination.** Immediately following the completion of the test period and hourly during the test period, reintroduce the zero and mid-level calibration gases, one at a time, to the measurement system at the calibration valve assembly. (Make no adjustments to the measurement system until after both the zero and calibration drift checks are made.) Record the analyzer response. If the drift values exceed the specified limits, invalidate the test results preceding the check and repeat the test following corrections to the measurement system. Alternatively, recalibrate the test measurement system as in Section 6.4 and report the results using both sets of calibration data (i.e., data determined prior to the test period and data determined following the test period).

8. Organic Concentration calculations

Determine the average organic concentration in terms of PPMv as propane or other calibration gas. The average shall be determined by the integration of the output recording over the period specified in the applicable regulation. If results are required in terms of PPMv as carbon, adjust measured concentrations using Equation 25A-1.

$C_c = K C_{meas}$ Eq. 25A-1

Where:

C_c = Organic concentration as carbon, PPMv.
C_{meas} = Organic concentration as measured, PPMv.
K = Carbon equivalent correction factor.
K = 2 for ethane.
K = 3 for propane.
K = 4 for butane.
K = Appropriate response factor for other organic calibration gases.

9. Bibliography

1. Measurement of Volatile Organic Compounds-Guideline Series. U.S. Environmental Protection Agency. Research Triangle Park, NC. Publication No. EPA-450/2-78-041. June 1978. p. 46-54.

2. Traceability Protocol for Establishing True Concentrations of Gases Used for Calibration and Audits of Continuous Source Emission Monitors (Protocol No. 1). U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory. Research Triangle Park, NC. June 1978.

3. Gasoline Vapor Emission Laboratory Evaluation-Part 2. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, NC. EMB Report No. 75-GAS-6. August 1975.

PHENOL

Phenol samples were collected using a Method 5 sampling train at 0.75 CFM using neutral-buffered absorbing reagent. The first impinger in each sampling was spiked with isotopically-labeled phenol (phenol-d_5) and 2-fluorophenol for sampling and recovery efficiency surrogates. The recovered samples were extracted and the extracts analyzed by GC/MS for phenol, phenol-d_5 and 2-fluorophenol as per EPA Method 8270. The recoveries of phenol-d_5 and 2-fluorophenol were used to adjust the measured phenol concentrations.

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This document is a preliminary draft. It has not been formally released by EPA and should not at this stage be construed to represent Agency policy. It is being circulated for comment on its technical accuracy and policy implications.

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FIELD TEST OF A GENERIC METHOD FOR SAMPLING AND ANALYSIS OF ISOCYANATES

Interim Report
(Work Assignment 55)

Prepared for:

Frank Wilshire
Atmospheric Research and Exposure Assessment Laboratory
Methods Research and Development Division
Source Methods Research Branch
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

Prepared by:

J. F. McGaughey
S. C. Foster
R. G. Merrill

RADIAN CORPORATION

P.O. Box 13000
Research Triangle Park, NC 27709

July 1993

DRAFT

This document is a preliminary draft. It has not been formally released by EPA and should not at this stage be construed to represent Agency policy. It is being circulated for comment on its technical accuracy and policy implications.

DISCLAIMER

The information in this document has been funded wholly by the United States Environmental Protection Agency under EPA Contract Number 68-D1-0010 to Radian. It has been subjected to the Agency's peer and administrative review, and it has been approved for publication as an EPA document. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

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EXECUTIVE SUMMARY

Isocyanates are used extensively in the production of polyurethane materials such as flexible foam, enamel wire coatings, paint formulations and in binders for the pressed board industry. Because of their widespread use and known adverse physiological effects, several isocyanates have been listed in Title III of the Clean Air Act Amendments of 1990. The isocyanates of interest are: 2,4-toluene diisocyanate (TDI), methylene diphenyl diisocyanate (MDI), 1,6-hexamethylene diisocyanate (HDI) and methyl isocyanate (MI). Previously, no validated sampling and analytical methodology for these compounds relative to stationary sources existed.

The field validation study presented in this report is a culmination of laboratory investigations, performed under previous work assignments, which were designed to develop and evaluate a viable approach for the determination of isocyanate emissions from stationary sources. After the successful completion of the laboratory studies, the sampling and analysis approach was formulated and a field validation test was initiated. At the direction of the EPA, TDI was selected as the primary analyte.

The test site selected was a flexible foam manufacturing facility in High Point, North Carolina, which used TDI in the manufacturing process. The approximate level of TDI in the emission stream was determined by the analysis of samples collected during a presurvey. A sampling scheme was then designed to ensure the collection of sufficient samples to yield statistically valid data. Following the EPA Method 301 protocol, quadruplicate trains (QUAD) were operated simultaneously with four co-located probes. Two of the trains were spiked with TDI and two were unspiked. Samples from eight QUAD runs (minimum of six valid runs required by Method 301) were returned to the laboratory and analyzed according to the analytical procedure developed in laboratory studies. These data were statistically evaluated following Method 301 protocol to determine the performance of the method relative to bias and precision. These results are summarized in the following table. The precision for both the spiked and unspiked trains was less than 5% RSD, which is well within the precision criteria (% RSD <50)

Method Validation Statistical Summary

Precision[a]	
% RSD for Spiked Samples	3.55[b]
% RSD for Unspiked Samples	4.72[b]
Accuracy[a]	
Bias:	-295 μg
Significant?	No
Correction Factor	1.0[c]
Recovery[a]	
Amount Spiked (as TDI)	7828 μg
Average Percent Recovered	95

[a]Results are based on the average of seven QUAD runs (14 spiked trains and 14 unspiked trains). TDI was present in the stack emissions and was therefore collected as background in the unspiked trains as well as in the spiked trains.

[b]EPA Method 301 requires the precision to be <50% RSD for the method to be acceptable.

[c]EPA Method 301 requires the calculated Correction Factor to be between 0.7 and 1.3 for the method to be acceptable.

for an acceptable method as tested. Using the data from all eight runs, the bias was found to be significant at the 95% level of confidence thus requiring the use of a correction factor of 1.053. Using the data from only seven runs (eliminating run number eight due to a questionable leak check for one of the trains) the bias was not significant and therefore did not require the calculation of a correction factor. In either case, the method was well within the bias acceptance criteria (correction factor between 0.7 and 1.3) for an acceptable method as tested.

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1.0 INTRODUCTION

Sampling and analytical methods for a particular analyte or group of analytes can be evaluated and validated by demonstrating their performance in field tests, thereby establishing the precision and bias of the methods experimentally. Few methods have been fully validated for sampling and analyzing the organic compounds listed in Title III of the Clean Air Act Amendments of 1990. For some analytes, methods have been validated for sample analysis, but not for sample collection. Full validation for both sampling and analytical methods, for both field and laboratory operations, is available for fewer than 10 percent of the analytes listed in Title III of the Clean Air Act Amendments at any source category. Field validation may be performed by side-by-side comparison of a candidate method to a validated method to establish comparable performance for the same analytes in the same matrix (same source category). Another procedure for validation of a method is to spike known quantities of analytes into the collection apparatus in the field so that the precision and bias of the method can be demonstrated from sample collection through analysis.

EPA, under the authority of Title III of the Clean Air Act Amendments (CAAA) of 1990, requires the identification and validation of sampling and analytical methods for the isocyanate compounds which are listed among the 189 hazardous air pollutants identified in Title III. These isocyanate compounds are listed in Table 1-1. Development of sampling and analytical methods for these four compounds was accomplished under Work Assignments 11, 21, and 40 on EPA Contract No. 68-D1-0010. At the direction of EPA, initial efforts were directed to the measurement of 2,4-toluene diisocyanate (TDI) emissions.

The objective of this work assignment was to validate the isocyanate sampling and analytical test method through field testing at an operating stationary source. The method was validated by collecting flue gas samples for the analysis of 2,4-TDI, and evaluating the data for bias and precision. EPA Method 301, "Field Validation of Pollutant Measurement Methods from Various Waste Media," was used as

Table 1-1

Isocyanates Listed in the Clean Air Act Amendments of 1990

Hexamethylene-1,6-diisocyanate (HDI)
2,4-Toluene diisocyanate (TDI)[a]
Methylene diphenyl diiocyanate (MDI)
Methyl isocyanate (MI)

[a]The 2,6 TDI isomer may also be present but is not listed in the CAAA.

a model for the validation protocol. Analyte spiking was used with quadruplicate sampling trains to generate the required data. The field validation was performed at an industrial facility which manufactures flexible foam products. Only two of the quadruplicate trains were spiked for each run. The two unspiked trains were used to establish the background level of target compound in the stack gas.

The sampling method utilizes a Method 5-type sampling train, which operates with a solution of 1-(2-pyridyl) piperazine and toluene in the impingers. Stack gas is extracted from the source through a heated probe and drawn through the impingers. TDI present in the stack gas reacts with the piperazine to form an isocyanate derivative. The quantity of isocyanate is determined by solvent exchange of the toluene solution with acetonitrile followed by high pressure liquid chromatographic (HPLC) analysis.

This report discusses the details of the field validation study. Section 2.0, Conclusions and Recommendations, summarizes the results and provides recommendations for future work. Sections 3.0 and 4.0 provide details of the sampling and analysis procedures respectively. Section 5.0 is a detailed discussion of the procedures, calculations and quality control.

2.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results presented in Section 6.0 of this report, the following conclusions can be made concerning the validity of the method as tested under the conditions described in this report:

- The calculated values for precision (%RSD) for both the spiked and unspiked trains, 3.55 and 4.72 respectively, are both well within the acceptance criteria of less than 50% RSD found in Section 6.3 of the EPA Method 301. Therefore, the method as tested at the source category described meets the precision requirements;

- The method bias, at the concentration levels tested, was found to be significantly different from zero at the 95% level of confidence when the data from all eight runs (minimum of six runs required) were used in the calculations. A correction factor of 1.053 would be required if all eight runs are included in the bias calculation. Good technical reasons exist for excluding one of eight QUAD runs. If this run is eliminated, no bias correction is required. In either case the correction factor is well within the acceptance criteria of 0.7 to 1.3 found in Section 1.2 of the EPA Method 301. Therefore, the method as tested at the source category described meets the bias and correction factor requirements; and

- The method as tested is sufficiently robust to allow testing at sources similar to the source tested in this study where the stack gas moisture is less than 1% by volume, the stack temperature is less than 30 degrees C and the presence of other compounds that may interfere with the analysis are minimal.

Recommendations for future testing and validation of the method for the sampling and analysis of isocyanates include the following:

- Identify a source for testing that has more than one isocyanate present in the stack gas;

- Spike as many of the four CAAA target isocyanates as possible into the train before sampling in order to gain as much information as possible from the field test; and

- Design the condenser between the first and second impinger of the train to more efficiently reduce the loss of toluene from the first impinger and minimize compound breakthrough due entrained aerosols.

3.0 FIELD TEST

The objective of this program was to perform a field test to establish the bias and precision of a sampling and analytical method for isocyanate compounds listed in Title III of the Clean Air Act Amendments of 1990. The method evaluation in this test series resulted from extensive literature reviews, industry consultation and laboratory development. To achieve the test objective, an industrial source with known emissions of TDI was selected as a field test site. Factors in the site selection were easy access, ample space for the quadruple sampling trains and proximity to Radian's office and laboratory in Research Triangle Park, North Carolina.

3.1 Site Description

The field validation test was performed at a flexible foam production plant located in High Point, North Carolina. In the manufacturing process starting materials (TDI, water, a polyether resin, methylene chloride, an amine catalyst, and coloring additives) are blended and continuously fed onto a conveyer belt. The TDI reacts with water and releases CO_2, which causes foaming in the resin material. Dichloromethane (DCM) can be added as a supplemental "blowing" or foaming agent. The heat from the reaction of TDI and water causes the DCM to vaporize, resulting in increased foaming. The density of the foam is controlled by the amount of TDI, water and DCM added. The foaming action continues as the material proceeds down the conveyer belt. Finished product is then allowed to cure and degas for 24 to 48 hours.

3.2 Sampling Location

Figure 3-1 presents a schematic view of the sampling location. Three induced draft (ID) fans are used to exhaust TDI and DCM vapors from the production process through three separate uninsulated sheet metal ducts that extend through the roof. Two of the ducts are connected by a 30-foot horizontal duct, 34 inches in diameter, which then extends vertically to a height of 25 feet above the roof top. A 6 inch

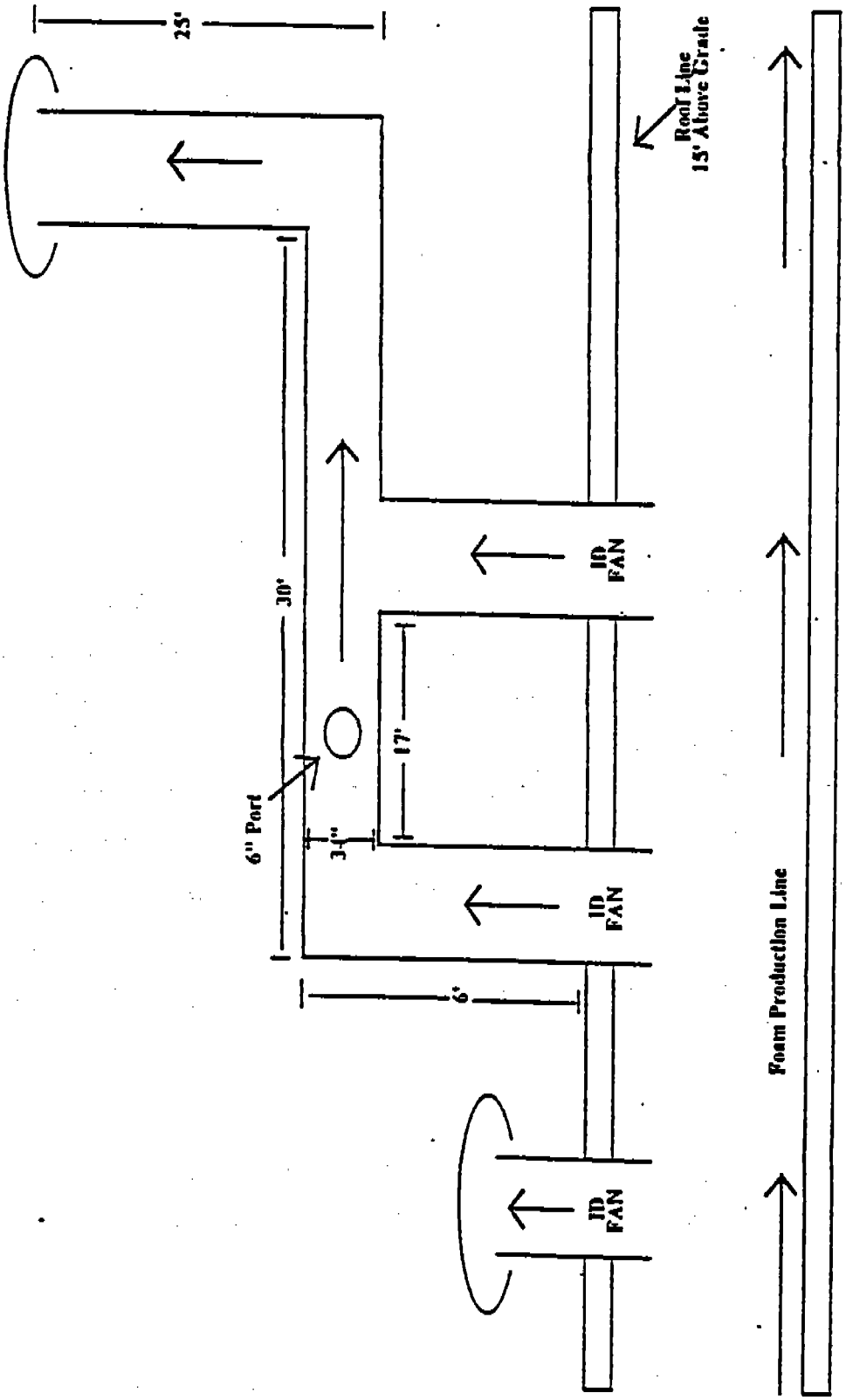


Figure 3-1. Sample Location

diameter sampling port is located in the horizontal duct midway between vertical ducts number 2 and 3, approximately 5 feet above the roof level. The roof level is approximately 15 feet above the ground.

A recovery trailer was located on the ground immediately in front of the sampling area, allowing easy communication between the sampling crew and recovery area. Two-way radio communication between the facility production personnel and the sampling crew allowed coordination between production startup and the start of each sampling run.

3.3 Test Schedule

The recovery trailer and test equipment were mobilized on Saturday, February 20, 1993. Equipment setup took place Saturday afternoon and Sunday, and testing began Monday morning.

The sampling schedule is shown in Table 3-1. Eight runs were completed, which included two extra runs above the required minimum of six.

3.4 Sample Collection

3.4.1 Quad Probe

Sampling was performed by withdrawing stack gas from a single port in the stack through a quad probe, then directing the sampled gas simultaneously to four independently operated sampling trains. The quad probe contains four similar heated sampling probes that were inserted into the stack as one unit, as shown in Figure 3-2. The front end of the quad probe was positioned in the center of the stack and remained

Table 3-1

Test Schedule

Run	Date	Start Time	Stop Time
1	2-22-93	1215	1300
2	2-22-93	1330	1410
3	2-23-93	0945	1085
4	2-23-93	1335	1415
5	2-24-93	1010	1110
6	2-24-93	1335	1420
7	2-25-93	1215	1255
8	2-25-93	1315	1355

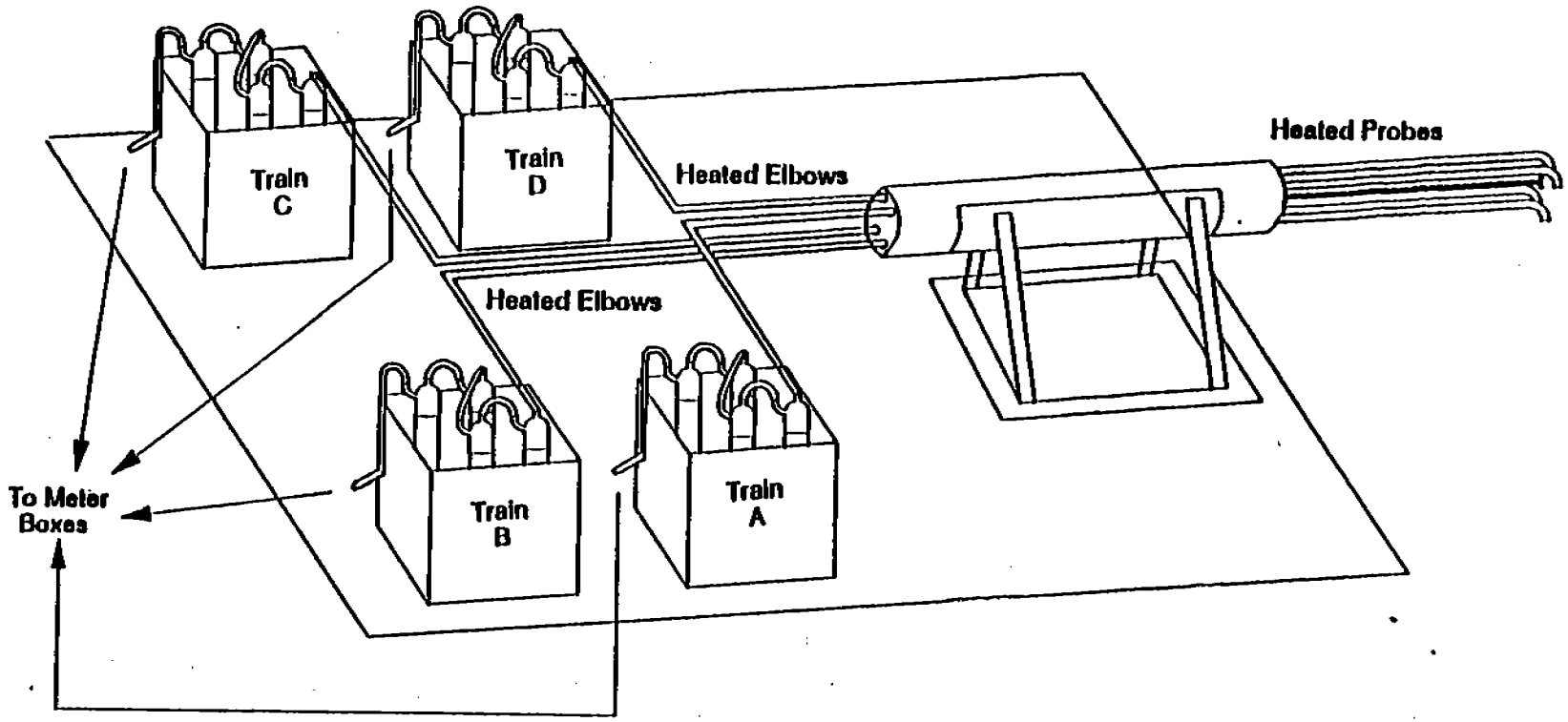


Figure 3-2. Schematic of Quad Train Setup

in that location during each test. The stack was not traversed nor were stack gas velocity measurements made, because determination of the true concentration and emission rate of the target compound in the stack gas was not required to meet the objectives of this program.

Method 301 of 40 CFR Part 63 describes field validation procedures and details the criteria for the quadruple sampling probe tip arrangement. This method requires the inside edge of sampling probe tips to be situated in a 6.0 cm x 6.0 cm square area. The area encompassed by the probe tip arrangement should occupy less than 5% of the stack cross-sectional area. The cross-sectional area of the probe tip arrangement used in this test was 5.8 square inches as measured from the probe/nozzle centerlines. This area is less than 1% of the stack cross-sectional area of 908 square inches, which satisfies the Method 301 criterion.

3.4.2 Quad-Train Assembly

Four independent sampling trains made up the quad-train assembly. Although four meter boxes were required, the velocity head (ΔP) was determined using only one set of pitot tubes. The sampling trains were identified as Train A, B, C, and D. Two of the four trains were spiked before each run. The spiking compound was added to the first impinger of these trains in the field for bias determination. The sampling train test matrix is given in Table 3-2.

3.5 Sampling Preparation

3.5.1 Glassware Preparation

All glassware used for sampling was thoroughly cleaned prior to use. This included the probe, impingers, all sample bottles and all utensils used during sample recovery. All glassware was washed with hot soapy water, rinsed with hot tap water, rinsed with distilled water and baked in a oven at 300 °C for four hours. The glassware

Table 3-2

Sampling Train Test Matrix

	Train Designation	
Run #	Spiked	Unspiked
1	A, B	C, D
2	C, D	A, B
3	A, B	C, D
4	C, D	A, B
5	A, B	C, D
6	C, D	A, B
7	A, B	C, D
8	C, D	A, B

was then triple-rinsed with HPLC grade acetonitrile, followed by triple-rinsing with HPLC grade toluene. Open ends of glassware were covered with aluminum foil to minimize potential contamination during transportation and set-up.

3.5.2 Preparation of Impinger Absorbing Solution

Historical data available from the host test site facility and data resulting from the collection of preliminary samples by Radian indicated that the concentration of TDI in the process exhaust was 1 ppm or less, depending on the density of foam being produced on any given day. At this concentration, a 30 cubic foot sample size would result in the collection of approximately 7 mg of TDI. Using the reaction stoichiometry of two moles of 1,2-PP per mole of TDI, the piperazine in toluene solution was then prepared at a concentration level three times the calculated minimum needed, or 133 μg/mL. This would provide a total of approximately 40 mg of 1,2-PP in 300 mL of impinger solution in the first impinger available for reaction with TDI. At this concentration, approximately 22 mg of TDI could be collected in the first impinger before the reagent was exhausted. This solution was prepared in the laboratory just prior to use in the field, and was used within 10 days of preparation.

3.5.3 Preparation of TDI Spiking Solution

The TDI spiking solution was prepared at a concentration of 1.5 mg of the derivatized TDI per 1 mL of acetonitrile. Fifteen mL of this spiking solution was spiked into the first impinger of two of the four trains prior to each QUAD run. This spiking scheme resulted in a total spike amount of derivatized TDI of 22.5 mg, which is equivalent to 7.83 mg of underivatized TDI. This is an amount equivalent to the amount of TDI expected to be collected in the train from the stack gas based on presurvey samples. Therefore, the amount present in the two spiked trains was designed to be at least twice the amount present in the two unspiked trains.

3.5.4 Sampling Equipment Preparation

Final sampling train preparations included calibration and leak checking of all the train equipment, including meter boxes, thermocouples, nozzles, pitot tubes, and umbilicals. Reference calibration procedures were followed when available, and the results were properly documented and archived. If a referenced calibration technique for a particular piece of apparatus was not available, then a state-of-the-art technique was used. A discussion of the techniques used to calibrate this equipment is presented below.

S-Type Pitot Tube Calibration

The EPA has specified guidelines concerning the construction and geometry of an acceptable S-Type pitot tube. If the specified design and construction guidelines are met, a pitot tube coefficient of 0.84 can be used. Information pertaining to the design and construction of the Type-S pitot tube is presented in detail in Section 4.1.1 of EPA Document 600/4-77027b. Only S-Type pitot tubes meeting the required EPA specifications were used. Pitot tubes were inspected and documented as meeting EPA specifications prior to field sampling.

Sampling Nozzle Calibration

Glass nozzles were used for sampling. All nozzles were thoroughly cleaned, visually inspected for damage , and calibrated according to the procedure outlined in Section 4.4.2 of EPA Document 600/4-77-027b.

Dry Gas Meter Calibration

Dry gas meters (DGMs) were used in the sample trains to measure the sample volume and sampling rate. All DGMs were calibrated to document the volume correction factor prior to the departure of the equipment to the field. Post-test

calibration checks were performed after the equipment was returned to Radian's laboratory. Pre- and post-test calibrations agreed to within 5 percent.

Prior to calibration, a positive pressure leak check of the system was performed using the procedure outlined in Section 4.3.2 of EPA Document 600/4-77-23b. The system was placed under approximately 10 inches of water pressure and an oil manometer was used to determine if the pressure decreased over a one-minute period.

After the sampling console was assembled and leak checked, the pump was allowed to run for 15 minutes to allow the pump and DGM to warm up. The valve was then adjusted to obtain the desired flow rate. For the pre-test calibrations, data were collected at the orifice manometer settings (ΔH) of 0.5, 1.0, 1.5, 2.0, 3.0, and 4.0 inches of water. Gas volumes of 5 ft^3 were used for the two lower orifice settings, and volumes of 10 ft^3 were used for the higher settings. The individual gas meter correction factors (γi) were calculated for each orifice setting and averaged. The method requires that each of the individual correction factors fall within $\pm 2\%$ of the average correction factor or the meter must be cleaned, adjusted, and recalibrated. In addition, Radian requires that the average correction factor be 1.00 ± 1 percent. For the post-test calibration, the meter was calibrated three times at the average orifice setting and vacuum which were used during the actual test.

Dry gas meter calibrations were performed at Radian's laboratory using an American® wet test meter as an intermediate standard. The intermediate standard is calibrated every six months against the EPA spirometer at EPA's Emission Measurement Laboratory in Research Triangle Park (RTP), North Carolina.

3.5.5 Sampling Operations

Vent gas samples were collected isokinetically from a single sampling point located in the center of the duct. Preliminary information about the stack gas velocity useful in selecting nozzle size and calculating the K-factor was obtained during the

pre-site survey. Prior to testing, a leak check of pitot lines was performed according to EPA Method 2. Oxygen (O_2) and carbon dioxide (CO_2) concentrations were ambient levels as determined by EPA Method 3. The stack gas moisture data was measured by the host facility as the relative humidity.

Preparation of Sampling Train

The four sampling trains for each QUAD run were charged and assembled in the recovery trailer. The impinger buckets were marked as Train A, B, C, or D. Tared impingers were used. Approximately 300 mL of the absorbing reagent was transferred to the first impinger and 200 mL to the second impinger. The first impinger of each train was of a Greenburg-Smith design and all remaining impingers were of the modified Greenburg-Smith design. The third impinger was empty, 200 to 300 g of silica gel was placed in the fourth impinger and 400 g of charcoal was placed in the fifth impinger. A water jacketed condenser was placed between the outlet of the first impinger and the inlet to the second impinger to promote cooling and minimize evaporative loses of toluene from the first impinger. Fifteen (15) mL of the spiking solution was pipetted into the first impinger of Trains A and B. Openings were covered with Teflon® film or aluminum foil after the assembly of the trains.

Final assembly of the sampling trains occurred at the sampling location. The complete train configuration is shown in Figure 3-3. Thermocouples were attached to measure the stack temperature and probe outlet and impinger outlet temperatures. Crushed ice was added to each impinger bucket, and the probe heaters were turned on and allowed to stabilize at 120° ± 12°C (248° ± 25°F).

The isocyanate trains were leak checked before and after each sampling run, as required in EPA Method 5. To leak check the assembled train, the nozzle end was capped off and the sampling train evacuated to a vacuum of 15 inches of Hg. After the system was evacuated and the pump isolated from the train, the volume of gas flowing through the system was timed for 60 seconds. The leak rate is required to be

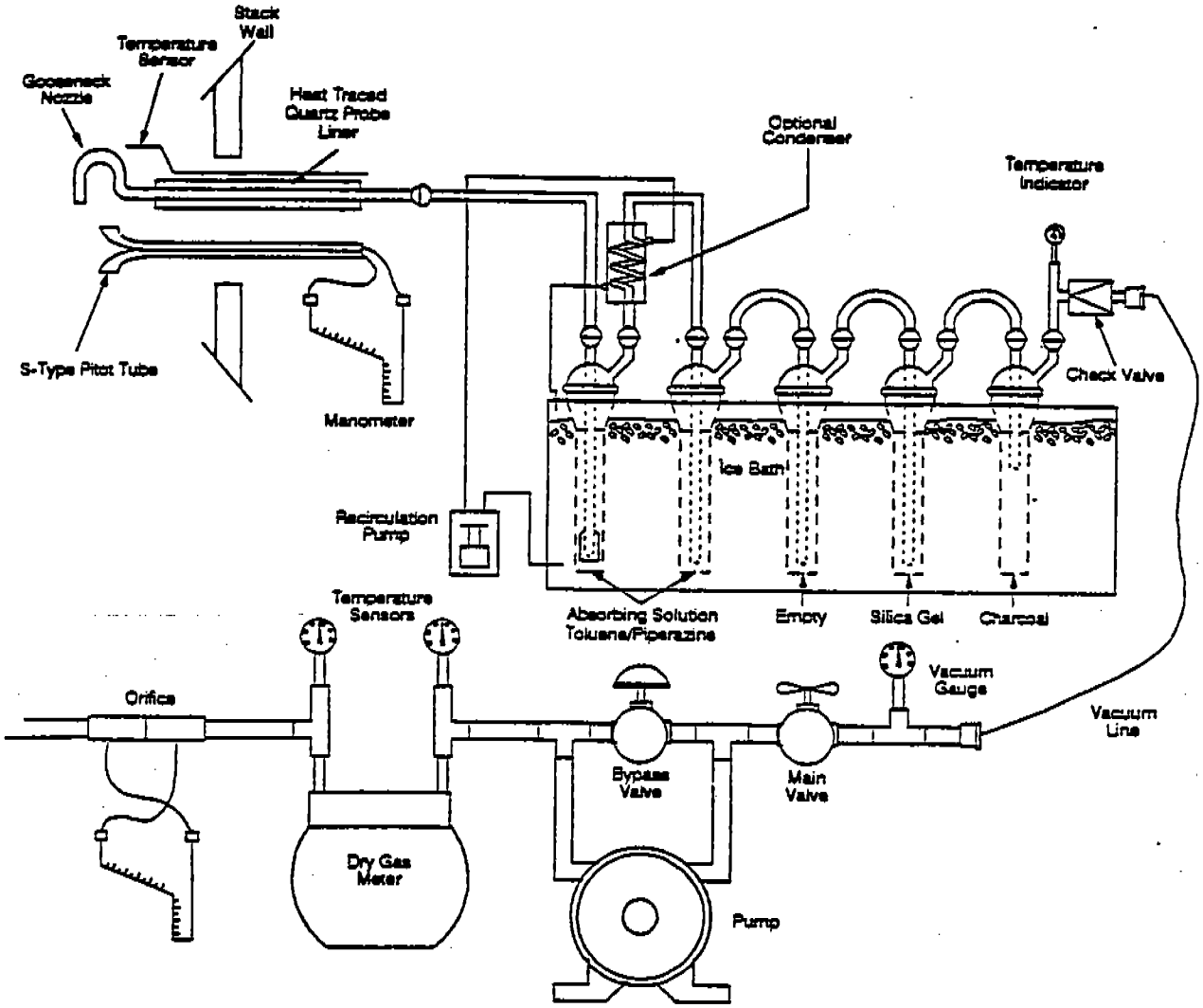


Figure 3-3. Sampling Train for Isocyanate

less than 0.02 acfm or 4% of the average sampling rate, whichever is less. After the leak rate was determined, the cap was slowly removed from the nozzle end until the vacuum in the train returned to atmospheric pressure and then the pump was turned off.

The leak rates and sampling start and stop times were recorded on the sampling task log. Also, any other events that occur during sampling were recorded on the task log (such as pitot cleaning, thermocouple malfunctions, heater malfunctions, and any other unusual occurrences). A nominal sample size of 30 cubic feet was collected in all sampling train. This was accomplished by sampling at a flowrate of 0.5 cubic feet per minute for 60 minutes. The sample volumes for each train by QUAD run are presented in Table 3-3.

3.5.6 Sample Recovery

The sample bottles containing the probe and nozzle washings and the impinger portion of the sampling trains were moved to the recovery trailer.

Each impinger was carefully removed from the impinger bucket, the outside was wiped dry, and the final impinger weight was determined and recorded to calculate stack moisture. The isocyanate sample was then collected in the following two fractions:

- First impinger contents, toluene rinses from the nozzle/probe liner and toluene/acetonitrile rinses of the first impinger and connecting glassware; and
- Contents and toluene/acetonitrile rinses from the second and third impingers and the condenser.

Recovery procedures are detailed in this section. All recovery bottles were wide mouth amber glass with Teflon® lined lids.

Table 3-3.

Quad Train Sample Volumes

Date	Run Number	Train A Vm @ 68° (ft^3)	Train B Vm @ 68° (ft^3)	Train C Vm @ 68° (ft^3)	Train D Vm @ 68° (ft^3)
2/22/93	1	33.42	33.89	33.02	33.04
2/22/93	2	29.07	29.65	28.67	28.40
2/23/93	3	34.24	35.15	33.75	33.01
2/23/93	4	30.60	31.17	30.35	29.54
2/24/93	5	34.14	34.70	34.46	32.59
2/24/93	6	35.10	35.17	34.49	33.78
2/25/93	7	31.11	31.94	30.14	29.91
2/25/93	8	30.89	29.73	30.49	31.95

Container 1 - Probe and First Impinger Contents

The contents and rinses of each of the first impingers and first impinger connectors were combined with the corresponding probe/nozzle washing solution. The entire contents of the first impinger were recovered as a single sample, even if two phases were present. The first impinger and connecting tubing were rinsed three times with 15 mL aliquots of toluene. A final rinse of the impinger with acetonitrile was also necessary to remove any water left on the impinger wall and to recover any remaining derivatized TDI.

Container 2 - Second and Third Impinger Contents/Condenser Rinse

The contents and toluene/acetonitrile rinses of the second and third impingers and the condenser of each train were collected in the same manner used for the first impinger described above. The contents of these impingers were analyzed separately from the contents collected in the first impinger to check for breakthrough; therefore, care was taken to avoid physical carryover from the first impinger to the second. The contents of the fourth and fifth impingers were weighed as previously described and then discarded.

Field Blanks

Four field blanks were prepared and recovered during the test, one on each day of testing. The four field blanks were prepared using Trains A, B, C, and D from the two sets of glassware used during the testing. A sampling train was assembled in the staging area, taken to the sampling location, and leak-checked. The probe of the blank train was heated during the generation of the field blank, but no gas sample was passed through the sampling train. The sampling train for the field blank was recovered with the same procedure described for authentic source samples.

Reagent Blank(s)

Aliquots of each lot of toluene, acetonitrile and absorbing reagent were collected daily to be analyzed as reagent blanks.

Sample Storage and Shipping

Sample containers were checked to ensure that complete labels had been affixed. The labels identified Trains A, B, C, or D, as appropriate. Teflon® lids were tightened and secured with Teflon® tape. The sample bottles were stored in a cooler packed with ice and were returned to Radian's laboratory in these coolers at the end of the field test.

3.6 Quality Control

The following quality control measures were implemented during the field testing phase of this program:

- All dry gas meters were calibrated. Calibration procedures were followed for the pitot tube/probe assembly and all thermocouple readout devices.
- Temperatures of the sampling train were maintained at the specified setting (120± 12°C) during each sampling run at levels prescribed in the test plan.
- Sampling trains were leak-checked both prior to and after sampling.
- All glassware was washed and oven-baked following appropriate method protocol, given in the test plan.
- All recovery solvents were HPLC grade and an aliquot of each was collected daily as reagent blanks.
- One field blank was collected for every two sampling runs.

- Chain of Custody forms and log books were filled in at the completion of each day of sampling.

4.0 ANALYTICAL PROCEDURES

4.1 Sample Preparation

The samples were received in the laboratory in screw-capped glass bottles with Teflon®-lined caps, sealed with Teflon® tape and stored in coolers packed with ice. Samples were logged into the laboratory sample tracking system and stored in a secure, refrigerated (4°C) sample storage area prior to analysis. Samples were prepared for analysis within 30 days of collection and analyzed within 30 days of preparation.

All labware was washed with detergent and water and rinsed with hot tap water, rinsed with deionized water, baked at 300°C, rinsed with acetonitrile and toluene prior to use. Solvents used were HPLC grade or equivalent.

Each of the two recovered samples from each train was transferred along with rinses to separate 500 mL round bottom flasks and then evaporated to dryness under vacuum in a 65°C water bath. Each round-bottom flask was then rinsed three times with separate two (2) mL aliquots of acetonitrile (ACN) and the rinses transferred to a 10-mL volumetric flask. The sample was then brought to volume with ACN and transferred to a 15-mL vial and sealed with a Teflon®-lined lid. The vial was stored in a refrigerated sample storage area at 4°C until analysis.

4.2 Chromatographic Analyses

The procedures for the HPLC analyses of the samples are described in the following sections.

4.2.1 Standard Preparation

A 300 μg/mL stock solution of TDI piperazine urea derivative was prepared by dissolving 7.5 mg of the purified crystals of the derivatized TDI in 25 mL of

ACN. [The derivatized TDI was previously prepared by adding 1 g of the neat TDI to a solution of 1-(2-pyridyl) piperazine in ACN, evaporating to dryness and recrystallizing the urea derivative three times from ACN.] Working standards for the calibration curve were made from this stock at six concentration levels in ACN ranging from 0 to 50 μg/mL. This concentration range covered the amount of TDI expected to be collected at the host facility. This stock solution was also used to prepare the field spiking solution. A check standard was prepared from a separately prepared stock solution. This check standard fell in the middle of the calibration curve.

4.2.2 Analysis

HPLC System

The HPLC system operating parameters for analysis of standards and samples were as follows:

Instrument:	RAININ HPXL Delivery System Waters 710B WISP autosampler
Data System:	Nelson 2600 (1 volt)
Column:	Zorbax ODS (4.6 mm ID x 25 cm)
Mobile Phase:	Acetonitrile/0.1M Ammonium Acetate Buffer
Gradient:	25:75 ACN/0.1 m ammonium acetate buffer, pH 6.2, hold 2 minutes, then to 60:40 by 19.5 minutes.
Detector:	RAININ Dynamax Dual-Wavelength, Ultraviolet at 254 nm
Flow Rate:	2 mL/min
Injector Volume:	50 μL
Retention Time:	2,4-TDI, 10.2 min.; 2,6-TDI 8.5 min.

Instrument Calibration

Calibration standards were prepared at seven levels as described in Section 4.2.1. Each calibration standard was injected in duplicate. Linear regression analysis of peak area response versus concentrations of TDI was used to prepare a calibration curve. Linearity of the calibration curve was confirmed by visual inspection and verified by a correlation coefficient of 0.9995. After an initial calibration curve was obtained, the calibration check standard described in Section 4.2.1 was analyzed. This standard was injected after every 3 samples, and was used for daily calibration. This check standard consistently agreed to within 10% of the true value.

All samples were analyzed in triplicate on the HPLC. An acetonitrile blank was analyzed once per day to ensure that the system was not contaminated. A check standard was analyzed prior to sample analysis, after every 3 samples, and at the end of the sample analysis each day.

4.3 Qualitative Identification

Analytes were identified by retention time. The retention time for 2,4-TDI was 10.2 min and 8.5 min for 2,6-TDI. Figures 4-1 and 4-2 show chromatograms from the analysis of first impinger contents from QUAD run number 4 for the unspiked and spiked trains respectively. As seen in the chromatograms, the TDI peaks are well separated from the peak for unreacted 1-2 PP. The peak at 17.5 min. was not identified.

4.4 Calculations

4.4.1 Calculation of the Amount of Isocyanate Collected

A least squares linear regression analysis of the calibration data was used to calculate a correlation coefficient, slope, and intercept. Concentration was used as the independent or X-variable and response was used as the dependent or Y-variable.

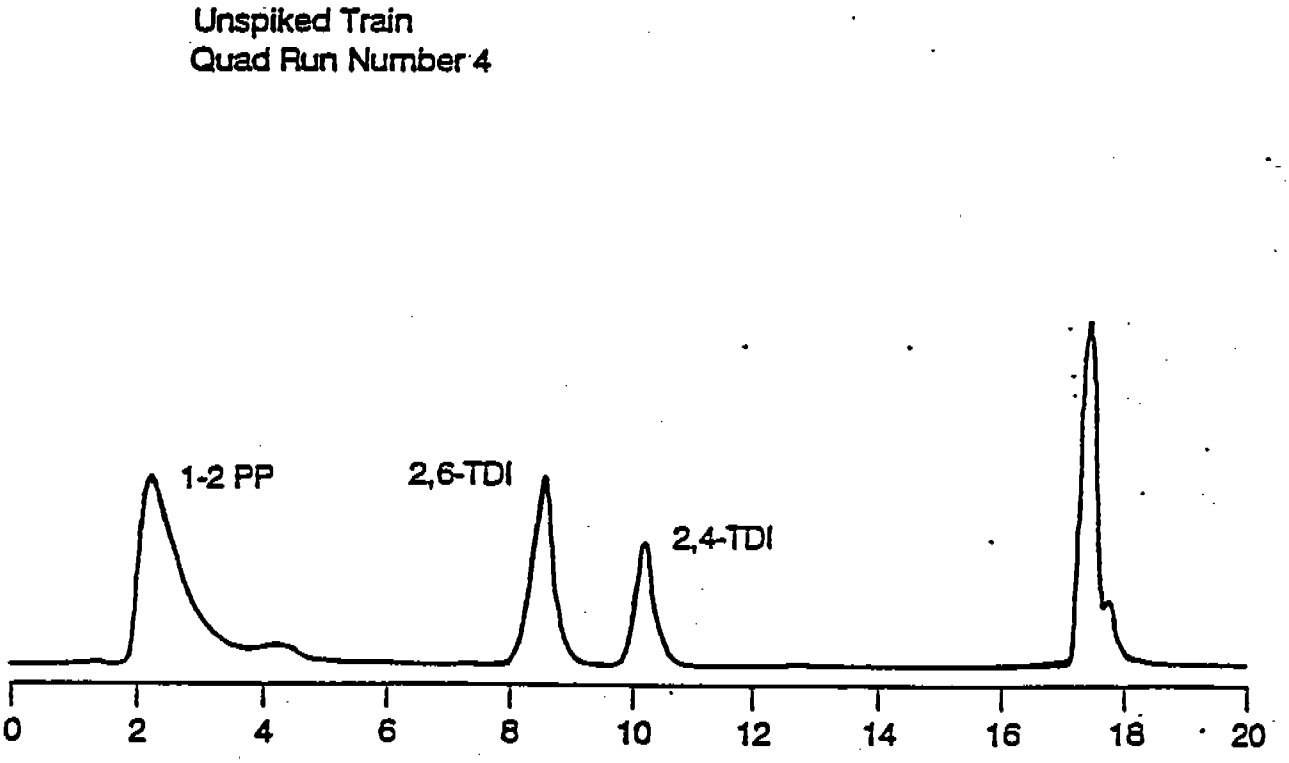


Figure 4-1. Chromatogram of Unspiked Train

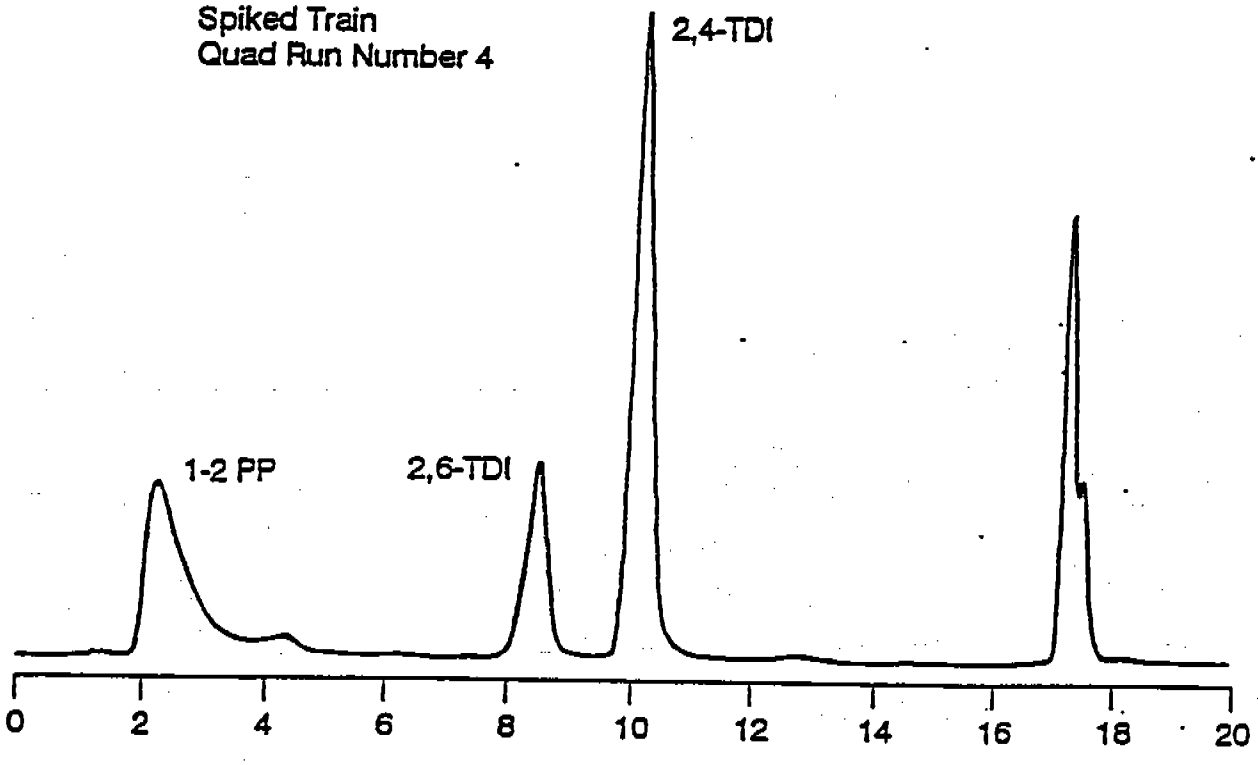


Figure 4-2. Chromatogram of Spiked Train

The concentration of isocyanate (as the derivative) in the concentrated samples was then calculated as follows:

$$\text{Concentration} = \frac{(\text{Sample Response} - \text{Intercept})}{\text{Slope}} \qquad 4\text{-}1$$

The total amount (μg) collected in a sample was then calculated by multiplying the concentration (μg/mL) times the final volume (10 mL) of ACN used to redissolve the concentrated sample.

$$\text{Amount TDI derivative} = \text{Concentration } (\mu\text{g/mL}) \times \text{Final Volume (10 mL)} \qquad 4\text{-}2$$

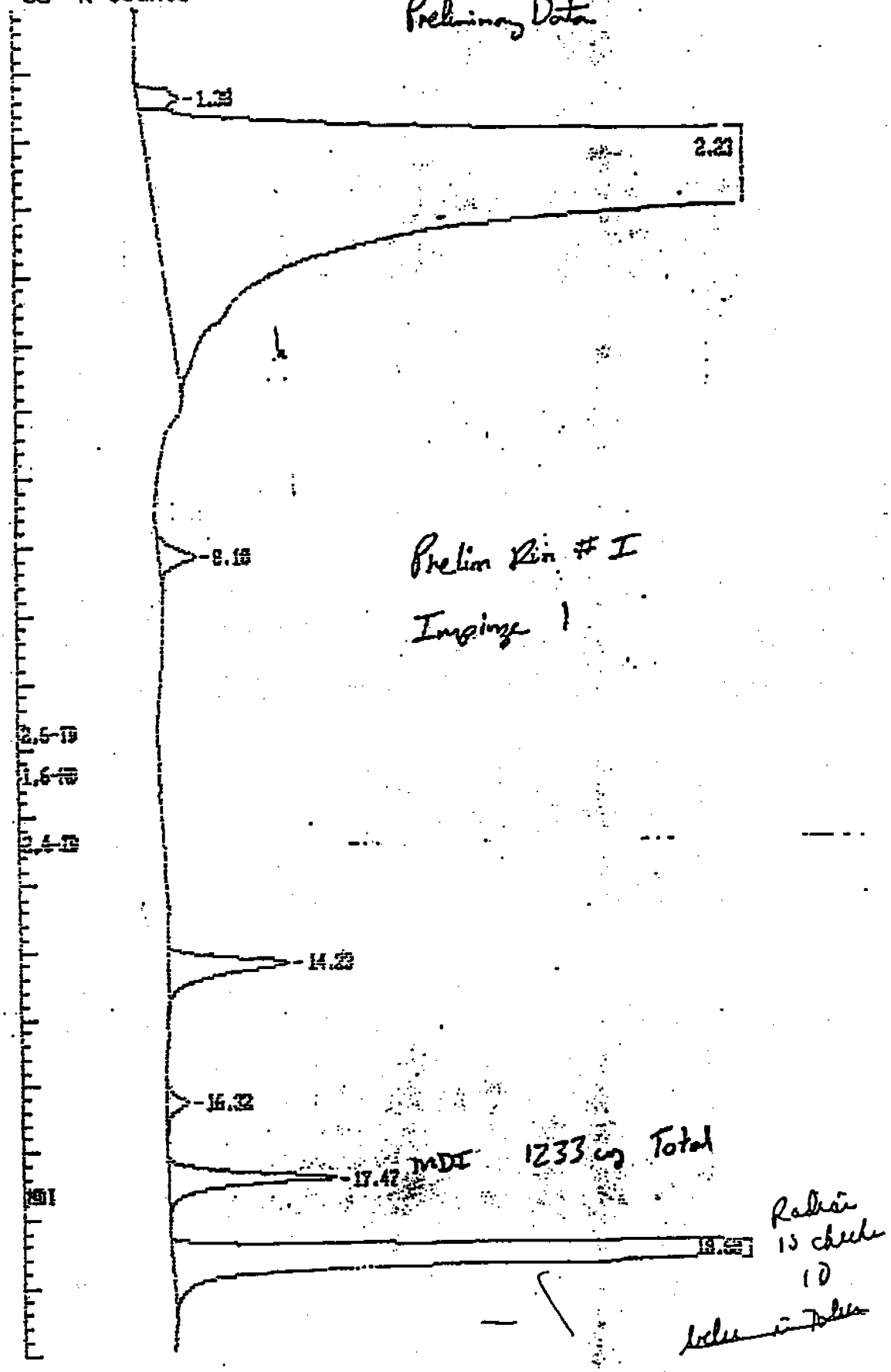
The equivalent amount of TDI required to generate this much derivative was calculated by multiplying the ratio of the molecular weights of TDI (174) and the TDI derivative (501) times the amount of TDI derivative (determined by using equation 4-2).

The total amount of 2,4-TDI (underivatized) collected in the unspiked and spiked trains is given in Table 4-1 and Table 4-2 respectively.

4.4.2 Normalization of the Amount of Isocyanate Collected

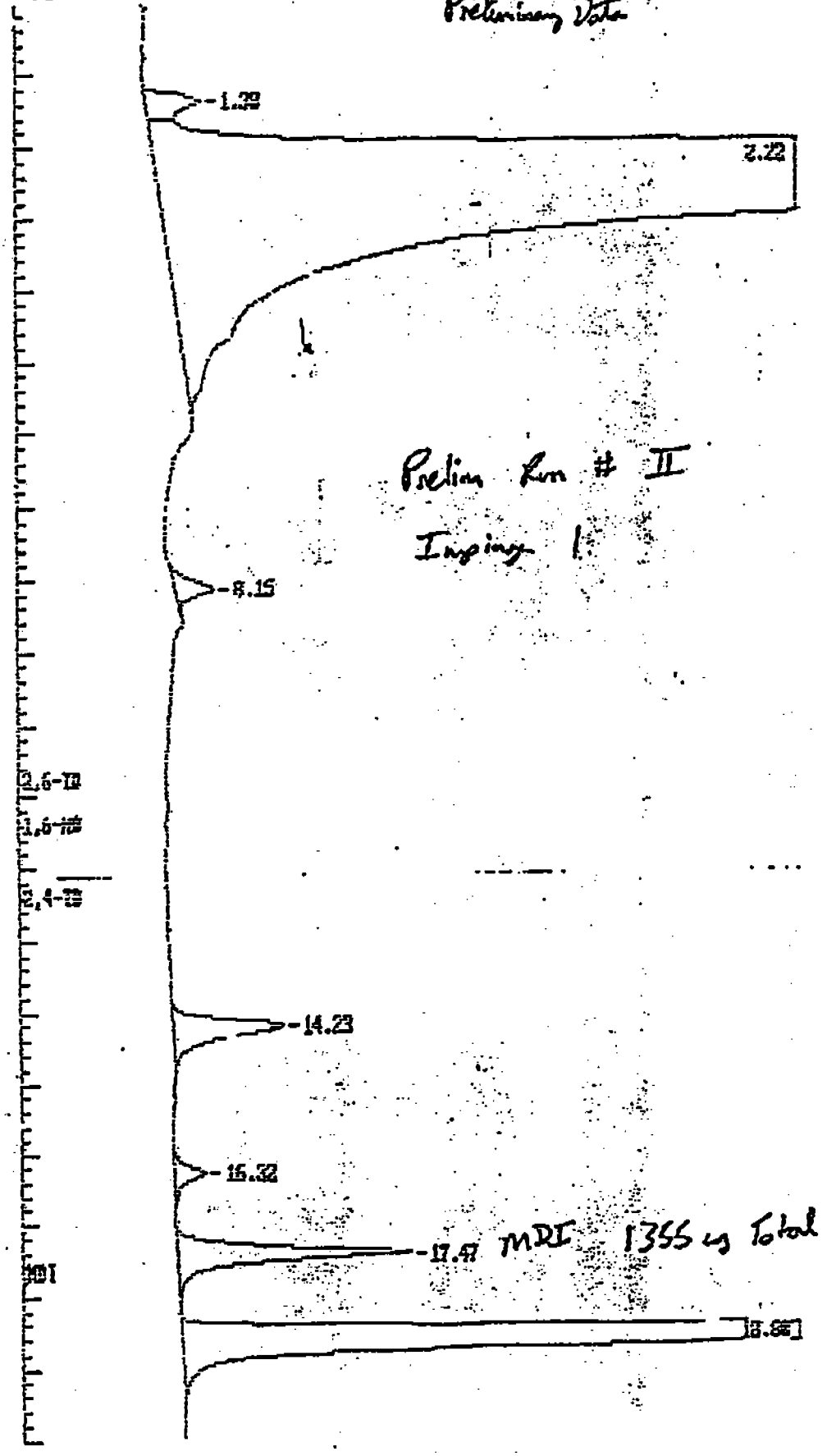
In order to simplify the comparison of the analytical results of the four trains in each QUAD run for subsequent calculations of bias and precision, the test plan called for the collected of 30 ft^3 of sample in each train. Due to operational variabilities inherent to each train, accurate but slightly differing sample volumes resulted as shown in Table 3-3. Therefore, it was necessary to normalize the data presented in Tables 4-1 and 4-2 to a common sample volume. The sample volume to which all data were normalized was selected to be 35.31 ft^3 which is equivalent to 1m^3. The following stepwise calculations were used to normalize the data. The data from QUAD run number 1 are used as an example.

Data File = E:\S3253F6.PTS Printed on 09-10-1993 at 12:29:41
Start time: 0.00 min. Stop time: 20.00 min. Offset: 0 cts
Full Range: 50 K-Counts



Areas, times, and heights stored in: E:\S3253F7.ATB
Data File = E:\S3253F7.PTS Printed on 09-10-1993 at 13:01:05
Start time: 0.00 min. Stop time: 20.00 min. Offset: 0 cts
Full Range: 50 K-Counts

Preliminary Data

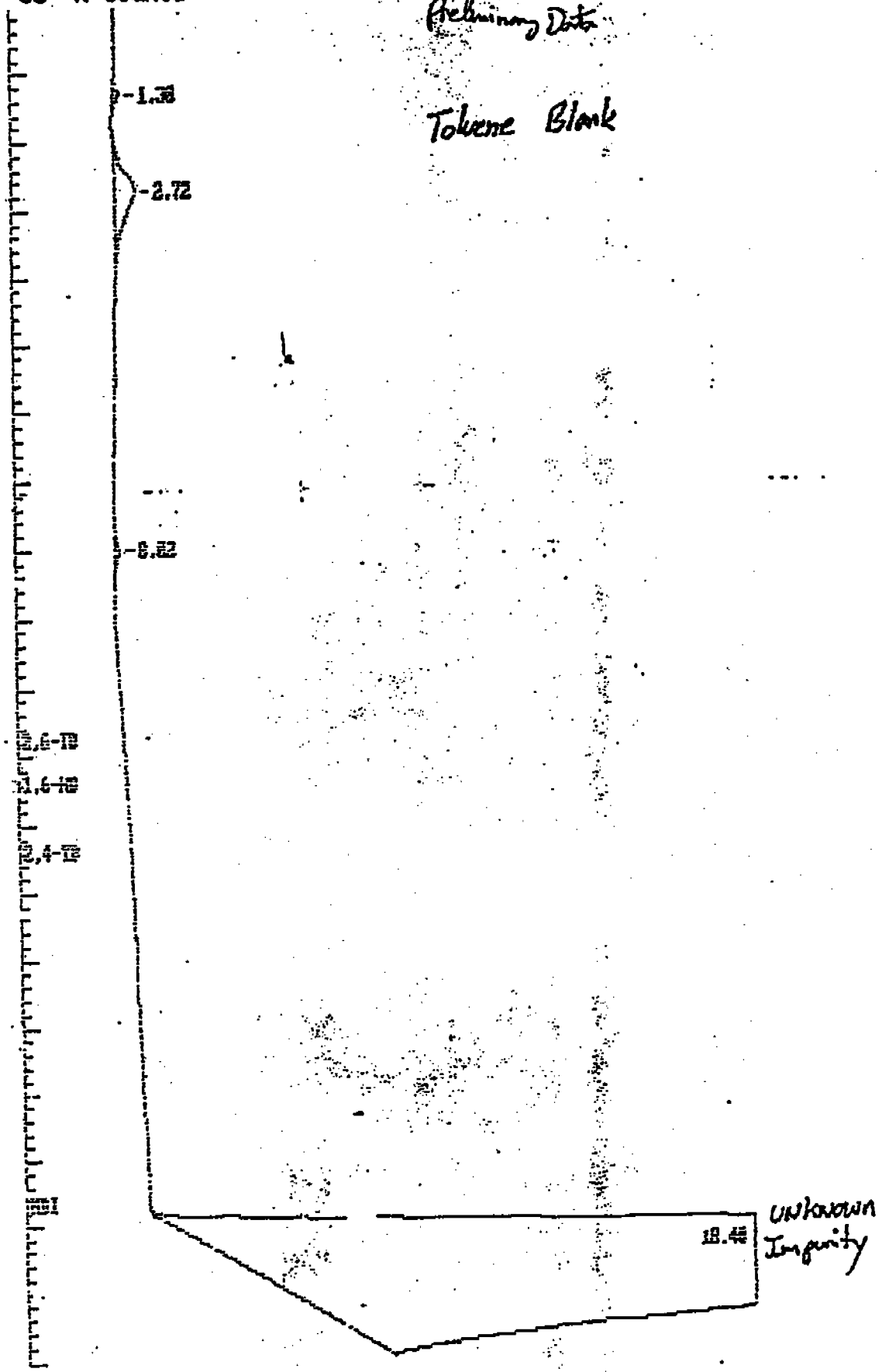


SENT BY:

Data File = E:\S3256F7.PTS Printed on 09-13-1993 at 14:43:55
Start time: 0.00 min. Stop time: 20.00 min. Offset: 0 cts
Full Range: 50 K-Counts

Preliminary Data

Toluene Blank



SENT BY:

Data file: [illegible] Offset: 0 cts

Start time: 0.00 min. Stop time: 20.00 min.

Full Range: 50 K-Counts

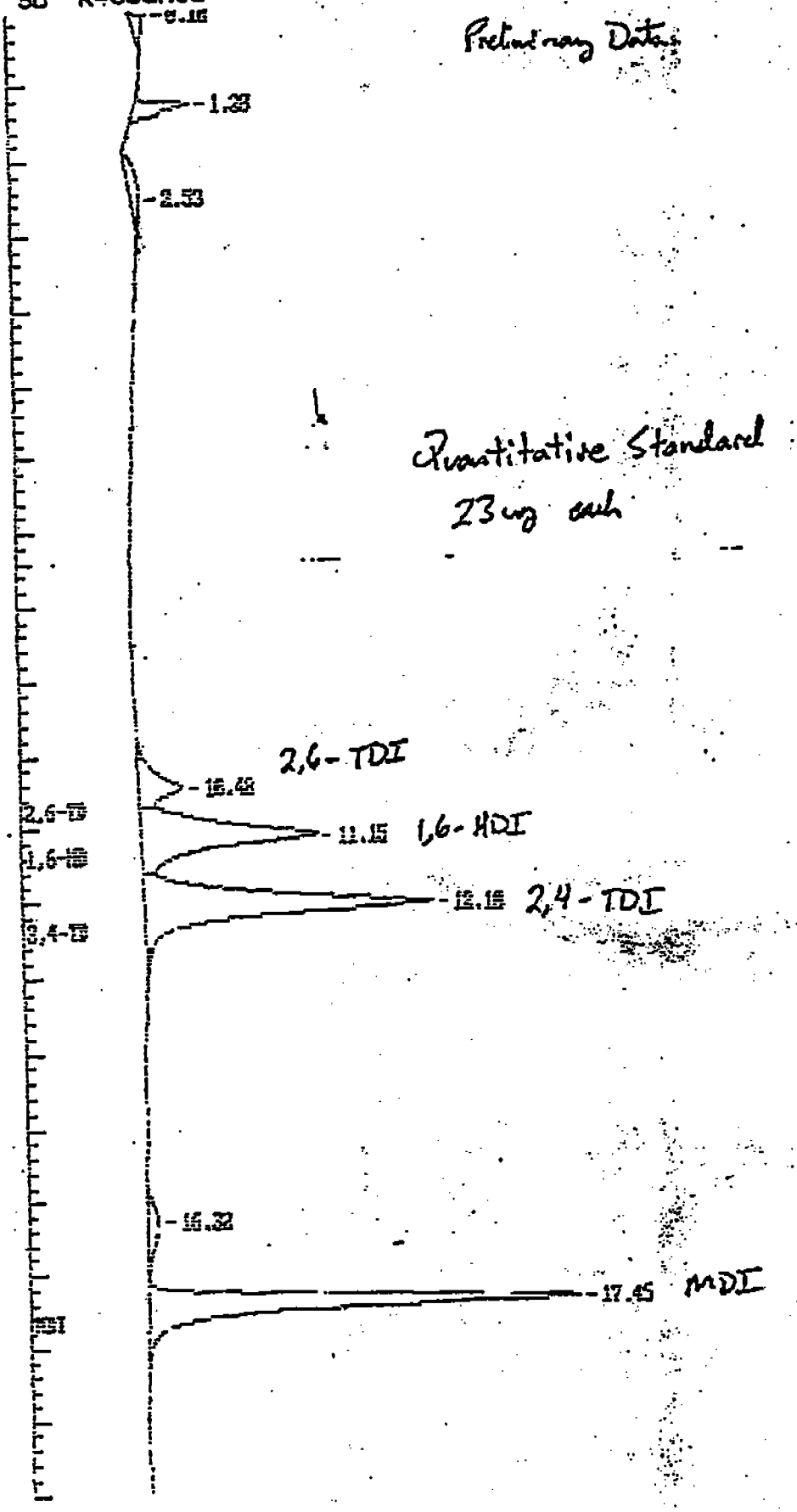


Table 4-1

2,4-TDI Detected in Unspiked Trains, μg

Train[1]	QUAD Run No.											
	1			2			3			4		
	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total
A	--	--	--	5114	61	5175	--	--	--	1832	16	1848
B	--	--	--	5224	40	5264	--	--	--	1864	24	1888
C	4409[2]	18	4427	--	--	--	3281	32	3313	--	--	--
D	4416	85	4501	--	--	--	2928	33	2960	--	--	--

[1]The unspiked trains alternated from run to run, C and D then A and B.
[2]All values are in micrograms of underivatized TDI.

Table 4-1 (Continued)

Train[1]	QUAD Run No.											
	5			6			7			8		
	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total
A	--	--	--	7880	105	7993	--	--	--	3521	53	3574
B	--	--	--	7488	89	7577	--	--	--	3805	50	3855
C	4810	17	4827	--	--	--	2160	23	2183	--	--	--
D	5054	42	5096	--	--	--	2180	36	2216	--	--	--

[1]The unspiked trains alternated from run to run, C and D then A and B.
[2]All values are in micrograms of underivatized TDI.

Table 4-2

2,4-TDI Detected in Spiked Trains, μg

Train[1]	QUAD Run No.											
	1			2			3			4		
	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total
A	11943[2]	64	12007	--	--	--	11488	36	11524	--	--	--
B	11301	28	11329	--	--	--	12024	38	12062	--	--	--
C	--	--	--	12045	35	12080	--	--	--	9329	58	9387
D	--	--	--	12454	49	12503	--	--	--	9429	26	9455

[1]The spiked trains alternated from run to run, A and B then C and D.
[2]All values are in micrograms of underivatized TDI.

Table 4-2 (Continued)

Train[1]	QUAD Run No.											
	5			6			7			8		
	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total	Imp 1	Imp 2	Total
A	12014	45	12059	--	--	--	10094	46	10140	--	--	--
B	12588	37	12625	--	--	--	9003	40	9043	--	--	--
C	--	--	--	15201	88	15289	--	--	--	10561	45	10606
D	--	--	--	15173	96	15269	--	--	--	10315	44	10359

[1]The spiked trains alternated from run to run, A and B then C and D.
[2]All values are in micrograms of underivatized TDI.

Step 1 Normalize unspiked Trains C and D first impinger amounts (μg) to the sample volume collected (cubic feet) in spiked Train A;

$$\text{Train C} \quad \frac{33.42\ ft^3}{33.02\ ft^3} X\ 4409\ \mu g = 4462\ \mu g \qquad 4\text{-}3A$$

$$\text{Train D} \quad \frac{33.42\ ft^3}{33.04\ ft^3} X\ 4416\ \mu g = 4467\ \mu g \qquad 4\text{-}3B$$

Step 2 Average the normalized, unspiked train amounts from step 1 above. Assuming the collection efficiency of all trains to be the same, this value would also be the amount of TDI that would be collected by Train A due to sampling the stack gas;

$$\frac{4462\ \mu g + 4467 \mu g}{2} = 4465\ \mu g \qquad 4\text{-}4$$

Step 3 Subtract the average value (step 2) from the uncorrected amount (sampled amount plus spike) for spiked Train A, first impinger, to get recovered spike amount;

$$11943\ \mu g - 4465\ \mu g = 7478\ \mu g \qquad 4\text{-}5$$

Step 4 Normalize the amount collected in spiked Train A, first impinger to 35.31 ft^3 using the sample volume for Train A and the value obtained in step 2;

$$\frac{35.31\ ft^3}{33.42\ ft^3} X\ 4465\ \mu g = 4718\ \mu g \qquad 4\text{-}6$$

Step 5 Normalize the amount collected in the second impinger of spiked Train A to 35.31 ft^3 using the sample volume for Train A and the amount determined by HPLC;

$$\frac{35.31\ ft^3}{33.42\ ft^3}\ X\ 63.9\ \mu g = 67.5\ \mu g \qquad 4\text{-}7$$

Step 6 Sum the values determined from steps 3, 4 and 5 to get the total amount of TDI found in spiked Train A, normalized to 35.31 ft^3;

$$7478\ \mu g + 4718\ \mu g + 67.5\mu g = 12264\ \mu g \qquad 4\text{-}8$$

Steps 1-6 can be repeated for similar calculations for spiked Train B. The total amount of TDI collected in each of the unspiked trains can be determined by first normalizing the amounts found in the two impingers of each train to 1m^3 and then summing the two values. The raw and normalized data for all analysis results are presented in Appendix A. The resulting normalized values are summarized in Tables 4-3 and 4-4.

4.5 Quality Control

Quality control procedures that were implemented for this program include:

- Adhering to applicable sampling and analysis protocols;
- Collecting and analyzing field blanks, trip blanks, reagent blanks, and laboratory blanks;
- Tracking samples from collection to analysis;
- Calibrating all analytical equipment prior to use:
- Maintaining accurate and complete written documentation;
- If any changes were made to the analytical system (i.e., column changed, column maintenance), a calibration check was performed to verify the validity of the calibration curve. If the calibration check did not meet acceptance criteria, the analytical system was recalibrated.

Table 4-3

Normalized Amount of 2,4-TDI Detected in Unspiked Trains, μg

Train[1]	QUAD Run No.							
	1	2	3	4	5	6	7	8
A	--	6287	--	2132	--	8042	--	4086
B	--	6270	--	2139	--	7608	--	4579
C	4735[2]	--	3466	--	4947	--	2557	--
D	4811	--	3166	--	5522	--	2616	--

[1]The unspiked trains alternated from run to run, C and D then A and B.
[2]All values are in micrograms of underivatized TDI, normalized to a sample volume of 35.31 ft^3 ($1m^3$).

Table 4-4

Normalized Amount of 2,4-TDI Detected in Spiked Trains, μg

Train[1]	QUAD Run No.							
	1	2	3	4	5	6	7	8
A	12264[2]	--	11625	--	12233	--	10450	--
B	11520	--	12078	--	12717	--	9290	--
C	--	13258	--	9694	--	15471	--	11197
D	--	13733	--	9805	--	15610	--	10947

[1]The spiked trains alternated from run to run, A and B then C and D.
[2]All values are in micrograms of underivatized TDI, normalized to a sample volume of 35.31 ft^3 ($1m^3$).

- Analysis of field spiked QC samples; and
- Analysis of check standards every 3 samples.

5.0 RESULTS AND DISCUSSION

This section presents the results of the eight sampling runs relative to the criteria for method precision and bias. Fractional results are also presented to show the amount of isocyanate breakthrough occurring in the impinger train. All sample fractions were prepared and analyzed for toluene diisocyanate at Radian's Research Triangle Park laboratory.

5.1 Bias and Precision

Table 5-1 is a summary table which presents the results of the statistical evaluation of the test data following the EPA Method 301 criteria showing the method precision and bias for 2-4 TDI. Method 301 requires valid data from a minimum of six QUAD runs. Table 5-1 presents data from all eight runs. Precision is shown as the percent relative standard deviation of the measured amounts of TDI in the samples. Results for precision of both the spiked and unspiked samples were less than 5 percent RSD, which is well within the limits of acceptable precision (upper limit of 50%) given in EPA Method 301.

Using the data from all eight QUAD runs, method bias was measured at -395 micrograms. This value was determined to be statistically significant at the 95% confidence level, using the t statistic calculated for the analytical data. A correction factor of 1.053 was calculated for use with the method to compensate for the bias should the method be used to measure TDI emissions from similar sources.

Using the data from only seven QUAD runs (eliminating run 8 because this run had the lowest average % recovery and the final leak check for one of the trains was questionable), the method bias was -295 micrograms. This bias was not statistically significant and therefore no correction factor was calculated. In either case, the criteria for an acceptable method were met (i.e., a correction factor between 0.7 and 1.3).

Table 5-1

Summary of Method 301 Statistical Calculations

Parameter	Spiked Trains		Unspiked Trains	
	7 Runs	8 Runs	7 Runs	8 Runs
Spiked Amount[1]	7828	7828	--	--
RSD, %	3.6	3.4	4.7	5.2
Average Bias[1]	-295	-395	--	--
Bias Significant?	No	Yes	--	--
Correction Factor	1.0	1.053	--	--

[1]Values are presented as μg of underivatized TDI

5.2 Breakthrough and Recovery

This section presents details of the breakthrough and recovery results for the field samples, as well as recovery information for the spiked compound (2,4-TDI).

5.2.1 Breakthrough

Tables 4-1 and 4-2 provide a summary of the combined total mass of 2,4-TDI collected in the probe/first impinger and second/third impinger samples for the unspiked and spiked trains, respectively. These totals are used as a basis for calculating breakthrough of the TDI from the first impinger to the second impinger. The mass of compound found in the probe/first impinger fraction and in the second impinger fraction were each divided by the total mass of TDI for that train and then multiplied by 100 to yield the percent of the total TDI found in the separate train sections. The results are presented in Table 5-2 and 5-3 for the spiked and unspiked trains respectively.

The average breakthrough for the spiked trains was 1.5% and for the unspiked trains 1.1%. More than 98% of the TDI was collected in the first impinger under the sampling conditions used in this study.

The amount of the toluene contained in the first impingers of each of the trains was reduced by approximately 25% (by weight) during the sampling run due to evaporation. The second impingers showed, on the average, a net gain of approximately 5%. The remainder was collected in the silica gel and the charcoal, both of which showed net weight gains. The total weight gained in the train components following the first impinger more than compensate for loses from the first impinger, probably due to the collection of a small amount of moisture. The loss of toluene from the first impinger was minimized by keeping the impingers in an ice bath and placing a water cooled condenser between the outlet of the first impinger and the inlet of the second impinger.

Table 5-2

Distribution of 2,4-TDI Within the Spiked Trains

Train[1]	Impinger No.	QUAD Run No.							
		1	2	3	4	5	6	7	8
A	1	98.5[2]	--	99.0	--	99.0	--	98.0	--
	2	1.5	--	1.0	--	1.0	--	2.0	--
B	1	99.2	--	99.1	--	99.2	--	97.0	--
	2	0.8	--	0.9	--	0.8	--	3.0	--
C	1	--	99.2	--	96.4	--	98.8	--	98.4
	2	--	0.8	--	3.6	--	1.2	--	1.6
D	1	--	99.0	--	98.5	--	98.7	--	98.4
	2	--	1.0	--	1.5	--	1.3	--	1.6
Average/ % RSD	1	98.5/0.81							
	2	1.5/54.4							

[1]Spiked Trains alternate from run to run, A and B, then C and D.
[2]Values are a percentage of the total amount of 2-4 TDI determined to be in each train.

Table 5-3

Distribution of 2,4-TDI Within the Unspiked Trains

Train[1]	Impinger No.	QUAD Run No.							
		1	2	3	4	5	6	7	8
A	1	--	98.8	--	99.1	--	98.7	--	98.5
	2	--	1.2	--	0.9	--	1.3	--	1.5
B	1	--	99.2	--	98.8	--	98.8	--	98.7
	2	--	0.8	--	1.2	--	1.2	--	1.3
C	1	99.6[2]	--	99.0	--	99.6	--	99.0	--
	2	0.4	--	1.0	--	0.4	--	1.0	--
D	1	99.1	--	98.9	--	99.2	--	98.4	--
	2	1.9	--	1.1	--	0.8	--	1.6	--
Average/ % RSD	1	98.9/0.41							
	2	1.1/37.1							

[1]Unspiked Trains alternate from run to run, C and D, then A and B.
[2]Values are a percentage of the total amount of 2,4-TDI determined to be in each train.

5.2.2 Recovery

One of the objectives of this test program was to obtain bias and precision data to validate the proposed test method for isocyanates. Samples from two of the four trains of each quad assembly were spiked with TDI before each sampling run. The estimation of method bias is based on the percentage of the TDI spikes recovered. Analytical results used for this calculation are the averages of the triplicate analysis results for each spiked sample. A summary of the spiked TDI recovery percentages is presented in Table 5-4.

The percent recovery was calculated for each spiked train for each run following the calculation procedures outlined in steps 1-3 of Section 5.0. The value obtained at step 3, the amount of spike recovered, is divided by the actual amount of TDI spiked, 7827 μg, multiplied by 100. An average recovery was determined by averaging the 16 individual run recoveries.

The recovery for TDI ranged between 83 and 112 percent and averaged 95 percent with a %RSD of 8.2.

5.3 Quality Assurance/Quality Control

As a part of the testing for Work Assignment No. 55, Radian designed and implemented a quality assurance/quality control (QA/QC) effort tailored to meet the specific needs of this project. The testing was conducted in accordance with QA/QC procedures described in the Quality Assurance Project Plan (QAPP). The results of the QA/QC effort demonstrate that the data are reliable and meet project objectives for completeness and representativeness. The data met the QA objectives for precision and accuracy and there are no data quality issues that effect conclusions regarding the objectives of this project.

Table 5-4

Percent Recovery of the Spiked 2,4-TDI

Train[1]	QUAD Run No.							
	1	2	3	4	5	6	7	8
A	96[2]	--	106	--	89	--	100	--
B	86	--	112	--	96	--	86	--
C	--	89	--	97	--	98	--	88
D	--	95	--	98	--	99	--	83
Average	95							
% RSD	8.2							

[1]Spiked Trains alternated from run to run, A and B, then C and D.
[2]Values are a percentage based upon a spiked amount of 7827.8 μg as 2,4-TDI.

The primary objectives of the QA/QC effort were to control, assess, and document data quality. In order to accomplish these objectives, the QA/QC approach consisted of the following key elements:

- Definition of data quality objectives that reflect the overall technical objectives of the project;
- Design of a sampling, analytical, QA/QC, and data analysis system to meet these objectives; and
- Initiation of corrective action when measurement system performance did not meet the specifications.

These elements include the use of selected standard sampling and analytical procedures as components of the overall approach in addition to, specified calibration requirements, QC checks, data reduction and validation procedures, and sample tracking.

A summary of analysis results for QA/QC samples, which includes measures of precision and accuracy and limitations in the use of these data is presented in this section.

5.3.1 Overview of Data Quality

The QAPjP established specific QA objectives for precision (15% RSD), accuracy (±30%), and completeness (100%) for the determination of TDI emissions. The statistical results presented in Table 5-1 and the % recovery values given in Table 5-4 show that the objectives were met. The data quality acceptance criteria and the experimental results are summarized in Table 5-5. Results for spike/spike duplicates and triplicate analyses were compared with the criteria. In all cases the criteria were met. Other data quality indicators for each type of analysis are also presented throughout the remainder of Section 5.3.

There are no cases where data quality issues impair the study's conclusions with respect to the validity of the sampling and analytical test method procedures. With

Table 5-5

Data Quality Acceptance Criteria and Results

Parameter	Criteria	Results
TDI Spike Recovery	70 - 130%	83 - 112%
TDI Analysis Results QUAD Train, % RSD	15%	5%
Individual DGM Correction Factor Agreement	±2% of Avg	<2%
Analytical Balance	≤0.1 g of Class S Weights	<0.1 g
HPLC Linearity Correlation Coeff.	>0.995	0.9995
HPLC Retention Time Variation	±15%	±10%
HPLC Calibration Check	±10% of Curve	±9%
HPLC System Blank	<0.1% Analyte level	<0.1%
HPLC Replicate Analyses	±10% of 1st injection	±2%
HPLC Method Spikes	±20% of theoretical	±5%

exception of a limited number of samples, the quality of measurement data generated for the test parameters fully meets the data quality objectives outlined in the QAPjP.

5.3.2 Sampling Quality Control

Quality control activities associated with the field sampling are described in the QAPjP. These activities include adherence to accepted reference method protocols, use of standardized data recording sheets, equipment calibration, and collection of field blanks.

Stack sampling QC data, including sampling rates, sample volume collected, maximum recorded leak rate, and maximum allowable leak rate, are summarized in Table 5-6 for each run. All of the data quality indicators are within acceptable limits, with the exception of a slightly high leak rate value for Train C Run 8. However, this train was leak checked at a vacuum of 7 inches of mercury which was almost twice that achieved during sampling and the leak would therefore have very little, if any, effect on the data. The leak rate criterion is <4% of the average sampling rate or 0.02 dscf, whichever is less.

5.3.3 Sample Storage and Holding Time

Sample hold times specified in the QAPP were met for all samples. All samples were prepared within 30 days of collection and analyzed within 30 days of preparation.

5.3.4 Analytical Quality Control

Results for method spikes, field spikes, field blanks, reagent blanks and method blanks are summarized in Table 5-7. These samples served the dual purpose of controlling and assessing measurement data quality, and providing the basis for precision and accuracy estimates. The QC acceptance criteria for each of these types of samples

Table 5-6

Sampling Train Leak Summary

Run Number	Std. Metered Volume (dscf)	Average Sampling Rate (dscfm)	Maximum Leak Check (dscf@ in Hg)	4% Sample Rate (dscfm)	Acceptable[a] Leak Rate?
1A	33.42	0.743	0.010 @ 10	0.030	Yes
1B	33.89	0.753	0.010 @ 15	0.030	Yes
1C	33.02	0.734	0.010 @ 8	0.029	Yes
1D	33.04	0.734	0.020 @ 10	0.029	Yes
2A	29.07	0.727	0.016 @ 8	0.029	Yes
2B	29.65	0.741	0.009 @ 8	0.030	Yes
2C	28.67	0.717	0.010 @ 7	0.029	Yes
2D	28.40	0.710	0.010 @ 8	0.028	Yes
3A	34.24	0.571	0.012 @ 10	0.023	Yes
3B	35.15	0.586	0.010 @ 8	0.023	Yes
3C	33.75	0.563	0.009 @ 8	0.023	Yes
3D	33.01	0.550	0.020 @ 5	0.022	Yes
4A	30.60	0.765	0.012 @ 8	0.031	Yes
4B	31.17	0.779	0.012 @ 7	0.031	Yes
4C	30.35	0.759	0.008 @ 7	0.030	Yes
4D	29.54	0.739	0.015 @ 10	0.030	Yes
5A	34.14	0.569	0.014 @ 10	0.023	Yes
5B	34.70	0.578	0.012 @ 8	0.023	Yes
5C	34.46	0.574	0.012 @ 8	0.023	Yes
5D	32.59	0.543	0.016 @ 7	0.022	Yes
6A	35.10	0.780	0.007 @ 7	0.031	Yes
6B	35.17	0.782	0.010 @ 8	0.031	Yes
6C	34.49	0.766	0.008 @ 7	0.031	Yes
6D	33.78	0.751	0.008 @ 10	0.030	Yes
7A	31.11	0.778	0.015 @ 9	0.031	Yes
7B	31.94	0.799	0.011 @ 8	0.032	Yes
7C	30.14	0.754	0.009 @ 7	0.030	Yes
7D	29.91	0.748	0.014 @ 10	0.030	Yes
8A	30.89	0.772	0.009 @ 10	0.031	Yes
8B	29.73	0.743	0.011 @ 8	0.030	Yes
8C	30.49	0.762	0.021 @ 7	0.030	No
8D	31.95	0.799	0.018 @ 8	0.032	Yes

[a]The maximum acceptable leak rate is the lesser of 0.020 dscfm or 4% of the average sampling rate.

Table 5-7

Summary of Analytical Quality Control Results

Sample ID	Total Detected μg	Theoretical μg	Percent Error %
Field Blank A	2.5	NA[4]	NA
Field Blank B	8.3	NA	NA
Field Blank C	6.4	NA	NA
Field Spike 1	7570	7828	96.7
Field Spike 2	7686	7828	98.2
Method Spike 1	8120	7828	104
Method Spike 2	7838	7828	100
Method Spike 3	7890	7828	101
Method Spike 4	7945	7828	101
Toluene Reagent Blank[1]	0.5	NA	NA
ACN Reagent Blank[2]	0.4	NA	NA
Method Blank[3]	10.2	NA	NA

[1]Average of four, ranging from 0.1 to 1.2 μg
[2]Average of four, ranging from 0.1 to 0.8 μg
[3]Average of three, ranging from 0.3 to 20.7 μg
[4]NA, Not Applicable

were met as shown in Table 5-5. Field blanks were collected by assembling a sampling train as if to collect a sample, transporting to the sampling location, leak checking and returning the train to the onsite laboratory for recovery. Field spikes and method spikes were prepared by spiking approximately 300 mL of the toluene 1,2-PP solution with 15 mL of the field spiking solution. Method and reagent blanks were prepared by evaporating approximately 300 mL of solvent to dryness and dissolving any residue with 10 mL of ACN. All spikes and blanks met the data acceptance criteria listed in Table 5-5.

No blank contamination problems were identified during the analysis of field and laboratory blanks and no blank corrections were performed for the reported data. All blank analysis data are presented along with other QC and field sample results in Appendix A.

APPENDIX A

Analytical Data for Samples, Blanks, Spikes and Quality Control Samples

Sample Name	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample ug	Avg Amt Sample ug	Volume Sampled Cu Ft	Sampling Factor	Adjusted Avg ug	Total Train ug	Amount Spiked ug	Spike Recovery %	Train ID
ISO-SCF-32293-4	1263013	5.90	5.40641	9%										
ISO-SCF-32293-4	1253783	5.86	5.40641	8%										
ISO-SCF-32293-4	1249399	5.84	5.40641	8%										
ARL-1	1277072	5.97			2000	11931.6	11942.9	33.42	1.05669	12196.0	12263.5	7827.81	95.69%	I-A-1
ARL-1	1276918	5.97			2000	11930.1								
ARL-1	1280852	5.98			2000	11966.8								
ARL-2	135291	0.64			100	64.1	63.9	33.42	1.05669	67.5				I-A-2
ARL-2	135913	0.64			100	64.4								
ARL-2	133152	0.63			100	63.1								
ARL-3	1196354	5.59			2000	11178.7	11300.8	33.89	1.04204	11491.1	11520.1	7827.81	86.19%	I-B-1
ARL-3	1214532	5.67			2000	11348.3								
ARL-3	1217429	5.69			2000	11375.3								
ARL-4	59159	0.29			100	28.6	27.8	33.89	1.04204	29.0				I-B-2
ARL-4	57134	0.28			100	27.7								
ARL-4	56201	0.27			100	27.2								
ISO-SCF-32293-4	1255771	5.87	5.40641	9%										
ISO-SCF-32293-4	1251918	5.85	5.40641	8%										
ISO-SCF-32293-4	1242330	5.80	5.40641	7%										
ARL-5	471546	2.21			2000	4418.4	4409.3	33.02	1.06949	4715.7	4735.0			I-C-1
ARL-5	470785	2.21			2000	4411.3								
ARL-5	469380	2.20			2000	4398.2								
ARL-6	35898	0.18			100	17.8	18.1	33.02	1.06949	19.3				I-C-2
ARL-6	37029	0.18			100	18.3								
ARL-6	36906	0.18			100	18.2								
ARL-7	469526	2.20			2000	4399.5	4416.1	33.04	1.06885	4720.1	4811.1			I-D-1
ARL-7	461467	2.16			2000	4324.4								
ARL-7	482909	2.26			2000	4524.4								
ARL-8	180144	0.85			100	85.0	85.1	33.04	1.06885	90.9				I-D-2
ARL-8	179633	0.85			100	84.8								
ARL-8	181047	0.85			100	85.4								
ISO-SCF-32293-4	1238919	5.79	5.40641	7%										
ISO-SCF-32293-4	1245039	5.82	5.40641	8%										
ISO-SCF-32293-4	1235673	5.77	5.40641	7%										

Sample Name	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample ug	Avg Amt Sample ug	Volume Sampled Cu Ft	Sampling Factor	Adjusted Avg ug	Total Train ug	Amount Spiked ug	Spike Recovery %	Train ID
ARL-9	544346	2.55			2000	5097.4	5114.2	29.07	1.21481	6212.9	6287.4			2-A-1
ARL-9	548157	2.57			2000	5132.9								
ARL-9	545954	2.56			2000	5112.4								
ARL-10	130306	0.62			100	61.8	61.4	29.07	1.21481	74.6				2-A-2
ARL-10	130940	0.62			100	62.1								
ARL-10	127140	0.60			100	60.3								
ARL-11	567669	2.66			2000	5314.9	5224.4	29.65	1.19105	6222.5	6269.9			2-B-1
ARL-11	563460	2.64			2000	5275.7								
ARL-11	542754	2.54			2000	5082.6								
ARL-12	83414	0.40			100	39.9	39.8	29.65	1.19105	47.4				2-B-2
ARL-12	83620	0.40			100	40.0								
ARL-12	82237	0.39			100	39.4								
ISO-SCF-32293-4	1220899	5.70	5.40641	6%	1	5.7								
ISO-SCF-32293-4	1232005	5.76	5.40641	6%	1	5.8								
ISO-SCF-32293-4	1230936	5.75	5.40641	6%	1	5.8								
ARL-13	1287864	6.02			2000	12032.2	12045.3	28.67	1.23176	13215.1	13258.2	7827.81	89.16%	2-C-1
ARL-13	1288870	6.02			2000	12041.6								
ARL-13	1291043	6.03			2000	12061.9								
ARL-14	71522	0.34			100	34.4	35.0	28.67	1.23176	43.1				2-C-2
ARL-14	73423	0.35			100	35.3								
ARL-14	73513	0.35			100	35.3								
ARL-15	1335291	6.24			2000	12474.6	12454.1	28.40	1.24347	13671.5	13732.6	7827.81	95.22%	2-D-1
ARL-15	1334709	6.23			2000	12469.2								
ARL-15	1329284	6.21			2000	12418.6								
ARL-16	103190	0.49			100	49.1	49.1	28.40	1.24347	61.1				2-D-2
ARL-16	103848	0.49			100	49.4								
ARL-16	102349	0.49			100	48.7								
ISO-SCF-32293-4	1246426	5.82	5.40641	8%	1	5.8								
ISO-SCF-32293-4	1237852	5.78	5.40641	7%	1	5.8								
ISO-SCF-32293-4	1239959	5.79	5.40641	7%	1	5.8								

Sample Name	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample ug	Avg Amt Sample ug	Volume Sampled Cu Ft	Sampling Factor	Adjusted Avg ug	Total Train ug	Amount Spiked ug	Spike Recovery %	Train ID
ARL-17	1229990	5.75			2000	11492.4	11487.9	34.24	1.03139	11587.8	11624.8	7827.81	106.14%	3-A-1
ARL-17	1214060	5.67			2000	11343.9								
ARL-17	1244450	5.81			2000	11627.3								
ARL-18	75825	0.36			100	36.4	35.9	34.24	1.03139	37.0				3-A-2
ARL-18	74917	0.36			100	36.0								
ARL-18	73672	0.35			100	35.4								
ARL-19	1282836	5.99			2000	11985.3	12024.4	35.15	1.00468	12039.7	12077.7	7827.81	111.93%	3-B-1
ARL-19	1289518	6.02			2000	12047.7								
ARL-19	1288725	6.02			2000	12040.3								
ARL-20	79007	0.38			100	37.9	37.8	35.15	1.00468	38.0				3-B-2
ARL-20	78713	0.38			100	37.7								
ARL-20	79021	0.38			100	37.9								
ISO-SCF-32293-4	1263449	5.90	5.40641	9%	1	5.9								
ISO-SCF-32293-4	1253499	5.86	5.40641	8%	1	5.9								
ISO-SCF-32293-4	1260480	5.89	5.40641	9%	1	5.9								
ARL-21	351376	1.65			2000	3297.6	3281.0	33.75	1.04636	3433.1	3466.4			3-C-1
ARL-21	343323	1.61			2000	3222.4								
ARL-21	354099	1.66			2000	3323.0								
ARL-22	65492	0.32			100	31.6	31.8	33.75	1.04636	33.3				3-C-2
ARL-22	66002	0.32			100	31.8								
ARL-22	66603	0.32			100	32.1								
ARL-23	319713	1.50			2000	3002.2	2927.6	33.01	1.06982	3132.0	3165.7			3-D-1
ARL-23	310818	1.46			2000	2919.3								
ARL-23	304609	1.43			2000	2861.4								
ARL-24	65115	0.31			100	31.4	31.5	33.01	1.06982	33.7				3-D-2
ARL-24	66054	0.32			100	31.8								
ARL-24	64767	0.31			100	31.2								
ISO-SCF-32293-4	1223529	5.72	5.40641	6%	1	5.7								
ISO-SCF-32293-4	1220297	5.70	5.40641	5%	1	5.7								
ISO-SCF-32293-4	1183133	5.70	5.40641	5%										

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Sample Name	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample ug	Avg Amt Sample ug	Volume Sampled Cu Ft	Sampling Factor	Adjusted Avg ug	Total Train ug	Amount Spiked ug	Spike Recovery %	Train ID
ARL-25	198810	0.94			2000	1874.6	1831.7	30.60	1.15407	2113.9	2132.1			4-A-1
ARL-25	195931	0.92			2000	1847.7								
ARL-25	187888	0.89			2000	1772.7								
ARL-26	33336	0.17			100	16.6	15.8	30.60	1.15407	18.3				4-A-2
ARL-26	32875	0.16			100	16.3								
ARL-26	29079	0.15			100	14.6								
ARL-27	200805	0.95			2000	1893.2	1864.2	31.17	1.13297	2112.1	2138.7			4-B-1
ARL-27	200538	0.95			2000	1890.7								
ARL-27	191767	0.90			2000	1808.9								
ARL-28	48281	0.24			100	23.5	23.5	31.17	1.13297	26.6				4-B-2
ARL-28	49506	0.24			100	24.1								
ARL-28	46705	0.23			100	22.8								
ISO-SCF-32293-4	1202635	5.62	5.40641	4%	1	5.6								
ISO-SCF-32293-4	1219147	5.70	5.40641	5%	1	5.7								
ARL-29	1001159	4.68			2000	9358.1	9329.4	30.35	1.16358	9626.4	9693.9	7827.81	96.56%	4-C-1
ARL-29	987039	4.61			2000	9226.4								
ARL-29	1006035	4.70			2000	9403.6								
ARL-30	124507	0.59			100	59.1	58.0	30.35	1.16358	67.5				4-C-2
ARL-30	122754	0.58			100	58.3								
ARL-30	119182	0.57			100	56.6								
ARL-31	1004933	4.70			2000	9393.3	9428.7	29.54	1.19549	9774.2	9804.7	7827.81	97.97%	4-D-1
ARL-31	1018359	4.76			2000	9518.5								
ARL-31	1002870	4.69			2000	9374.1								
ARL-32	53598	0.26			100	26.0	25.5	29.54	1.19549	30.5				4-D-2
ARL-32	53113	0.26			100	25.8								
ARL-32	50832	0.25			100	24.7								
ISO-SCF-32293-4	1200453	5.61	5.40641	4%	1	5.6								
ISO-SCF-32293-4	1204115	5.63	5.40641	4%	1	5.6								
ISO-SCF-32293-4	1189454	5.56	5.40641	3%	1	5.6								

Sample Name	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample ug	Avg Amt Sample ug	Volume Sampled Cu Ft	Sampling Factor	Adjusted Avg ug	Total Train ug	Amount Spiked ug	Spike Recovery %	Train ID
ARL-33	1309769	6.12			2000	12236.5	12014.2	34.14	1.03441	12187.3	12233.3	7827.81	89.41%	5-A-1
ARL-33	1323802	6.18			2000	12367.4								
ARL-33	1224229	5.72			2000	11438.7								
ARL-34	103486	0.49			100	49.3	44.5	34.14	1.03441	46.1				5-B-1
ARL-34	103816	0.49			100	49.4								
ARL-34	72585	0.35			100	34.9								
ARL-35	1369996	6.40			2000	12798.3	12588.1	34.70	1.01771	12678.6	12716.7	7827.81	95.59%	5-B-1
ARL-35	1382908	6.46			2000	12918.7								
ARL-35	1289467	6.02			2000	12047.2								
ARL-36	84360	0.40			100	40.4	37.4	34.70	1.01771	38.0				5-B-2
ARL-36	85164	0.41			100	40.7								
ARL-36	64462	0.31			100	31.1								
ISO-SCF-32293-4	1198549	5.60	5.40641	4%	1	5.6								
ISO-SCF-32293-4	1178529	5.51	5.40641	2%	1	5.5								
ARL-37	511915	2.40			2000	4794.9	4809.8	34.46	1.02480	4929.1	4946.9			5-C-1
ARL-37	520667	2.44			2000	4876.5								
ARL-37	507945	2.38			2000	4757.9								
ARL-38	36452	0.18			100	18.0	17.4	34.46	1.02480	17.8				5-C-2
ARL-38	36462	0.18			100	18.0								
ARL-38	32321	0.16			100	16.1								
ARL-39	532851	2.50			2000	4990.2	5054.0	32.59	1.08360	5476.5	5521.9			5-D-1
ARL-39	544154	2.55			2000	5095.6								
ARL-39	542066	2.54			2000	5076.1								
ARL-40	90692	0.43			100	43.3	41.9	32.59	1.08360	45.4				5-D-2
ARL-40	82975	0.40			100	39.7								
ARL-40	89246	0.43			100	42.6								
ISO-SCF-32293-4	1187611	5.55	5.40641	3%	1	5.5								
ISO-SCF-32293-4	1199464	5.60	5.40641	4%	1	5.6								
ISO-SCF-32293-4	1183133	5.53	5.40641	2%	1	5.5								

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Sample Name	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample ug	Avg Amt Sample ug	Volume Sampled Cu Ft	Sampling Factor	Adjusted Avg ug	Total Train ug	Amount Spiked ug	Spike Recovery %	Train ID
ARL-41	861252	4.03			2000	8053.2	7887.9	35.10	1.00612	7936.1	8041.6			6-A-1
ARL-41	860232	4.02			2000	8043.7								
ARL-41	809094	3.78			2000	7566.7								
ARL-42	227095	1.07			100	106.9	104.8	35.10	1.00612	105.4				6-A-2
ARL-42	228142	1.07			100	107.4								
ARL-42	212430	1.00			100	100.1								
ARL-43	815730	3.81			2000	7628.6	7488.0	35.17	1.00411	7518.8	7607.6			6-B-1
ARL-43	825689	3.86			2000	7721.5								
ARL-43	760533	3.56			2000	7113.8								
ARL-44	193894	0.91			100	91.4	88.5	35.17	1.00411	88.8				6-B-2
ARL-44	197908	0.93			100	93.3								
ARL-44	170746	0.81			100	80.6								
ISO-SCF-32293-4	1189088	5.56	5.40641	3%	1	5.6								
ISO-SCF-32293-4	1190921	5.56	5.40641	3%	1	5.6								
ARL-45	1656820	7.74			2000	15473.5	15201.1	34.49	1.02391	15381.5	15471.2	7827.81	97.69%	6-C-1
ARL-45	1652121	7.71			2000	15429.7								
ARL-45	1573883	7.35			2000	14700.0								
ARL-46	187832	0.89			100	88.6	87.6	34.49	1.02391	89.7				6-C-2
ARL-46	195647	0.92			100	92.3								
ARL-46	173379	0.82			100	81.9								
ARL-47	1649873	7.70			2000	15408.7	15173.2	33.78	1.04543	15509.0	15609.8	7827.81	99.46%	6-D-1
ARL-47	1634325	7.63			2000	15263.7								
ARL-47	1589678	7.42			2000	14847.3								
ARL-48	220417	1.04			100	103.8	96.3	33.78	1.04543	100.7				6-D-2
ARL-48	206802	0.97			100	97.5								
ARL-48	186023	0.88			100	87.8								
ISO-SCF-32293-4	1205054	5.63	5.40641	4%	1	5.6								
ISO-SCF-32293-4	1195876	5.59	5.40641	3%	1	5.6								
ISO-SCF-32293-4	1183664	5.53	5.40641	2%	1	5.5								

Sample Name	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample ug	Avg Amt Sample ug	Volume Sampled Cu Ft	Sampling Factor	Adjusted Avg ug	Total Train ug	Amount Spiked ug	Spike Recovery %	Train ID
ARL-49	1081312	5.05			2000	10105.7	10094.4	31.11	1.13515	10398.3	10450.0	7827.81	100.45%	7-A-1
ARL-49	1074952	5.02			2000	10046.4								
ARL-49	1084020	5.07			2000	10131.0								
ARL-50	98427	0.47			100	46.9	45.6	31.11	1.13515	51.8				7-A-2
ARL-50	96270	0.46			100	45.9								
ARL-50	92145	0.44			100	44.0								
ARL-51	963252	4.50			2000	9004.6	9002.6	31.94	1.10566	9246.5	9290.2	7827.81	85.63%	7-B-1
ARL-51	970463	4.54			2000	9071.8								
ARL-51	955412	4.47			2000	8931.4								
ARL-52	83965	0.40			100	40.2	39.5	31.94	1.10566	43.6				7-B-2
ARL-52	83998	0.40			100	40.2								
ARL-52	79455	0.38			100	38.1								
ISO-SCF-32293-4	1194001	5.58	5.40641	3%	1	5.6								
ISO-SCF-32293-4	1201282	5.61	5.40641	4%	1	5.6								
ARL-53	230346	1.08			2000	2168.7	2159.8	30.14	1.17169	2530.6	2557.9			7-C-1
ARL-53	232911	1.10			2000	2192.6								
ARL-53	224911	1.06			2000	2118.0								
ARL-54	49290	0.24			100	24.0	23.3	30.14	1.17169	27.3				7-C-2
ARL-54	49749	0.24			100	24.2								
ARL-54	44499	0.22			100	21.8								
ARL-55	237247	1.12			2000	2233.1	2180.2	29.91	1.18070	2574.2	2616.4			7-D-1
ARL-55	228829	1.08			2000	2154.5								
ARL-55	228660	1.08			2000	2153.0								
ARL-56	75486	0.36			100	36.2	35.8	29.91	1.18070	42.3				7-D-2
ARL-56	75034	0.36			100	36.0								
ARL-56	73273	0.35			100	35.2								
ISO-SCF-32293-4	1201622	5.61	5.40641	4%	1	5.6								
ISO-SCF-32293-4	1192039	5.57	5.40641	3%	1	5.6								
ISO-SCF-32293-4	1184261	5.53	5.40641	2%	1	5.5								

Sample Name	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample ug	Avg Amt Sample ug	Volume Sampled Cu Ft	Sampling Factor	Adjusted Avg ug	Total Train ug	Amount Spiked ug	Spike Recovery %	Train ID
ARL-57	374801	1.76			2000	3516.0	3520.7	30.89	1.14324	4025.0	4086.0			8-A-1
ARL-57	377410	1.77			2000	3540.4								
ARL-57	373681	1.75			2000	3505.6								
ARL-58	111353	0.53			100	52.9	53.4	30.89	1.14324	61.0				8-A-2
ARL-58	112493	0.53			100	53.5								
ARL-58	113066	0.54			100	53.7								
ARL-59	406883	1.91			2000	3815.3	3805.4	29.73	1.18785	4520.2	4579.2			8-B-1
ARL-59	401924	1.88			2000	3769.0								
ARL-59	408657	1.92			2000	3831.8								
ARL-60	105005	0.50			100	50.0	49.7	29.73	1.18785	59.0				8-B-2
ARL-60	104950	0.50			100	50.0								
ARL-60	102971	0.49			100	49.0								
ISO-SCF-32293-4	1197542	5.59	5.40641	3%	1	5.6								
ISO-SCF-32293-4	1200068	5.61	5.40641	4%	1	5.6								
ISO-SCF-32293-4	1190471	5.56	5.40641	3%	1	5.6								
ARL-61	1137017	5.31			2000	10625.3	10561.2	30.49	1.15824	11144.9	11197.4	7827.81	88.46%	8-C-1
ARL-61	1120569	5.24			2000	10471.9								
ARL-61	1132853	5.29			2000	10586.4								
ARL-62	94647	0.45			100	45.2	45.3	30.49	1.15824	52.5				8-C-2
ARL-62	95991	0.46			100	45.8								
ARL-62	94335	0.45			100	45.0								
ARL-63	1108755	5.18			2000	10361.7	10314.5	31.95	1.10531	10721.6	10770.2	7827.81	83.01%	8-D-1
ARL-63	1096270	5.12			2000	10245.2								
ARL-63	1106072	5.17			2000	10336.7								
ARL-64	92259	0.44			100	44.0	44.0	31.95	1.10531	48.6				8-D-2
ARL-64	92558	0.44			100	44.2								
ARL-64	91667	0.44			100	43.8								
ISO-SCF-32293-4	1186551	5.54	5.40641	3%	1	5.5								
ISO-SCF-32293-4	1187157	5.55	5.40641	3%	1	5.5								
ISO-SCF-32293-4	1196473	5.59	5.40641	3%	1	5.6								

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Sample Name	FILE	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample	Avg Amt Sample	Amount Spiked	Spike Recovery	Train ID
ISO-SCF-32293-4	S3083F4	1263013	5.90	5.41	9%	1	5.9	5.9			QC
ISO-SCF-32293-4	S3083F5	1253783	5.86	5.41	8%	1	5.9				
ISO-SCF-32293-4	S3083F6	1249399	5.84	5.41	8%	1	5.8				
ARL-81	S3083F19	30452	0.15			10	1.5	1.6			FBA
ARL-81	S3083F20	31446	0.16			10	1.6				
ARL-81	S3083F21	33523	0.17			10	1.7				
ARL-104	S3083F22	809699	3.79			2000	7572.4	7569.9	7827.81	97%	FS-1
ARL-104	S3083F23	808659	3.78			2000	7562.7				
ARL-104	S3083F24	809952	3.79			2000	7574.7				
ISO-SCF-32293-4	S3083F25	1255771	5.87	5.41	9%	1	5.9	5.8			QC
ISO-SCF-32293-4	S3083F26	1251918	5.85	5.41	8%	1	5.8				
ISO-SCF-32293-4	S3083F27	1242330	5.80	5.41	7%	1	5.8				
ARL-82	S3083F40	16055	0.08			10	0.8	0.9			FBA
ARL-82	S3083F41	16597	0.09			10	0.9				
ARL-82	S3083F42	16113	0.09			10	0.9				
ARL-105	S3083F43	832058	3.89			2000	7780.9	7686.3	7827.81	98%	FS-2
ARL-105	S3083F44	822507	3.85			2000	7691.8				
ARL-105	S3083F45	811167	3.79			2000	7586.1				
ISO-SCF-32293-4	S3083F46	1238919	5.79	5.41	7%	1	5.8	5.8			QC
ISO-SCF-32293-4	S3083F47	1245039	5.82	5.41	8%	1	5.8				
ISO-SCF-32293-4	S3083F48	1235673	5.77	5.41	7%	1	5.8				
ARL-83	S3084F13	163746	0.77			10	7.7	7.7			FBB
ARL-83	S3084F14	162706	0.77			10	7.7				
ARL-83	S3084F15	164806	0.78			10	7.8				
ARL-106	S3084F16	869707	4.07			2000	8132.1	8120.1	7827.81	104%	MS-1
ARL-106	S3084F17	867360	4.06			2000	8110.2				
ARL-106	S3084F18	868206	4.06			2000	8118.1				
ISO-SCF-32293-4	S3084F19	1220899	5.70	5.41	6%	1	5.7	5.7			QC
ISO-SCF-32293-4	S3084F20	1232005	5.76	5.41	6%	1	5.8				
ISO-SCF-32293-4	S3084F21	1230936	5.75	5.41	6%	1	5.8				
ARL-84	S3084F34	33054	0.16			10	1.6	1.6			FBB
ARL-84	S3084F35	32381	0.16			10	1.6				
ARL-84	S3084F36	32300	0.16			10	1.6				

Sample Name	FILE	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample	Avg Amt Sample	Amount Spiked	Spike Recovery	Train ID
ARL-107	S3084F37	829745	3.88			2000	7759.3	7837.5	7827.81	100%	MS-2
ARL-107	S3084F38	838117	3.92			2000	7837.4				
ARL-107	S3084F39	846508	3.96			2000	7915.7				
ISO-SCF-32293-4	S3084F40	1246426	5.82	5.41	8%	1	5.8	5.8			QC
ISO-SCF-32293-4	S3084F41	1237852	5.78	5.41	7%	1	5.8				
ISO-SCF-32293-4	S3084F42	1239959	5.79	5.41	7%	1	5.8				
ARL-85	S3085F19	75475	0.36			10	3.6	3.6			FBC
ARL-85	S3085F20	75608	0.36			10	3.6				
ARL-85	S3085F21	72681	0.35			10	3.5				
ARL-108	S3085F22	847084	3.96			2000	7921.1	7890.2	7827.81	101%	MS-3
ARL-108	S3085F23	836897	3.91			2000	7826.0				
ARL-108	S3085F24	847337	3.96			2000	7923.4				
ISO-SCF-32293-4	S3085F25	1263449	5.90	5.41	9%	1	5.9	5.9			QC
ISO-SCF-32293-4	S3085F26	1253499	5.86	5.41	8%	1	5.9				
ISO-SCF-32293-4	S3085F27	1260480	5.89	5.41	9%	1	5.9				
ARL-86	S3085F40	59577	0.29			10	2.9	2.8			FBC
ARL-86	S3085F41	56343	0.27			10	2.7				
ARL-86	S3085F42	59626	0.29			10	2.9				
ARL-109	S3085F43	851309	3.98			2000	7960.5	7944.8	7827.81	101%	MS-4
ARL-109	S3085F44	850793	3.98			2000	7955.6				
ARL-109	S3085F45	846800	3.96			2000	7918.4				
ISO-SCF-32293-4	S3085F46	1245663	5.82	5.41	8%	1	5.8	4.0			QC
ISO-SCF-32293-4	S3085F47	0	0.01	5.41	-100%	1	0.0				
ISO-SCF-32293-4	S3085F48	1296988	6.06	5.41	12%	1	6.1				
ISO-SCF-32293-4	S3098F1	1158548	5.41	5.41	0%	1	5.4				
ARL-89	S3098F2	0	0.01			10	0.1	0.1			T-RB1
ARL-89	S3098F3	0	0.01			10	0.1				
ARL-89	S3098F4	0	0.01			10	0.1				
ARL-90	S3098F5	0	0.01			10	0.1	0.3			T-RB2
ARL-90	S3098F6	5758.5	0.04			10	0.4				
ARL-90	S3098F7	5867.5	0.04			10	0.4				
ARL-91	S3098F8	0	0.01			10	0.1	0.2			T-RB3
ARL-91	S3098F9	3273	0.03			10	0.3				
ARL-91	S3098F10	0	0.01			10	0.1				

Sample Name	FILE	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample	Avg Amt Sample	Amount Spiked	Spike Recovery	Train ID
ARL-92	S3098F11	26248	0.13			10	1.3	1.2			T-RB4
ARL-92	S3098F12	22909.08	0.12			10	1.2				
ARL-92	S3098F13	22154	0.11			10	1.1				
ISO-SCF-32293-4	S3098F14	1202486	5.62	5.41	4%	1	5.6	5.7			QC
ISO-SCF-32293-4	S3098F15	1212015	5.66	5.41	5%	1	5.7				
ISO-SCF-32293-4	S3098F16	1220989	5.70	5.41	6%	1	5.7				
ARL-94	S3098F17	0	0.01			10	0.1	0.2			A-RB1
ARL-94	S3098F18	5431	0.04			10	0.4				
ARL-94	S3098F19	0	0.01			10	0.1				
ARL-95	S3098F20	0	0.01			10	0.1	0.1			A-RB2
ARL-95	S3098F21	0	0.01			10	0.1				
ARL-95	S3098F22	0	0.01			10	0.1				
ARL-96	S3098F23	6352.5	0.04			10	0.4	0.4			A-RB3
ARL-96	S3098F24	6436	0.04			10	0.4				
ARL-96	S3098F25	5886	0.04			10	0.4				
ARL-97	S3098F26	25606	0.13			10	1.3	0.8			A-RB4
ARL-97	S3098F27	21934	0.11			10	1.1				
ARL-97	S3098F28	0	0.01			10	0.1				
ISO-SCF-32293-4	S3098F29	1164624	5.44	5.41	1%	1	5.4	5.4			QC
ISO-SCF-32293-4	S3098F30	1159319	5.42	5.41	0%	1	5.4				
ISO-SCF-32293-4	S3098F31	1149310	5.37	5.41	-1%	1	5.4				
ARL-99	S3098F32	0	0.01			10	0.1	0.1			ABS-RB
ARL-99	S3098F33	0	0.01			10	0.1				
ARL-99	S3098F34	0	0.01			10	0.1				
ARL-100	S3098F35	0	0.01			10	0.1	0.1			ABS-RB
ARL-100	S3098F36	0	0.01			10	0.1				
ARL-100	S3098F37	0	0.01			10	0.1				
ARL-101	S3098F38	15010.13	0.08			10	0.8	0.9			ABS-RB
ARL-101	S3098F39	15823	0.08			10	0.8				
ARL-101	S3098F40	23127	0.12			10	1.2				
ARL-102	S3098F41	0	0.01			10	0.1	0.1			ABS-RB
ARL-102	S3098F42	0	0.01			10	0.1				
ARL-102	S3098F43	0	0.01			10	0.1				

Sample Name	FILE	AREA	AMOUNT ug/mL	QC Con ug/mL	QC Bias %	Dilution Factor	Amount Sample	Avg Amt Sample	Amount Spiked	Spike Recovery	Train ID
ISO-SCF-32293-4	S3098F44	1187727	5.55	5.41	3%	1	5.5	5.6			QC
ISO-SCF-32293-4	S3098F45	1199251	5.60	5.41	4%	1	5.6				
ISO-SCF-32293-4	S3098F46	1206006	5.63	5.41	4%	1	5.6				
ARL-117	S3098F47	4701	0.03			10	0.3	0.3			MB-1
ARL-117	S3098F48	4680.5	0.03			10	0.3				
ARL-117	S3098F49	5001	0.03			10	0.3				
ARL-118	S3098F50	204000	0.96			10	9.6	9.7			MB-2
ARL-118	S3098F51	207157	0.98			10	9.8				
ARL-118	S3098F52	207481	0.98			10	9.8				
ARL-119	S3098F53	446217.5	2.09			10	20.9	20.7			MB-3
ARL-119	S3098F54	427833.1	2.01			10	20.1				
ARL-119	S3098F55	452112	2.12			10	21.2				
ISO-SCF-4893-1	S3098F56	1164164	5.44	5.41	1%	1	5.4	5.5			QC
ISO-SCF-4893-1	S3098F57	1176245	5.50	5.41	2%	1	5.5				
ISO-SCF-4893-3	S3098F58	1160212	5.42	5.41	0%	1	5.4				

2,4-TDI Summary Information

Amount of 2,4-TDI Spiked into the trains: 7827.81 ug

Percent Recovery for Spiked Quad Trains

Quad No.	1		2		3		4		5		6		7		8			
Train ID	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	Average	RSD
% Recovery	85.69%	86.19%	89.16%	95.22%	106.14%	111.93%	96.56%	97.97%	89.41%	95.59%	97.69%	99.46%	100.45%	85.63%	88.46%	83.01%	95%	8%
Total ug	12263	11520	13258	13733	11625	12078	9694	9805	12233	12717	15471	15810	10450	9290	11197	10770	11962	16%

Amount Collected in Unspiked Quad Trains

Quad No.	1		2		3		4		5		6		7		8			
Train ID	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	Average	RSD
Total ug	4735	4811	6267	6270	3466	3166	2132	2139	4947	5522	8042	7608	2558	2616	4086	4579	4560	41%

Percent Carry over from 1st Impinger in Spiked Quad Trains

Quad No.	1		2		3		4		5		6		7		8			
Train ID	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	Average	RSD
1st Impinger	98.48%	99.21%	99.21%	98.97%	99.02%	99.11%	96.38%	98.46%	98.95%	99.22%	98.83%	98.71%	98.03%	97.02%	98.44%	98.35%	98.52%	0.81%
2nd Impinger	1.52%	0.79%	0.79%	1.03%	0.98%	0.89%	3.62%	1.54%	1.05%	0.78%	1.17%	1.29%	1.97%	2.98%	1.56%	1.65%	1.48%	54.36%

Percent Carry over from 1st Impinger in Unspiked Quad Trains

Quad No.	1		2		3		4		5		6		7		8			
Train ID	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	Average	RSD
1st Impinger	99.59%	98.11%	98.81%	99.24%	99.04%	98.94%	99.14%	98.76%	99.64%	99.18%	98.69%	98.83%	98.93%	98.38%	98.51%	98.71%	98.91%	0.41%
2nd Impinger	0.41%	1.89%	1.19%	0.76%	0.96%	1.06%	0.86%	1.24%	0.36%	0.82%	1.31%	1.17%	1.07%	1.62%	1.49%	1.29%	1.09%	37.05%

AREAL WA 55 -- Method 301 Results

Using Modified Data

Run	Train				Amount	Precision of UNSpiked Samples			
#	A	B	C	D	Spiked	Diff	STDu	STDm	RSD
1	12263.0	11520.0	4735.0	4811.0	7827.81	-76.00	216.596	30.942	4.721
2	6287.0	6270.0	13258.0	13733.0	7827.81	17.00			
3	11625.0	12078.0	3466.0	3166.0	7827.81	300.00			
4	2132.0	2139.0	9694.0	9805.0	7827.81	-7.00			
5	12233.0	12717.0	4947.0	5522.0	7827.81	-575.00			
6	8084.0	7608.0	15471.0	15610.0	7827.81	476.00			
7	10450.0	9290.0	2557.0	2616.0	7827.81	-59.00			

AREAL WA 55 -- Method 301 Results

Using Modified Data

Run	Train				Amount	Precision of Spiked Samples				Bias				
#	A	B	C	D	Spiked	Diff	SDs	SDm	RSD	Run	Compound	SD	t Test	CF
1	12263.0	11520.0	4735.0	4811.0	7827.81	743.00	430.48	162.71	3.55	-709.31	-295.41	481.90	-1.622	N/A
2	6287.0	6270.0	13258.0	13733.0	7827.81	-475.00				-610.81			^	
3	11625.0	12078.0	3466.0	3166.0	7827.81	-453.00				707.69			|	
4	2132.0	2139.0	9694.0	9805.0	7827.81	-111.00				-213.81			critical Value	
5	12233.0	12717.0	4947.0	5522.0	7827.81	-484.00				-587.31			is 2.160	
6	8084.0	7608.0	15471.0	15610.0	7827.81	-139.00				-133.31				
7	10450.0	9290.0	2557.0	2616.0	7827.81	1160.00				-544.31				

AREAL WA 55 -- Method 301 Results

Using Modified Data

Run	Train				Amount	Precision of UNSpiked Samples			
#	A	B	C	D	Spiked	Diff	STDu	STDm	RSD
1	12263.0	11520.0	4735.0	4811.0	7827.81	-76.00	237.150	29.644	5.205
2	6287.0	6270.0	13258.0	13733.0	7827.81	17.00			
3	11625.0	12078.0	3466.0	3166.0	7827.81	300.00			
4	2132.0	2139.0	9694.0	9805.0	7827.81	-7.00			
5	12233.0	12717.0	4947.0	5522.0	7827.81	-575.00			
6	8084.0	7608.0	15471.0	15610.0	7827.81	476.00			
7	10450.0	9290.0	2557.0	2616.0	7827.81	-59.00			
8	4086.0	4579.0	11197.0	10947.0	7827.81	-493.00			

AREAL WA 55 -- Method 301 Results

Using Modified Data

Run	Train				Amount	Precision of Spiked Samples				Bias				
#	A	B	C	D	Spiked	Diff	SDs	SDm	RSD	Run	Compound	SD	t Test	CF
1	12263.0	11520.0	4735.0	4811.0	7827.81	743.00	407.50	144.07	3.40	-709.31	-394.53	471.48	-2.367	1.053
2	6287.0	6270.0	13258.0	13733.0	7827.81	-475.00				-610.81			^	
3	11625.0	12078.0	3466.0	3166.0	7827.81	-453.00				707.69			|	
4	2132.0	2139.0	9694.0	9805.0	7827.81	-111.00				-213.81			critical Value	
5	12233.0	12717.0	4947.0	5522.0	7827.81	-484.00				-587.31			is 2.131	
6	8084.0	7608.0	15471.0	15610.0	7827.81	-139.00				-133.31				
7	10450.0	9290.0	2557.0	2616.0	7827.81	1160.00				-544.31				
8	4086.0	4579.0	11197.0	10947.0	7827.81	250.00				-1088.31				

EPA
METHOD 0011

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SAMPLING FOR FORMALDEHYDE EMISSIONS FROM STATIONARY SOURCES

1.0 SCOPE AND APPLICATION

1.1 This method is applicable to the determination of Destruction and Removal Efficiency (DRE) of formaldehyde, CAS Registry number 50-00-0, and possibly other aldehydes and ketones from stationary sources as specified in the regulations. The methodology has been applied specifically to formaldehyde; however, many laboratories have extended the application to other aldehydes and ketones. Compounds derivatized with 2,4-dinitrophenylhydrazine can be detected as low as 6.4×10^{-8} lbs/cu ft (1.8 ppbv) in stack gas over a 1 h sampling period, sampling approximately 45 cu ft.

2.0 SUMMARY OF METHOD

2.1 Gaseous and particulate pollutants are withdrawn isokinetically from an emission source and are collected in aqueous acidic 2,4-dinitrophenylhydrazine. Formaldehyde present in the emissions reacts with the 2,4-dinitrophenylhydrazine to form the formaldehyde dinitrophenylhydrazone derivative. The dinitrophenylhydrazone derivative is extracted, solvent-exchanged, concentrated, and then analyzed by high performance liquid chromatography.

3.0 INTERFERENCES

3.1 A decomposition product of 2,4-dinitrophenylhydrazine, 2,4-dinitroaniline, can be an analytical interferent if concentrations are high. 2,4-dinitroaniline can coelute with the 2,4-dinitrophenylhydrazone of formaldehyde under high performance liquid chromatography conditions which may be used for the analysis. High concentrations of highly oxygenated compounds, especially acetone, that have the same retention time or nearly the same retention time as the dinitrophenylhydrazone of formaldehyde and that also absorb at 360 nm will interfere with the analysis.

Formaldehyde, acetone, and 2,4-dinitroaniline contamination of the aqueous acidic 2,4-dinitrophenylhydrazine (DNPH) reagent is frequently encountered. The reagent must be prepared within five days of use in the field and must be stored in an uncontaminated environment both before and after sampling in order to minimize blank problems. Some level of acetone contamination is unavoidable, because acetone is ubiquitous in laboratory and field operations. However, the acetone contamination must be minimized.

4.0 APPARATUS AND MATERIALS

4.1 A schematic of the sampling train is shown in Figure 1. This sampling train configuration is adapted from EPA Method 5 procedures. The sampling train consists of the following components: Probe Nozzle, Pitot Tube, Differential Pressure Gauge, Metering System, Barometer, and Gas Density Determination Equipment.

4.1.1 Probe Nozzle: Quartz or glass with sharp, tapered (30° angle) leading edge. The taper shall be on the outside to preserve a constant inner diameter. The nozzle shall be buttonhook or elbow design. A range of nozzle sizes suitable

INTERPOLL LABORATORIES
4500 BALL ROAD N.E.
CIRCLE PINES, MN 55014-1819
(612) 786-8020

configuration such that the tip of the sensor extends beyond the leading edge of the probe sheath and does not touch any metal. Alternatively, the sensor may be attached just prior to use in the field. Note, however, that if the temperature sensor is attached in the field, the sensor must be placed in an interference-free arrangement with respect to the Type S pitot tube openings (see EPA Method 2, Figure 2-7). As a second alternative, if a difference of no more than 1% in the average velocity measurement is to be introduced, the temperature gauge need not be attached to the probe or pitot tube.

4.2 Sample Recovery

4.2.1 Probe Liner: Probe nozzle and brushes; Teflon® bristle brushes with stainless steel wire handles are required. The probe brush shall have extensions of stainless steel, Teflon®, or inert material at least as long as the probe. The brushes shall be properly sized and shaped to brush out the probe liner, the probe nozzle, and the impingers.

4.2.2 Wash Bottles: Three wash bottles are required. Teflon® or glass wash bottles are recommended; polyethylene wash bottles should not be used because organic contaminants may be extracted by exposure to organic solvents used for sample recovery.

4.2.3 Graduated Cylinder and/or Balance: A graduated cylinder or balance is required to measure condensed water to the nearest 1 mL or 1 g. Graduated cylinders shall have divisions not >2 mL. Laboratory balances capable of weighing to ±0.5 g are required.

4.2.4 Amber Glass Storage Containers: One-liter wide-mouth amber flint glass bottles with Teflon®-lined caps are required to store impinger water samples. The bottles must be sealed with Teflon® tape.

4.2.5 Rubber Policeman and Funnel: A rubber policeman and funnel are required to aid in the transfer of materials into and out of containers in the field.

5.0 REAGENTS

Reagent grade chemicals or better grades shall be used in all tests. Unless otherwise indicated, all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.

5.1 Water: HPLC-grade water is used in preparation of DNPH reagent and in all other applications in the sampling train.

5.2 Silica Gel: Silica gel shall be indicating type, 6-16 mesh. If the silica gel has been used previously, dry at 175°C (350°F) for 2 h before using. New silica gel may be used as received. Alternatively, other types of desiccants (equivalent or better) may be used.

5.3 Crushed Ice: Quantities ranging from 10-50 lb may be necessary during a sampling run, depending upon ambient temperature. Samples which have been taken must be stored and shipped cold; sufficient ice for this purpose must be allowed.

for isokinetic sampling should be available in increments of 0.16 cm (1/16 in), e.g., 0.32 to 1.27 cm (1/8 to 1/2 in), or larger if higher volume sampling trains are used. Each nozzle shall be calibrated according to the procedures outlined in Section 8.1.

4.1.2 Probe Liner: Borosilicate glass or quartz shall be used for the probe liner. The tester should not allow the temperature in the probe to exceed 120 ± 14°C (248 ± 25°F).

4.1.3 Pitot Tube: The Pitot tube shall be Type S, as described in Section 2.1 of EPA Method 2, or any other appropriate device. The pitot tube shall be attached to the probe to allow constant monitoring of the stack gas velocity. The impact (high pressure) opening plane of the pitot tube shall be even with or above the nozzle entry plane (see EPA Method 2, Figure 2-6b) during sampling. The Type S pitot tube assembly shall have a known coefficient, determined as outlined in Section 4 of EPA Method 2.

4.1.4 Differential Pressure Gauge: The differential pressure gauge shall be an inclined manometer or equivalent device as described in Section 2.2 of EPA Method 2. One manometer shall be used for velocity-head readings and the other for orifice differential pressure readings.

4.1.5 Impingers: The sampling train requires a minimum of four impingers, connected as shown in Figure 1, with ground glass (or equivalent) vacuum-tight fittings. For the first, third, and fourth impingers, use the Greenburg-Smith design, modified by replacing the tip with a 1.3-cm inside diameter (1/2 in) glass tube extending to 1.3 cm (1/2 in) from the bottom of the flask. For the second impinger, use a Greenburg-Smith impinger with the standard tip. Place a thermometer capable of measuring temperature to within 1°C (2°F) at the outlet of the fourth impinger for monitoring purposes.

4.1.6 Metering System: The necessary components are a vacuum gauge, leak-free pump, thermometers capable of measuring temperature within 3°C (5.4°F), dry-gas meter capable of measuring volume to within 1%, and related equipment as shown in Figure 1. At a minimum, the pump should be capable of 4 cfm free flow, and the dry gas meter should have a recording capacity of 0-999.9 cu ft with a resolution of 0.005 cu ft. Other metering systems may be used which are capable of maintaining sampling rates within 10% of isokinetic collection and of determining sample volumes to within 2%. The metering system may be used in conjunction with a pitot tube to enable checks of isokinetic sampling rates.

4.1.7 Barometer: The barometer may be mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in Hg). In many cases, the barometric reading may be obtained from a nearby National Weather Service Station, in which case the station value (which is the absolute barometric pressure) is requested and an adjustment for elevation differences between the weather station and sampling point is applied at a rate of minus 2.5 mm Hg (0.1 in Hg) per 30 m (100 ft) elevation increase (vice versa for elevation decrease).

4.1.8 Gas Density Determination Equipment: Temperature sensor and pressure gauge (as described in Sections 2.3 and 2.4 of EPA Method 2), and gas analyzer, if necessary (as described in EPA Method 3). The temperature sensor ideally should be permanently attached to the pitot tube or sampling probe in a fixed

5.4 2,4-Dinitrophenylhydrazine Reagent: The 2,4-dinitrophenylhydrazine reagent must be prepared in the laboratory within five days of sampling use in the field. Preparation of DNPH can also be done in the field, with consideration of appropriate procedures required for safe handling of solvent in the field. When a container of prepared DNPH reagent is opened in the field, the contents of the opened container should be used within 48 hours. All laboratory glassware must be washed with detergent and water and rinsed with water, methanol, and methylene chloride prior to use.

NOTE: The glassware must not be rinsed with acetone or unacceptable levels of acetone contamination will be introduced. If field preparation of DNPH is performed, caution must be exercised in avoiding acetone contamination.

Reagent bottles for storage of cleaned DNPH derivatizing solution must be rinsed with acetonitrile and dried before use. Baked glassware is not essential for preparation of DNPH reagent.

NOTE: DNPH crystals or DNPH solution should be handled with plastic gloves at all times, with prompt and extensive use of running water in case of skin exposure.

5.4.1 Preparation of Aqueous Acidic DNPH: The following materials and reagents are required for preparation of the reagent.

5.4.1.1 Bottles/Caps: amber 1- or 4 L bottles with Teflon®-lined caps are required for storing cleaned DNPH solution. Additional 4-L bottles are required to collect waste organic solvents.

5.4.1.2 Large Glass Container: at least one large glass container (8 to 16 L) is required for mixing the aqueous acidic DNPH solution.

5.4.1.3 Stir Plate/Large Stir Bars/Stir Bar Retriever: a magnetic stir plate and large stir bar are required for the mixing of the aqueous acidic DNPH solution. A stir bar retriever is needed for removing the stir bar from the large container holding the DNPH solution.

5.4.1.4 Buchner Filter/Filter Flask/Filter Paper: a large filter flask (2-4 L) with a buchner filter, appropriate rubber stopper, filter paper, and connecting tubing are required for filtering the aqueous acidic DNPH solution prior to cleaning.

5.4.1.5 Separatory Funnels: at least one large separatory funnel (2 L) is required for cleaning the DNPH prior to use.

5.4.1.6 Beakers: beakers (150 mL, 250 mL, and 400 mL) are useful for holding/measuring organic liquids when cleaning the aqueous acidic DNPH solution and for weighing DNPH crystals.

5.4.1.7 Funnels: at least one large funnel is needed for pouring the aqueous acidic DNPH into the separatory funnel.

5.4.1.8 Graduated Cylinders: at least one large graduated cylinder (1 to 2 L) is required for measuring HPLC-grade water and acid when preparing the DNPH solution.

5.4.1.9 Top-Loading Balance: a one-place top loading balance is needed for weighing out the DNPH crystals used to prepare the aqueous acidic DNPH solution.

5.4.1.10 Spatulas: spatulas are needed for weighing out DNPH when preparing the aqueous DNPH solution.

5.4.1.11 HPLC-Grade Water: water (HPLC-grade) is required to mix the aqueous DNPH solution.

5.4.1.12 Hydrochloric Acid: reagent grade hydrochloric acid (approximately 12N) is required for acidifying the aqueous DNPH solution.

5.4.1.13 2,4-Dinitrophenylhydrazine: a supply of moist solid 2,4-dinitrophenylhydrazine (DNPH) is required for preparation of aqueous acidic DNPH solution. The quantity of water may vary from 10 to 30%. Reagent grade or equivalent is required.

5.4.1.14 Methylene Chloride: methylene chloride (suitable for residue and pesticide analysis, GC/MS, HPLC, GC, Spectrophotometry or equivalent) is required for cleaning the aqueous acidic DNPH solution, rinsing glassware, and recovery of sample trains.

5.4.1.15 Cyclohexane: cyclohexane (HPLC grade) is required for cleaning the aqueous acidic DNPH solution.

NOTE: Do not use spectroanalyzed grades of cyclohexane if this sampling methodology is extended to aldehydes and ketones with four or more carbon atoms.

5.4.1.16 Methanol: methanol (HPLC grade or equivalent) is required for rinsing glassware.

5.4.1.17 Acetonitrile: acetonitrile (HPLC grade or equivalent) is required for rinsing glassware.

5.4.1.18 Formaldehyde: Analytical grade or equivalent formaldehyde is required for preparation of standards. If other aldehydes or ketones are used, analytical grade or equivalent is required.

5.4.2 Preparation of Aqueous Acidic DNPH Derivatizing Reagent: Each batch of DNPH reagent should be prepared and purified within five days of sampling, according to the procedure described below.

5.4.2.1 Place an 8-L container under a fume hood on a magnetic stirrer. Add a large stir bar and fill the container half full of HPLC-grade water. Save the empty bottle from HPLC-grade water. Start the stirring bar and adjust the stir rate to be as fast as possible. Using a graduated cylinder, measure 1.4 mL of concentrated hydrochloric acid. Slowly pour the acid into the stirring water. Fumes may be generated and the water may become warm. Weigh the DNPH crystals on a one-place balance (see Table 1 for approximate amounts) and add to the stirring acid solution. Fill the 8 L container to the 8 L mark with HPLC water and stir overnight. If all of the DNPH crystals have dissolved overnight, add additional DNPH and stir for two more hours. Continue the process of adding DNPH with additional stirring until a saturated solution has been formed. Filter the DNPH solution using vacuum filtration. Gravity filtration may be used, but a

much longer time is required. Store the filtered solution in an amber bottle at room temperature.

TABLE 1. APPROXIMATE AMOUNT OF CRYSTALLINE DNPH USED TO PREPARE A SATURATED SOLUTION

Amount of Moisture in DNPH	Weight Required per 8 L of Solution
10 weight percent	31 g
15 weight percent	33 g
30 weight percent	40 g

Within five days of proposed use, place about 1.6 L of the DNPH reagent in a 2 L separatory funnel. Add approximately 200 mL of methylene chloride and stopper the funnel. Wrap the stopper of the funnel with paper towels to absorb any leakage. Invert and vent the funnel. Then shake vigorously for 3 minutes. Initially, the funnel should be vented frequently (every 10 - 15 sec). After the layers have separated, discard the lower (organic) layer.

Extract the DNPH a second time with methylene chloride and finally with cyclohexane. When the cyclohexane layer has separated from the DNPH reagent, the cyclohexane layer will be the top layer in the separatory funnel. Drain the lower layer (the cleaned extracted DNPH reagent solution) into an amber bottle that has been rinsed with acetonitrile and allowed to dry.

5.4.3 Quality Control: Take two aliquots of the extracted DNPH reagent. The size of the aliquots is dependent upon the exact sampling procedure used, but 100 mL is reasonably representative. To ensure that the background in the reagent is acceptable for field use, analyze one aliquot of the reagent according to the procedure of EPA Draft Method 8315. Save the other aliquot of aqueous acidic DNPH for use as a method blank when the analysis is performed.

5.4.4 Shipment to the Field: Tightly cap the bottle containing extracted DNPH reagent using a Teflon®-lined cap. Seal the bottle with Teflon® tape. After the bottle is labeled, the bottle may be placed in a friction-top can (paint can or equivalent) containing a 1 -2 inch layer of granulated charcoal and stored at ambient temperature until use.

If the DNPH reagent has passed the Quality Control criteria, the reagent may be packaged to meet necessary shipping requirements and sent to the sampling area. If the Quality Control criteria are not met, the reagent solution may be re-extracted or the solution may be re-prepared and the extraction sequence repeated.

If the DNPH reagent is not used in the field within five days of extraction, an aliquot may be taken and analyzed as described Draft Method 8315. If the reagent meets the Quality Control requirements, the reagent may be used. If the reagent does not meet Quality Control requirements, the reagent must be discarded and new reagent must be prepared and tested.

5.4.5 Calculation of Acceptable Levels of Impurities in DNPH Reagent: The acceptable impurity level (AIL, µg/mL) is calculated from the expected analyte level in the sampled gas (EAL, ppbv), the volume of air that will be sampled at standard conditions (SVOL, L), the formula weight of the analyte (FW, g/mol), and the volume of DNPH reagent that will be used in the impingers (RVOL, mL):

$$AIL = 0.1 \times [EAL \times SVOL \times FW/22.4 \times (FW + 180)/FW]/(RVOL \times 1000).$$

where 0.1 is the acceptable contaminant level, 22.4 is a factor relating ppbv to g/L, 180 is a factor relating the underivatized analyte to the derivatized analyte, and 1000 is a unit conversion factor.

5.4.6 Disposal of Excess DNPH Reagent: Excess DNPH reagent may be returned to the laboratory and recycled or treated as aqueous waste for disposal purposes. 2,4-Dinitrophenylhydrazine is a flammable solid when dry so water should not be evaporated from the solution of the reagent.

5.5 Field Spike Standard Preparation: To prepare a formaldehyde field spiking standard at 4.01 mg/mL, use a 500µL syringe to transfer 0.5 mL of 37% by weight of formaldehyde (401 mg/mL) to a 50 mL volumetric flask containing approximately 40 mL of methanol. Dilute to 50 mL with methanol.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 Because of the complexity of this method, field personnel should be trained in and experienced with the test procedures in order to obtain reliable results.

6.2 Laboratory Preparation:

6.2.1 All the components shall be maintained and calibrated according to the procedure described in APTD-0576, unless otherwise specified.

6.2.2 Weigh several 200- to 300-g portions of silica gel in airtight containers to the nearest 0.5 g. Record on each container the total weight of the silica gel plus containers. As an alternative to preweighing the silica gel, it may instead be weighed directly in the impinger or sampling holder just prior to train assembly.

6.3 Preliminary Field Determinations:

6.3.1 Select the sampling site and the minimum number of sampling points according to EPA Method 1 or other relevant criteria. Determine the stack pressure, temperature, and range of velocity heads using EPA Method 2. A leak-check of the pitot lines according to EPA Method 2, Section 3.1, must be performed. Determine the stack gas moisture content using EPA Approximation Method 4 or its alternatives to establish estimates of isokinetic sampling-rate settings. Determine the stack gas dry molecular weight, as described in EPA Method 2, Section 3.6. If integrated EPA Method 3 sampling is used for molecular weight determination, the integrated bag sample shall be taken simultaneously with, and for the same total length of time as, the sample run.

6.3.2 Select a nozzle size based on the range of velocity heads so that it is not necessary to change the nozzle size in order to maintain isokinetic sampling rates below 28 L/min (1.0 cfm). During the run, do not change the nozzle.

Ensure that the proper differential pressure gauge is chosen for the range of velocity heads encountered (see Section 2.2 of EPA Method 2).

6.3.3 Select a suitable probe liner and probe length so that all traverse points can be sampled. For large stacks, to reduce the length of the probe, consider sampling from opposite sides of the stack.

6.3.4 A minimum of 45 ft^3 of sample volume is required for the determination of the Destruction and Removal Efficiency (DRE) of formaldehyde from incineration systems (45ft^3 is equivalent to one hour of sampling at 0.75 dscf). Additional sample volume shall be collected as ecessitated by the capacity of the DNPH reagent and analytical detection limit constraints. To determine the minimum sample volume required, refer to sample calculations in Section 10.

6.3.5 Determine the total length of sampling time needed to obtain the identified minimum volume by comparing the anticipated average sampling rate with the volume requirement. Allocate the same time to all traverse points defined by EPA Method 1. To avoid timekeeping errors, the length of time sampled at each traverse point should be an integer or an integer plus 0.5 min.

6.3.6 In some circumstances (e.g., batch cycles) it may be necessary to sample for shorter times at the traverse points and to obtain smaller gas-volume samples. In these cases, careful documentation must be maintained in order to allow accurate calculation of concentrations.

6.4 Preparation of Collection Train:

6.4.1 During preparation and assembly of the sampling train, keep all openings where contamination can occur covered with Teflon® film or aluminum foil until just prior to assembly or until sampling is about to begin.

6.4.2 Place 100 mL of cleaned DNPH solution in each of the first two impingers, and leave the third impinger empty. If additional capacity is required for high expected concentrations of formaldehyde in the stack gas, 200 mL of DNPH per impinger may be used or additional impingers may be used for sampling. Transfer approximately 200 to 300 g of pre-weighed silica gel from its container to the fourth impinger. Care should be taken to ensure that the silica gel is not entrained and carried out from the impinger during sampling. Place the silica gel container in a clean place for later use in the sample recovery. Alternatively, the weight of the silica gel plus impinger may be determined to the nearest 0.5 g and recorded.

6.4.3 With a glass or quartz liner, install the selected nozzle using a Viton-A O-ring when stack temperatures are <260°C (500°F) and a woven glass-fiber gasket when temperatures are higher. See APTD-0576 (Rom, 1972) for details. Other connecting systems utilizing either 316 stainless steel or Teflon® ferrules may be used. Mark the probe with heat-resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point.

6.4.4 Assemble the train as shown in Figure 1. During assembly, do not use any silicone grease on ground-glass joints upstream of the impingers. Use Teflon® tape, if required. A very light coating of silicone grease may be used on ground-glass joints downstream of the impingers, but the silicone grease should be limited to the outer portion (see APTD-0576) of the ground-glass joints to

necessary, a leak check shall be conducted immediately after the interruption of sampling and before the change is made. The leak check shall be done according to the procedure described in Section 6.5.1, except that it shall be done at a vacuum greater than or equal to the maximum value recorded up to that point in the test. If the leakage rate is found to be no greater than 0.00057 m^3/min (0.02 cfm) or 4% of the average sampling rate (whichever is less), the results are acceptable. If a higher leakage rate is obtained, the tester must void the sampling run.

NOTE: Any correction of the sample volume by calculation reduces the integrity of the pollutant concentration data generated and must be avoided.

6.5.2.2 Immediately after a component change and before sampling is re-initiated, a leak check similar to a pre-test leak check must also be conducted.

6.5.3 Post-test Leak Check:

6.5.3.1 A leak check is mandatory at the conclusion of each sampling run. The leak check shall be done with the same procedures as the pre-test leak check, except that the post-test leak check shall be conducted at a vacuum greater than or equal to the maximum value reached during the sampling run. If the leakage rate is found to be no greater than 0.00057 m^3/min (0.02 cfm) or 4% of the average sampling rate (whichever is less), the results are acceptable. If, however, a higher leakage rate is obtained, the tester shall record the leakage rate and void the sampling run.

6.6 Sampling Train Operation:

6.6.1 During the sampling run, maintain an isokinetic sampling rate to within 10% of true isokinetic, below 28 L/min (1.0 cfm). Maintain a temperature around the probe of 120° ± 14°C (248° ± 25°F).

6.6.2 For each run, record the data on a data sheet such as the one shown in Figure 2. Be sure to record the initial dry-gas meter reading. Record the dry-gas meter readings at the beginning and end of each sampling time increment, when changes in flow rates are made, before and after each leak check, and when sampling is halted. Take other readings required by Figure 2 at least once at each sample point during each time increment and additional readings when significant adjustments (20% variation in velocity head readings) necessitate additional adjustments in flow rate. Level and zero the manometer. Because the manometer level and zero may drift due to vibrations and temperature changes, make periodic checks during the traverse.

6.6.3 Clean the stack access ports prior to the test run to eliminate the chance of sampling deposited material. To begin sampling, remove the nozzle cap, verify that the filter and probe heating systems are at the specified temperature, and verify that the pitot tube and probe are properly positioned. Position the nozzle at the first traverse point, with the tip pointing directly into the gas stream. Immediately start the pump and adjust the flow to isokinetic conditions. Nomographs, which aid in the rapid adjustment of the isokinetic sampling rate without excessive computations, are available. These nomographs are designed for use when the Type S pitot tube coefficient is 0.84 ± 0.02 and the stack gas equivalent density (dry molecular weight) is equal to 29 ± 4. APTD-0576 details the procedure for using the nomographs. If the stack gas molecular weight and

minimize silicone grease contamination. If necessary, Teflon® tape may be used to seal leaks. Connect all temperature sensors to an appropriate potentiometer/display unit. Check all temperature sensors at ambient temperature.

6.4.5 Place crushed ice all around the impingers.

6.4.6 Turn on and set the probe heating system at the desired operating temperature. Allow time for the temperature to stabilize.

6.5 Leak-Check Procedures:

6.5.1 Pre-test Leak Check:

6.5.1.1 After the sampling train has been assembled, turn on and set the probe heating system at the desired operating temperature. Allow time for the temperature to stabilize. If a Viton-A O-ring or other leak-free connection is used in assembling the probe nozzle to the probe liner, leak-check the train at the sampling site by plugging the nozzle and pulling a 381-mm Hg (15 in Hg) vacuum.

NOTE: A lower vacuum may be used, provided that the lower vacuum is not exceeded during the test.

6.5.1.2 If an asbestos string is used, do not connect the probe to the train during the leak check. Instead, leak-check the train by first attaching a carbon-filled leak check impinger to the inlet and then plugging the inlet and pulling a 381-mm Hg (15 in Hg) vacuum. (A lower vacuum may be used if this lower vacuum is not exceeded during the test.) Then connect the probe to the train and leak-check at about 25 mm Hg (1 in Hg) vacuum. Alternatively, leak-check the probe with the rest of the sampling train in one step at 381 mm Hg (15 in Hg) vacuum. Leakage rates in excess of 4% of the average sampling rate or >0.00057 m^3/min (0.02 cfm), whichever is less, are acceptable.

6.5.1.3 The following leak check instructions for the sampling train described in APTD-0576 and APTD-0581 may be helpful. Start the pump with the fine-adjust valve fully open and coarse-adjust valve completely closed. Partially open the coarse-adjust valve and slowly close the fine-adjust valve until the desired vacuum is reached. Do not reverse direction of the fine-adjust valve, as liquid will back up into the train. If the desired vacuum is exceeded, either perform the leak check at this higher vacuum or end the leak check, as shown below, and start over.

6.5.1.4 When the leak check is completed, first slowly remove the plug from the inlet to the probe. When the vacuum drops to 127 mm (5 in) Hg or less, immediately close the coarse-adjust valve. Switch off the pumping system and reopen the fine-adjust valve. Do not reopen the fine-adjust valve until the coarse-adjust valve has been closed to prevent the liquid in the impingers from being forced backward into the sampling line and silica gel from being entrained backward into the third impinger.

6.5.2 Leak Checks During Sampling Runs:

6.5.2.1 If, during the sampling run, a component change (i.e., impinger) becomes

the pitot tube coefficient are outside the above ranges, do not use the nomographs unless appropriate steps are taken to compensate for the deviations.

6.6.4 When the stack is under significant negative pressure (equivalent to the height of the impinger stem), take care to close the coarse-adjust valve before inserting the probe into the stack in order to prevent liquid from backing up through the train. If necessary, the pump may be turned on with the coarse-adjust valve closed.

6.6.5 When the probe is in position, block off the openings around the probe and stack access port to prevent unrepresentative dilution of the gas stream.

6.6.6 Traverse the stack cross section, as required by EPA Method 1, being careful not to bump the probe nozzle into the stack walls when sampling near the walls or when removing or inserting the probe through the access port, in order to minimize the chance of extracting deposited material.

6.6.7 During the test run, make periodic adjustments to keep the temperature around the probe at the proper levels. Add more ice and, if necessary, salt, to maintain a temperature of <20°C (68°F) at the silica gel outlet. Also, periodically check the level and zero of the manometer.

6.6.8 A single train shall be used for the entire sampling run, except in cases where simultaneous sampling is required in two or more separate ducts or at two or more different locations within the same duct, or in cases where equipment failure necessitates a change of trains. An additional train or additional trains may also be used for sampling when the capacity of a single train is exceeded.

6.6.9 When two or more trains are used, separate analyses of components from each train shall be performed. If multiple trains have been used because the capacity of a single train would be exceeded, first impingers from each train may be combined, and second impingers from each train may be combined.

6.6.10 At the end of the sampling run, turn off the coarse-adjust valve, remove the probe and nozzle from the stack, turn off the pump, record the final dry gas meter reading, and conduct a post-test leak check. Also, leak check the pitot lines as described in EPA Method 2. The lines must pass this leak check in order to validate the velocity-head data.

6.6.11 Calculate percent isokineticity (see Method 2) to determine whether the run was valid or another test should be made.

7.0 SAMPLE RECOVERY

7.1 Preparation:

7.1.1 Proper cleanup procedure begins as soon as the probe is removed from the stack at the end of the sampling period. Allow the probe to cool. When the probe can be handled safely, wipe off all external particulate matter near the tip of the probe nozzle and place a cap over the tip to prevent losing or gaining particulate matter. Do not cap the probe tip tightly while the sampling train is cooling because a vacuum will be created, drawing liquid from the impingers back through the sampling train.

7.1.2 Before moving the sampling train to the cleanup site, remove the probe from the sampling train and cap the open outlet, being careful not to lose any condensate that might be present. Remove the umbilical cord from the last impinger and cap the impinger. If a flexible line is used, let any condensed water or liquid drain into the impingers. Cap off any open impinger inlets and outlets. Ground glass stoppers, Teflon® caps, or caps of other inert materials may be used to seal all openings.

7.1.3 Transfer the probe and impinger assembly to an area that is clean and protected from wind so that the chances of contaminating or losing the sample are minimized.

7.1.4 Inspect the train before and during disassembly, and note any abnormal conditions.

7.1.5 Save a portion of all washing solutions (methylene chloride, water) used for cleanup as a blank. Transfer 200 mL of each solution directly from the wash bottle being used and place each in a separate, pre-labeled sample container.

7.2 Sample Containers:

7.2.1 Container 1: Probe and Impinger Catches. Using a graduated cylinder, measure to the nearest mL, and record the volume of the solution in the first three impingers. Alternatively, the solution may be weighed to the nearest 0.5 g. Include any condensate in the probe in this determination. Transfer the impinger solution from the graduated cylinder into the amber flint glass bottle. Taking care that dust on the outside of the probe or other exterior surfaces does not get into the sample, clean all surfaces to which the sample is exposed (including the probe nozzle, probe fitting, probe liner, first impinger, and impinger connector) with methylene chloride. Use less than 500 mL for the entire wash (250 mL would be better, if possible). Add the washings to the sample container.

7.2.1.1 Carefully remove the probe nozzle and rinse the inside surface with methylene chloride from a wash bottle. Brush with a Teflon® bristle brush, and rinse until the rinse shows no visible particles or yellow color, after which make a final rinse of the inside surface. Brush and rinse the inside parts of the Swagelok® fitting with methylene chloride in a similar way.

7.2.1.2 Rinse the probe liner with methylene chloride. While squirting the methylene chloride into the upper end of the probe, tilt and rotate the probe so that all inside surfaces will be wetted with methylene chloride. Let the methylene chloride drain from the lower end into the sample container. The tester may use a funnel (glass or polyethylene) to aid in transferring the liquid washes to the container. Follow the rinse with a Teflon® brush. Hold the probe in an inclined position, and squirt methylene chloride into the upper end as the probe brush is being pushed with a twisting action through the probe. Hold the sample container underneath the lower end of the probe, and catch any methylene chloride, water, and particulate matter that is brushed from the probe. Run the brush through the probe three times or more. With stainless steel or other metal probes, run the brush through in the above prescribed manner at least six times since there may be small crevices in which particulate matter can be entrapped. Rinse the brush with methylene chloride or water, and quantitatively collect these washings in the sample container. After the brushings, make a final rinse

of the probe as described above.

NOTE: Two people should clean the probe in order to minimize sample losses. Between sampling runs, brushes must be kept clean and free from contamination.

7.2.1.3 Rinse the inside surface of each of the first three impingers (and connecting tubing) three separate times. Use a small portion of methylene chloride for each rinse, and brush each surface to which sample is exposed with a Teflon® bristle brush to ensure recovery of fine particulate matter. Water will be required for the recovery of the impingers in addition to the specified quantity of methylene chloride. There will be at least two phases in the impingers. This two-phase mixture does not pour well, and a significant amount of the impinger catch will be left on the walls. The use of water as a rinse makes the recovery quantitative. Make a final rinse of each surface and of the brush, using both methylene chloride and water.

7.2.1.4 After all methylene chloride and water washings and particulate matter have been collected in the sample container, tighten the lid so that solvent, water, and DNPH reagent will not leak out when the container is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurs during transport. Seal the container with Teflon® tape. Label the container clearly to identify its contents.

7.2.1.5 If the first two impingers are to be analyzed separately to check for breakthrough, separate the contents and rinses of the two impingers into individual containers. Care must be taken to avoid physical carryover from the first impinger to the second. The formaldehyde hydrazone is a solid which floats and froths on top of the impinger solution. Any physical carryover of collected moisture into the second impinger will invalidate a breakthrough assessment.

7.2.2 Container 2: Sample Blank. Prepare a blank by using an amber flint glass container and adding a volume of DNPH reagent and methylene chloride equal to the total volume in Container 1. Process the blank in the same manner as Container 1.

7.2.3 Container 3: Silica Gel. Note the color of the indicating silica gel to determine whether it has been completely spent and make a notation of its condition. The impinger containing the silica gel may be used as a sample transport container with both ends sealed with tightly fitting caps or plugs. Ground-glass stoppers or Teflon® caps may be used. The silica gel impinger should then be labeled, covered with aluminum foil, and packaged on ice for transport to the laboratory. If the silica gel is removed from the impinger, the tester may use a funnel to pour the silica gel and a rubber policeman to remove the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use water or other liquids to transfer the silica gel. If a balance is available in the field, the spent silica gel (or silica gel plus impinger) may be weighed to the nearest 0.5 g.

7.2.4 Sample containers should be placed in a cooler, cooled by although not in contact with ice. Sample containers must be placed vertically and, since they are glass, protected from breakage curing shipment. Samples should be cooled during shipment so they will be received cold at the laboratory.

8.0 CALIBRATION

8.1 Probe Nozzle: Probe nozzles shall be calibrated before their initial use in the field. Using a micrometer, measure the inside diameter of the nozzle to the nearest 0.025 mm (0.001 in). Make measurements at three separate places across the diameter and obtain the average of the measurements. The difference between the high and low numbers shall not exceed 0.1 mm (0.004 in). When the nozzles become nicked or corroded, they shall be replaced and calibrated before use. Each nozzle must be permanently and uniquely identified.

8.2 Pitot tube: The Type S pitot tube assembly shall be calibrated according to the procedure outlined in Section 4 of EPA Method 2, or assigned a nominal coefficient of 0.84 if it is not visibly nicked or corroded and if it meets design and intercomponent spacing specifications.

8.3 Metering system:

8.3.1 Before its initial use in the field, the metering system shall be calibrated according to the procedure outlined in APTD-0576. Instead of physically adjusting the dry-gas meter dial readings to correspond to the wet-test meter readings, calibration factors may be used to correct the gas meter dial readings mathematically to the proper values. Before calibrating the metering system, it is suggested that a leak check be conducted. For metering systems having diaphragm pumps, the normal leak check procedure will not detect leakages within the pump. For these cases, the following leak check procedure will apply: make a ten-minute calibration run at 0.00057 m^3/min (0.02 cfm). At the end of the run, take the difference of the measured wet-test and dry-gas meter volumes and divide the difference by 10 to get the leak rate. The leak rate should not exceed 0.00057 m^3/min (0.02 cfm).

8.3.2 After each field use, check the calibration of the metering system by performing three calibration runs at a single intermediate orifice setting (based on the previous field test). Set the vacuum at the maximum value reached during the test series. To adjust the vacuum, insert a valve between the wet-test meter and the inlet of the metering system. Calculate the average value of the calibration factor. If the calibration has changed by more than 5%, recalibrate the meter over the full range of orifice settings, as outlined in APTD-0576.

8.3.3 Leak check of metering system: The portion of the sampling train from the pump to the orifice meter (see Figure 1) should be leak-checked prior to initial use and after each shipment. Leakage after the pump will result in less volume being recorded than is actually sampled. Use the following procedure: Close the main valve on the meter box. Insert a one-hole rubber stopper with rubber tubing attached into the orifice exhaust pipe. Disconnect and vent the low side of the orifice manometer. Close off the low side orifice tap. Pressurize the system to 13 - 18 cm (5 - 7 in) water column by blowing into the rubber tubing. Pinch off the tubing and observe the manometer for 1 min. A loss of pressure on the manometer indicates a leak in the meter box. Leaks must be corrected.

NOTE: If the dry-gas-meter coefficient values obtained before and after a test series differ by >5%, either the test series must be voided or calculations for test series must be performed using whichever meter coefficient value (i.e., before or after) gives the lower value of total sample volume.

8.4 Probe heater: The probe heating system must be calibrated before its initial use in the field according to the procedure outlined in APTD-0576. Probes constructed according to APTD-0581 need not be calibrated if the calibration curves in APTD-0576 are used.

8.5 Temperature gauges: Each thermocouple must be permanently and uniquely marked on the casting. All mercury-in-glass reference thermometers must conform to ASTM E-1 63C or 63F specifications. Thermocouples should be calibrated in the laboratory with and without the use of extension leads. If extension leads are used in the field, the thermocouple readings at ambient air temperatures, with and without the extension lead, must be noted and recorded. Correction is necessary if the use of an extension lead produces a change >1.5%.

8.5.1 Impinger and dry-gas meter thermocouples: For the thermocouples used to measure the temperature of the gas leaving the impinger train, three-point calibration at ice water, room air, and boiling water temperatures is necessary. Accept the thermocouples only if the readings at all three temperatures agree to ±2°C (3.6°F) with those of the absolute value of the reference thermometer.

8.5.2 Probe and stack thermocouple: For the thermocouples used to indicate the probe and stack temperatures, a three-point calibration at ice water, boiling water, and hot oil bath temperatures must be performed. Use of a point at room air temperature is recommended. The thermometer and thermocouple must agree to within 1.5% at each of the calibration points. A calibration curve (equation) may be constructed (calculated) and the data extrapolated to cover the entire temperature range suggested by the manufacturer.

8.6 Barometer: Adjust the barometer initially and before each test series to agree to within ±2.5 mm Hg (0.1 in Hg) of the mercury barometer or the corrected barometric pressure value reported by a nearby National Weather Service Station (same altitude above sea level).

8.7 Triple-beam balance: Calibrate the triple-beam balance before each test series, using Class S standard weights. The weights must be within ±0.5% of the standards, or the balance must be adjusted to meet these limits.

9.0 CALCULATIONS

Carry out calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculation.

9.1 Calculation of Total Formaldehyde:

To determine the total formaldehyde in mg, use the following equation:

Total mg formaldehyde = C_d x V x DF x

([g/mole aldehyde]/[g/mole DNPH derivative]) x

10^{-3} mg/µg

where:

C_d = measured concentration of DNPH-formaldehyde derivative, µg/mL.

V = organic extract volume, mL

DF = dilution factor

9.2 Formaldehyde concentration in stack gas:

Determine the formaldehyde concentration in the stack gas using the following equation:

C_f = K [total formaldehyde, mg] / $V_{m(std)}$

where:

K = 35.31 ft^3/m^3 if $V_{m(std)}$ is expressed in English units

= 1.00 m^3/m^3 if $V_{m(std)}$ is expressed in metric units

$V_{m(std)}$ = volume of gas sample as measured by dry gas meter, corrected to standard conditions, dscm (dscf)

9.3 Average Dry Gas Meter Temperature and Average Orifice Pressure Drop are obtained from the data sheet.

9.4 Dry Gas Volume: Calculate $V_{m(std)}$ and adjust for leakage, if necessary, using the equation in Section 6.3 of EPA Method 5.

9.5 Volume of Water Vapor and Moisture Content: Calculate the volume of water vapor and moisture content from equations 5-2 and 5-3 of EPA Method 5.

10.0 DETERMINATION OF VOLUME TO BE SAMPLED

To determine the minimum sample volume to be collected, use the following sequence of equations.

10.1 From prior analysis of the waste feed, the concentration of formaldehyde (FORM) introduced into the combustion system can be calculated. The degree of destruction and removal efficiency that is required is used to determine the maximum amount of FORM allowed to be present in the effluent. This amount may be expressed as:

Max $FORM_i$ Mass =

$$[\ (WF)\ (FORM_i\ conc)\ (100 - \%DRE)\ ]\ /\ 100$$

where:

WF = mass flow rate of waste feed per h, g/h (lb/h)

$FORM_i$ = concentration of FORM (wt %) introduced into the combustion process

DRE = percent Destruction and Removal Efficiency required

Max FORM = mass flow rate (g/h [lb/h]) of FORM emitted from the combustion source

10.2 The average discharge concentration of the FORM in the effluent gas is determined by comparing the Max FORM with the volumetric flow rate being exhausted from the source. Volumetric flow rate data are available as a result of preliminary EPA Method 1 - 4 determinations:

$$\text{Max } FORM_i \text{ conc} = [\text{Max } FORM_i \text{ Mass }] / DV_{eff(std)}$$

where:

$DV_{eff(std)}$ = volumetric flow rate of exhaust gas, dscm (dscf)

$FORM_i$ conc = anticipated concentration of the FORM in the exhaust gas stream, g/dscm (lb/dscf)

10.3 In making this calculation, it is recommended that a safety margin of at least ten be included.

$$[LDL_{FORM} \times 10] / [FORM_{i\ conc}] = V_{tbe}$$

where:

LDL_{FORM} = detectable amount of FORM in entire sampling train

V_{tbe} = minimum dry standard volume to be collected at dry-gas meter

10.4 The following analytical detection limits and DNPH Reagent Capacity (based on a total volume of 200 mL in two impingers) must also be considered in determining a volume to be sampled.

Table 2. Instrument Detection Limits and Reagent Capacity for Formaldehyde Analysis[1]

Analyte	Detection Limit, ppbv[2]	Reagent Capacity, ppmv
formaldehyde	1.8	66
acetaldehyde	1.7	70
acrolein	1.5	75
acetone/propionaldehyde	1.5	75
butyraldehyde	1.5	79
methyl ethyl ketone	1.5	79
valeraldehyde	1.5	84
isovaleraldehyde	1.4	84
hexaldehyde	1.3	88
benzaldehyde	1.4	84
o-/m-/p-tolualdehyde	1.3	89
dimethylbenzaldehyde	1.2	93

[1] Oxygenated compounds in addition to formaldehyde are included for comparison with formaldehyde; extension of the methodology to other compounds is possible.

[2] Detection limits are determined in solvent. These values therefore represent the optimum capability of the methodology.

11.0 QUALITY CONTROL

11.1 Sampling: See EPA Manual 600/4-77-027b for Method 5 quality control.

11.2 Analysis: The quality assurance program required for this method includes the analysis of field and method blanks, procedure validations, and analysis of field spikes. The assessment of combustion data and positive identification and quantitation of formaldehyde are dependent on the integrity of the samples received and the precision and accuracy of the analytical methodology. Quality Assurance procedures for this method are designed to monitor the performance of the analytical methodology and to provide the required information to take corrective action if problems are observed in laboratory operations or in field sampling activities.

11.2.1 Field Blanks: Field blanks must be submitted with the samples collected at each sampling site. The field blanks include the sample bottles containing aliquots of sample recovery solvents, methylene chloride and water, and unused DNPH reagent. At a minimum, one complete sampling train will be assembled in the field staging area, taken to the sampling area, and leak-checked at the beginning and end of the testing (or for the same total number of times as the actual sampling train). The probe of the blank train must be heated during the sample test. The train will be recovered as if it were an actual test sample. No gaseous sample will be passed through the Blank sampling train.

11.2.2 Method Blanks: A method blank must be prepared for each set of analytical operations, to evaluate contamination and artifacts that can be derived from glassware, reagents, and sample handling in the laboratory.

11.2.3 Field Spike: A field spike is performed by introducing 200 µL of the Field Spike Standard into an impinger containing 200 mL of DNPH solution. Standard impinger recovery procedures are followed and the field spike sample is returned to the laboratory for analysis. The field spike is used as a check on field handling and recovery procedures. An aliquot of the field spike standard is retained in the laboratory for derivatization and comparative analysis.

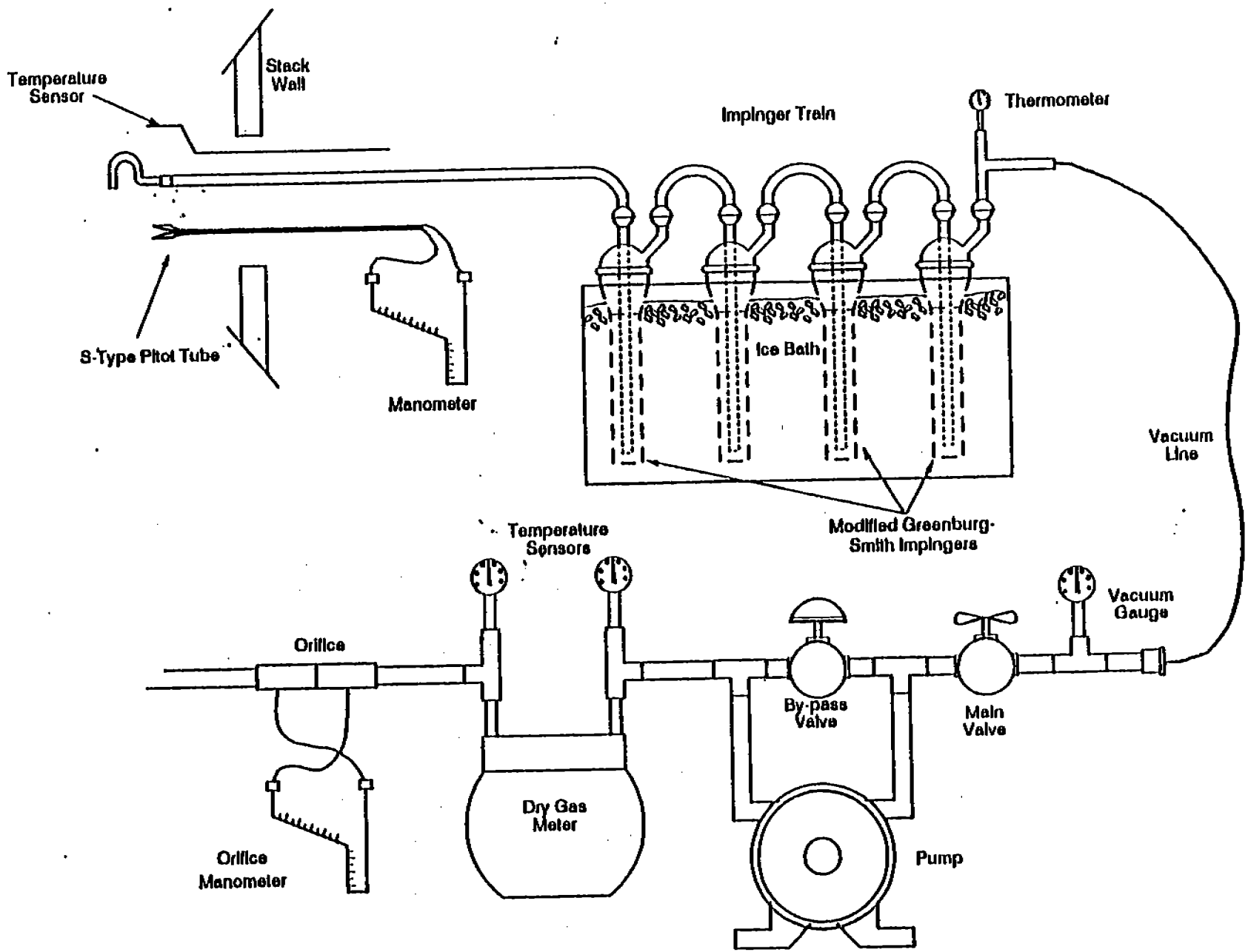
12.0 METHOD PERFORMANCE

12.1 Method performance evaluation: The following expected method performance parameters for precision, accuracy, and detection limits are provided in Table 3.

Table 3. Expected Method Performance for Formaldehyde

Parameter	Precision	[1]Accuracy[2]	Detection Limit[3]
Matrix: Dual trains	±15% RPD	±20%	1.5×10^{-7} lb/ft^3 (1.8 ppbv)

[1] Relative percent difference limit for dual trains.
[2] Limit for field spike recoveries.
[3] The lower reporting limit having less than 1% probability of false positive detection.



Formaldehyde Sampling Train

340434SR

Plant _____

Location _____

Operator _____

Date _____

Run No. _____

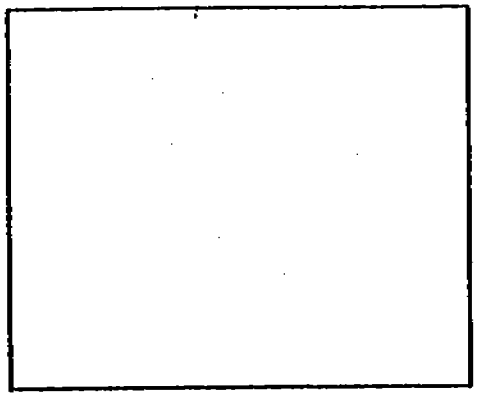
Sample Box No. _____

Meter Box No. _____

Meter H@ _____

C Factor _____

Pitot Tube Coefficient C_p _____



Schematic of Stack Cross Section

Ambient Temperature _____

Barometric Pressure _____

Assumed Moisture % _____

Probe Length, m(ft) _____

Nozzle Identification No. _____

Average Calibrated Nozzle Diameter, cm (in) _____

Probe Heating Setting _____

Leak Rate, m^3/min. (cfm) _____

Probe Liner Material _____

Static Pressure, mm Hg (in. Hg) _____

Filter No. _____

Traverse Point Number	Sampling Time (θ) Min.	Vacuum mm Hg (in. Hg)	Stack Temperature (T_s) °C (°F)	Velocity Head (P_s) mm (in) H_2O	Pressure Differential Across Orifice Meter mm (H_2O) (in H_2O)	Gas Sample Volume m^3 (ft^3)	Gas Sample Temp. at Dry Gas Meter		Filter Holder Temperature °C(°F)	Temperature of Gas Leaving Last Impinger °C(°F)
							Inlet °C(°F)	Outlet °C(°F)		
Total							Avg.	Avg.		
Average										

3404346R

Figure 2. Field Data Sheet

Interpoll Laboratories
4500 Ball Road N.E.
Circle Pines, Minnesota 55014

Telephone (612)786-6020
Fascimile (612)786-7854

COLLECTION OF SEMIVOLATILE COMPOUNDS

EPA METHOD 0010

(Interpoll Method II-8788 - Version 1.0)

EPA Method SW846 USEPA Office of Solid Waste and Emergency Response 3rd Ed., November 1986: Test Methods for Evaluating Solid Waste Volume 2: Field Manual Physical/Chemical Methods Method 0010.

MODIFIED METHOD 5 SAMPLING TRAIN

1.0 SCOPE AND APPLICATION

1.1 This method is applicable to the determination of Destruction and Removal Efficiency (DRE) of semivolatile Principal Organic Hazardous Compounds (POHCs) from incineration systems (PHS, 1967). This method also may be used to determine particulate emission rates from stationary sources as per EPA Method 5 (see References at end of this method).

2.0 SUMMARY OF METHOD

2.1 Gaseous and particulate pollutants are withdrawn from an emission source at an isokinetic sampling rate and are collected in a multicomponent sampling train. Principal components of the train include a high-efficiency glass- or quartz-fiber filter and a packed bed of porous polymeric adsorbent resin. The filter is used to collect organic-laden particulate materials and the porous polymeric resin to adsorb semivolatile organic species. Semivolatile species are defined as compounds with boiling points >100°C.

2.2 Comprehensive chemical analyses of the collected sample are conducted to determine the concentration and identity of the organic materials.

3.0 INTERFERENCES

3.1 Oxides of nitrogen (NO_x) are possible interferents in the determination of certain water-soluble compounds such as dioxane, phenol, and urethane; reaction of these compounds with NO_x in the presence of moisture will reduce their concentration. Other possibilities that could result in positive or negative bias are (1) stability of the compounds in methylene chloride, (2) the formation of water-soluble organic salts on the resin in the presence of moisture, and (3) the solvent extraction efficiency of water-soluble compounds from aqueous media. Use of two or more ions per compound for qualitative and quantitative analysis can overcome interference at one mass. These concerns should be addressed on a compound-by-compound basis before using this method.

4.0 APPARATUS AND MATERIALS

4.1 Sampling train:

4.1.1 A schematic of the sampling train used in this method is shown in Figure 1. This sampling train configuration is adapted from EPA Method 5 procedures, and, as such, the majority of the required equipment

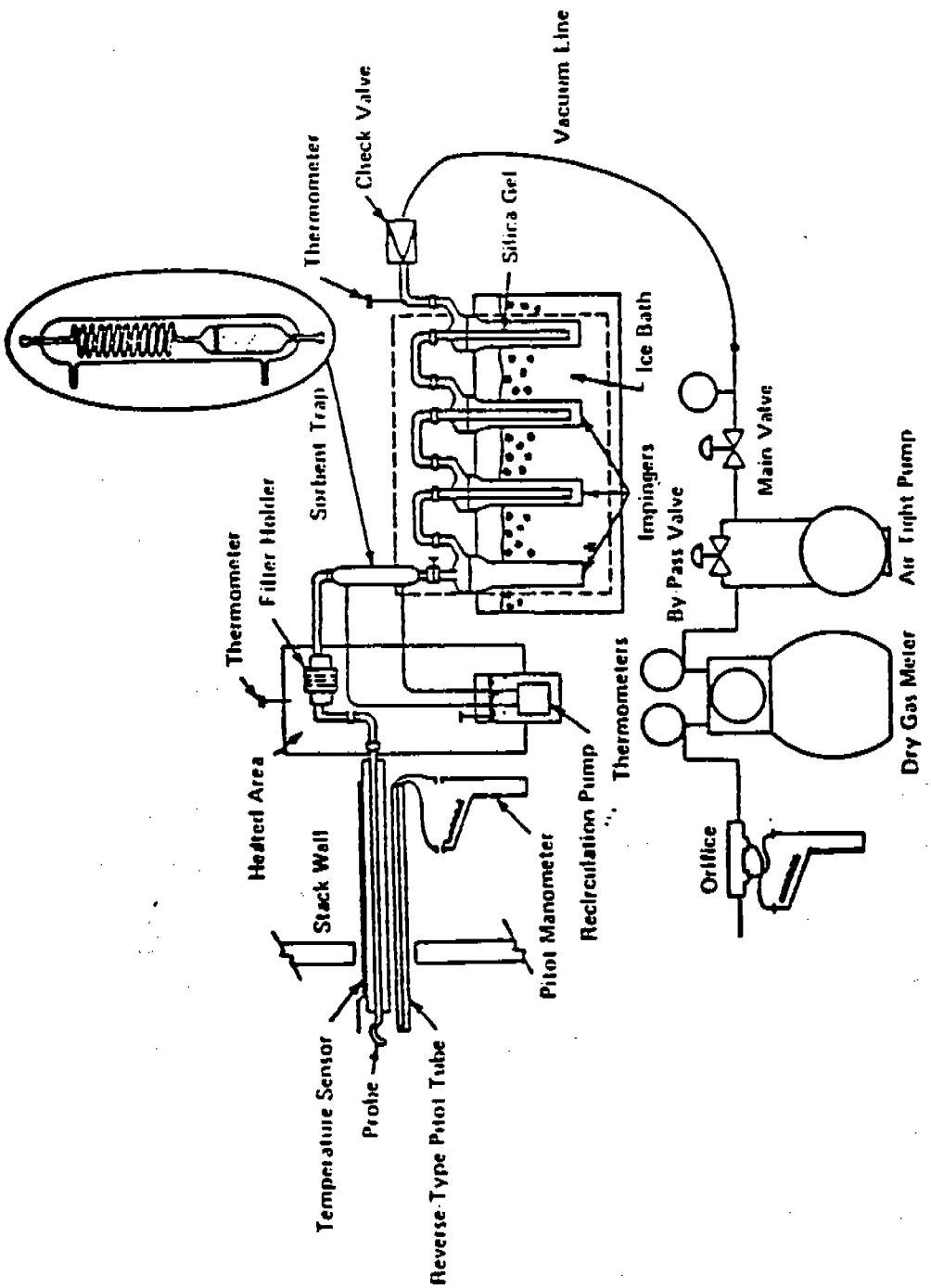


Figure 1. Modified Method 5 Sampling Train.

Revision 0
Date September 1986

is identical to that used in EPA Method 5 determinations. The new components required are a condenser coil and a sorbent module, which are used to collect semivolatile organic materials that pass through the glass- or quartz-fiber filter in the gas phase.

4.1.2 Construction details for the basic train components are given in APTD-0581 (see Martin, 1971, in Section 13.0, References); commercial models of this equipment are also available. Specifications for the sorbent module are provided in the following subsections. Additionally, the following subsections list changes to APTD-0581 and identify allowable train configuration modifications.

4.1.3 Basic operating and maintenance procedures for the sampling train are described in APTD-0576 (see Rom, 1972, in Section 13.0, References). As correct usage is important in obtaining valid results, all users should refer to APTD-0576 and adopt the operating and maintenance procedures outlined therein unless otherwise specified. The sampling train consists of the components detailed below.

4.1.3.1 Probe nozzle: Stainless steel (316) or glass with sharp, tapered (30° angle) leading edge. The taper shall be on the outside to preserve a constant I.D. The nozzle shall be buttonhook or elbow design and constructed from seamless tubing (if made of stainless steel). Other construction materials may be considered for particular applications. A range of nozzle sizes suitable for isokinetic sampling should be available in increments of 0.16 cm (1/16 in.), e.g., 0.32-1.27 cm (1/8-1/2 in.), or larger if higher volume sampling trains are used. Each nozzle shall be calibrated according to the procedures outlined in Paragraph 9.1.

4.1.3.2 Probe liner: Borosilicate or quartz-glass tubing with a heating system capable of maintaining a gas temperature of 120 ± 14°C (248 ± 25°F) at the exit end during sampling. (The tester may opt to operate the equipment at a temperature lower than that specified.) Because the actual temperature at the outlet of the probe is not usually monitored during sampling, probes constructed according to APTD-0581 and utilizing the calibration curves of APTD-0576 (or calibrated according to the procedure outlined in APTD-0576) are considered acceptable. Either borosilicate or quartz-glass probe liners may be used for stack temperatures up to about 480°C (900°F). Quartz liners shall be used for temperatures between 480 and 900°C (900 and 1650°F). (The softening temperature for borosilicate is 820°C (1508°F), and for quartz 1500°C (2732°F).) Water-cooling of the stainless steel sheath will be necessary at temperatures approaching and exceeding 500°C.

4.1.3.3 Pitot tube: Type S, as described in Section 2.1 of EPA Method 2, or other appropriate devices (Vollaro, 1976). The pitot tube shall be attached to the probe to allow constant monitoring of the stack-gas velocity. The impact (high-pressure) opening plane of the pitot tube shall be even with or above the nozzle entry plane (see EPA Method 2, Figure 2-6b) during sampling. The Type S pitot tube assembly shall have a known coefficient, determined as outlined in Section 4 of EPA Method 2.

4.1.3.4 Differential pressure gauge: Inclined manometer or equivalent device as described in Section 2.2 of EPA Method 2. One manometer shall be used for velocity-head (ΔP) readings and the other for orifice differential pressure (ΔH) readings.

4.1.3.5 Filter holder: Borosilicate glass, with a glass frit filter support and a sealing gasket. The sealing gasket should be made of materials that will not introduce organic material into the gas stream at the temperature at which the filter holder will be maintained. The gasket shall be constructed of Teflon or materials of equal or better characteristics. The holder design shall provide a positive seal against leakage at any point along the filter circumference. The holder shall be attached immediately to the outlet of the cyclone or cyclone bypass.

4.1.3.6 Filter heating system: Any heating system capable of maintaining a temperature of 120 ± 14°C (248 ± 25°F) around the filter holder during sampling. Other temperatures may be appropriate for particular applications. Alternatively, the tester may opt to operate the equipment at temperatures other than that specified. A temperature gauge capable of measuring temperature to within 3°C (5.4°F) shall be installed so that the temperature around the filter holder can be regulated and monitored during sampling. Heating systems other than the one shown in APTD-0581 may be used.

4.1.3.7 Organic sampling module: This unit consists of three sections, including a gas-conditioning section, a sorbent trap, and a condensate knockout trap. The gas-conditioning system shall be capable of conditioning the gas leaving the back half of the filter holder to a temperature not exceeding 20°C (68°F). The sorbent trap shall be sized to contain approximately 20 g of porous polymeric resin (Rohm and Haas XAD-2 or equivalent) and shall be jacketed to maintain the internal gas temperature at 17 ± 3°C (62.5 ± 5.4°F). The most commonly used coolant is ice water from the impinger ice-water bath, constantly circulated through the outer jacket, using rubber or plastic tubing and a peristaltic pump. The sorbent trap should be outfitted with a glass well or depression, appropriately sized to accommodate a small thermocouple in the trap for monitoring the gas entry temperature. The condensate knockout trap shall be of sufficient size to collect the condensate following gas conditioning. The organic module components shall be oriented to direct the flow of condensate formed vertically downward from the conditioning section, through the adsorbent media, and into the condensate knockout trap. The knockout trap is usually similar in appearance to an empty impinger directly underneath the sorbent module; it may be oversized but should have a shortened center stem (at a minimum, one-half the length of the normal impinger stems) to collect a large volume of condensate without bubbling and overflowing into the impinger train. All surfaces of the organic module wetted by the gas sample shall be fabricated of borosilicate glass, Teflon, or other inert materials. Commercial versions of the

complete organic module are not currently available, but may be assembled from commercially available laboratory glassware and a custom-fabricated sorbent trap. Details of two acceptable designs are shown in Figures 2 and 3 (the thermocouple well is shown in Figure 2).

4.1.3.8 Impinger train: To determine the stack-gas moisture content, four 500-mL impingers, connected in series with leak-free ground-glass joints, follow the knockout trap. The first, third, and fourth impingers shall be of the Greenburg-Smith design, modified by replacing the tip with a 1.3-cm (1/2-in.) I.D. glass tube extending about 1.3 cm (1/2 in.) from the bottom of the outer cylinder. The second impinger shall be of the Greenburg-Smith design with the standard tip. The first and second impingers shall contain known quantities of water or appropriate trapping solution. The third shall be empty or charged with a caustic solution, should the stack gas contain hydrochloric acid (HCl). The fourth shall contain a known weight of silica gel or equivalent desiccant.

4.1.3.9 Metering system: The necessary components are a vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 3°C (5.4°F), dry-gas meter capable of measuring volume to within 1%, and related equipment, as shown in Figure 1. At a minimum, the pump should be capable of 4 cfm free flow, and the dry-gas meter should have a recording capacity of 0-999.9 cu ft with a resolution of 0.005 cu ft. Other metering systems capable of maintaining sampling rates within 10% of isokineticity and of determining sample volumes to within 2% may be used. The metering system must be used in conjunction with a pitot tube to enable checks of isokinetic sampling rates. Sampling trains using metering systems designed for flow rates higher than those described in APTD-0581 and APTD-0576 may be used, provided that the specifications of this method are met.

4.1.3.10 Barometer: Mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in. Hg). In many cases the barometric reading may be obtained from a nearby National Weather Service station, in which case the station value (which is the absolute barometric pressure) is requested and an adjustment for elevation differences between the weather station and sampling point is applied at a rate of minus 2.5 mm Hg (0.1 in. Hg) per 30-m (100 ft) elevation increase (vice versa for elevation decrease).

4.1.3.11 Gas density determination equipment: Temperature sensor and pressure gauge (as described in Sections 2.3 and 2.4 of EPA Method 2), and gas analyzer, if necessary (as described in EPA Method 3). The temperature sensor ideally should be permanently attached to the pitot tube or sampling probe in a fixed configuration such that the tip of the sensor extends beyond the leading edge of the probe sheath and does not touch any metal.

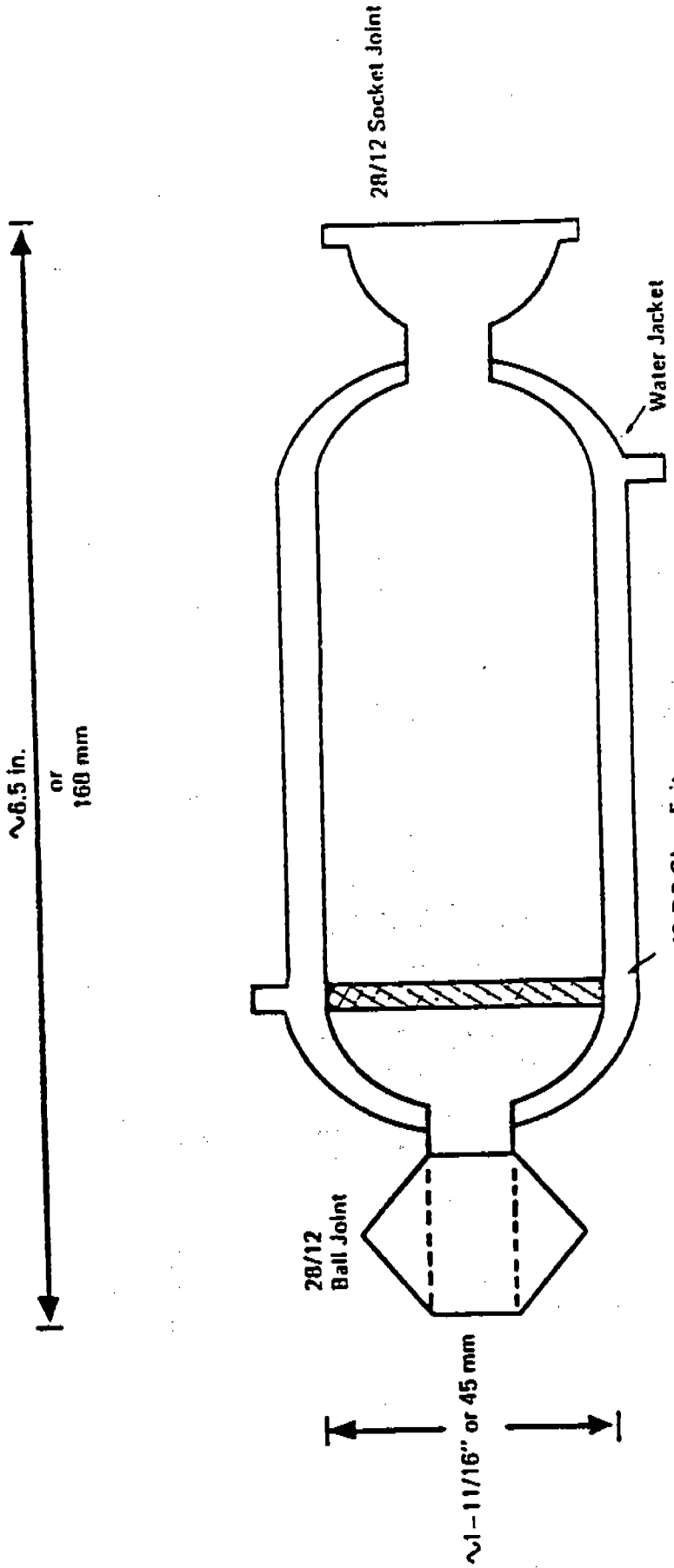


Figure 2. Adsorbent Sampling System.

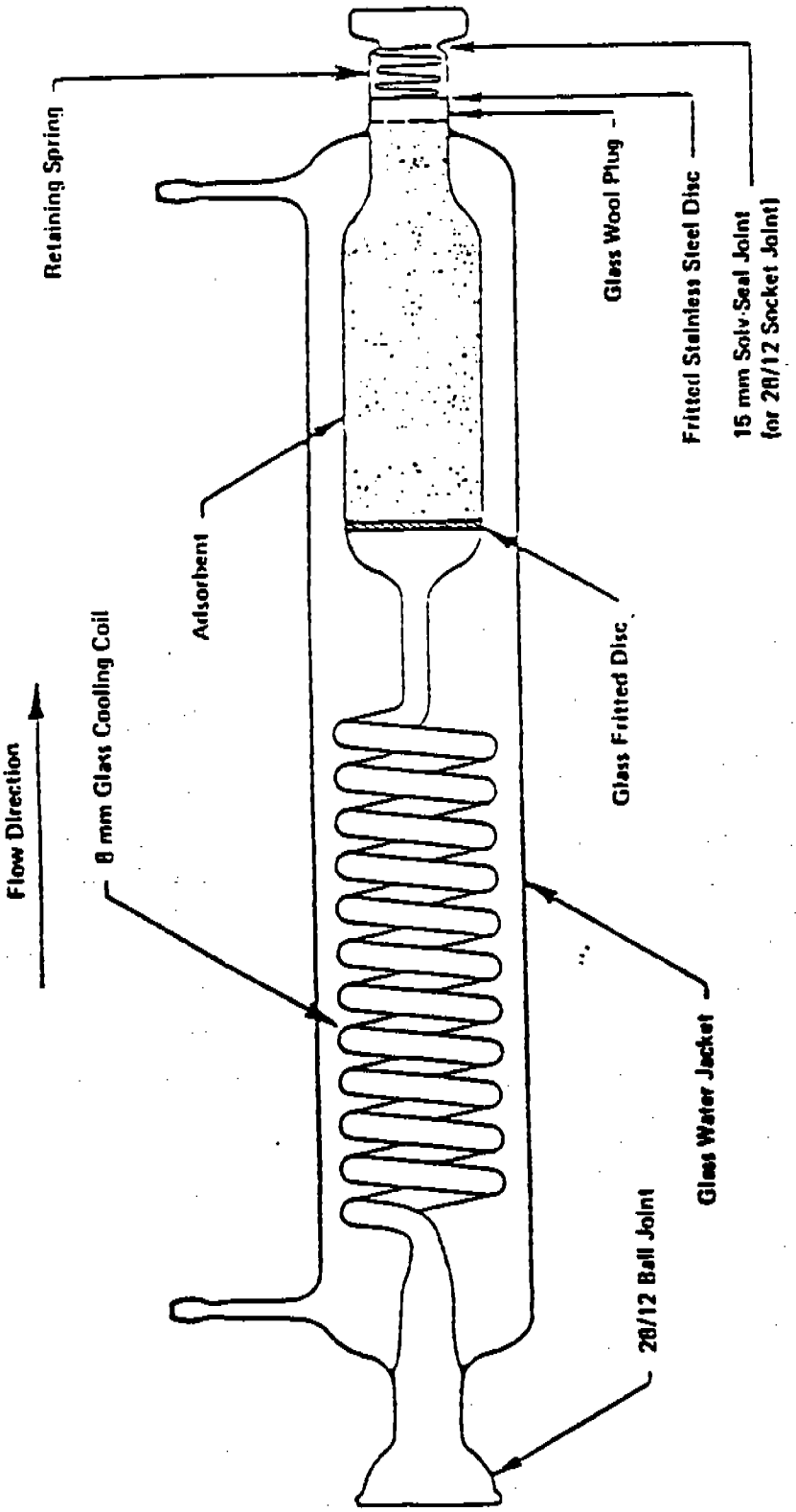


Figure 3. Adsorbent Sampling System.

Alternatively, the sensor may be attached just prior to use in the field. Note, however, that if the temperature sensor is attached in the field, the sensor must be placed in an interference-free arrangement with respect to the Type S pitot tube openings (see EPA Method 2, Figure 2-7). As a second alternative, if a difference of no more than 1% in the average velocity measurement is to be introduced, the temperature gauge need not be attached to the probe or pitot tube.

4.1.3.12 Calibration/field-preparation record: A permanently bound laboratory notebook, in which duplicate copies of data may be made as they are being recorded, is required for documenting and recording calibrations and preparation procedures (i.e., filter and silica gel tare weights, clean XAD-2, quality assurance/quality control check results, dry-gas meter, and thermocouple calibrations, etc.). The duplicate copies should be detachable and should be stored separately in the test program archives.

4.2 Sample Recovery:

4.2.1 Probe liner: Probe nozzle and organic module conditioning section brushes; nylon bristle brushes with stainless steel wire handles are required. The probe brush shall have extensions of stainless steel, Teflon, or inert material at least as long as the probe. The brushes shall be properly sized and shaped to brush out the probe liner, the probe nozzle, and the organic module conditioning section.

4.2.2 Wash bottles: Three. Teflon or glass wash bottles are recommended; polyethylene wash bottles should not be used because organic contaminants may be extracted by exposure to organic solvents used for sample recovery.

4.2.3 Glass sample storage containers: Chemically resistant, borosilicate amber and clear glass bottles, 500-mL or 1,000-mL. Bottles should be tinted to prevent action of light on sample. Screw-cap liners shall be either Teflon or constructed so as to be leak-free and resistant to chemical attack by organic recovery solvents. Narrow-mouth glass bottles have been found to exhibit less tendency toward leakage.

4.2.4 Petri dishes: Glass, sealed around the circumference with wide (1-in.) Teflon tape, for storage and transport of filter samples.

4.2.5 Graduated cylinder and/or balances: To measure condensed water to the nearest 1 mL or 1 g. Graduated cylinders shall have subdivisions not >2 mL. Laboratory triple-beam balances capable of weighing to ±0.5 g or better are required.

4.2.6 Plastic storage containers: Screw-cap polypropylene or polyethylene containers to store silica gel.

4.2.7 Funnel and rubber policeman: To aid in transfer of silica gel to container (not necessary if silica gel is weighed in field).

4.2.8 Funnels: Glass, to aid in sample recovery.

4.3 Filters: Glass- or quartz-fiber filters, without organic binder, exhibiting at least 99.95% efficiency (<0.05% penetration) on 0.3-um dioctyl phthalate smoke particles. The filter efficiency test shall be conducted in accordance with ASTM standard method D2986-71. Test data from the supplier's quality control program are sufficient for this purpose. In sources containing SO_2 or SO_3, the filter material must be of a type that is unreactive to SO_2 or SO_3. Reeve Angel 934 AH or Schleicher and Schwell #3 filters work well under these conditions.

4.4 Crushed ice: Quantities ranging from 10-50 lb may be necessary during a sampling run, depending on ambient air temperature.

4.5 Stopcock grease: Solvent-insoluble, heat-stable silicone grease. Use of silicone grease upstream of the module is not permitted, and amounts used on components located downstream of the organic module shall be minimized. Silicone grease usage is not necessary if screw-on connectors and Teflon sleeves or ground-glass joints are used.

4.6 Glass wool: Used to plug the unfritted end of the sorbent module. The glass-wool fiber should be solvent-extracted with methylene chloride in a Soxhlet extractor for 12 hr and air-dried prior to use.

5.0 REAGENTS

5.1 Adsorbent resin: Porous polymeric resin (XAD-2 or equivalent) is recommended. These resins shall be cleaned prior to their use for sample collection. Appendix A of this method should be consulted to determine appropriate precleaning procedure. For best results, resin used should not exhibit a blank of higher than 4 mg/kg of total chromatographable organics (TCO) (see Appendix B) prior to use. Once cleaned, resin should be stored in an airtight, wide-mouth amber glass container with a Teflon-lined cap or placed in one of the glass sorbent modules tightly sealed with Teflon film and elastic bands. The resin should be used within 4 wk of the preparation.

5.2 Silica gel: Indicating type, 6-16 mesh. If previously used, dry at 175°C (350°F) for 2 hr before using. New silica gel may be used as received. Alternatively, other types of desiccants (equivalent or better) may be used, subject to the approval of the Administrator.

5.3 Impinger solutions: Distilled organic-free water (Type II) shall be used, unless sampling is intended to quantify a particular inorganic gaseous species. If sampling is intended to quantify the concentration of additional species, the impinger solution of choice shall be subject to Administrator approval. This water should be prescreened for any compounds of interest. One hundred mL will be added to the specified impinger; the third impinger in the train may be charged with a basic solution (1 N sodium hydroxide or sodium acetate) to protect the sampling pump from acidic gases. Sodium acetate should be used when large sample volumes are anticipated because sodium hydroxide will react with carbon dioxide in aqueous media to form sodium carbonate, which may possibly plug the impinger.

5.4 Sample recovery reagents:

5.4.1 Methylene chloride: Distilled-in-glass grade is required for sample recovery and cleanup (see Note to 5.4.2 below).

5.4.2 Methyl alcohol: Distilled-in-glass grade is required for sample recovery and cleanup.

NOTE: Organic solvents from metal containers may have a high residue blank and should not be used. Sometimes suppliers transfer solvents from metal to glass bottles; thus blanks shall be run prior to field use and only solvents with low blank value (<0.001%) shall be used.

5.4.3 Water: Water (Type II) shall be used for rinsing the organic module and condenser component.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 Because of complexity of this method, field personnel should be trained in and experienced with the test procedures in order to obtain reliable results.

6.2 Laboratory preparation:

6.2.1 All the components shall be maintained and calibrated according to the procedure described in APTD-0576, unless otherwise specified.

6.2.2 Weigh several 200- to 300-g portions of silica gel in airtight containers to the nearest 0.5 g. Record on each container the total weight of the silica gel plus containers. As an alternative to preweighing the silica gel, it may instead be weighed directly in the impinger or sampling holder just prior to train assembly.

6.2.3 Check filters visually against light for irregularities and flaws or pinhole leaks. Label the shipping containers (glass Petri dishes) and keep the filters in these containers at all times except during sampling and weighing.

6.2.4 Desiccate the filters at 20 ± 5.6°C (68 ± 10°F) and ambient pressure for at least 24 hr, and weigh at intervals of at least 6 hr to a constant weight (i.e., <0.5-mg change from previous weighing), recording results to the nearest 0.1 mg. During each weighing the filter must not be exposed for more than a 2-min period to the laboratory atmosphere and relative humidity above 50%. Alternatively (unless otherwise specified by the Administrator), the filters may be oven-dried at 105°C (220°F) for 2-3 hr, desiccated for 2 hr, and weighed.

6.3 Preliminary field determinations:

6.3.1 Select the sampling site and the minimum number of sampling points according to EPA Method 1 or as specified by the Administrator. Determine the stack pressure, temperature, and range of velocity heads using EPA Method 2. It is recommended that a leak-check of the pitot lines (see EPA Method 2, Section 3.1) be performed. Determine the stack-gas moisture content using EPA Approximation Method 4 or its alternatives to establish estimates of isokinetic sampling-rate settings. Determine the stack-gas dry molecular weight, as described in EPA Method 2, Section 3.6. If integrated EPA Method 3 sampling is used for molecular weight determination, the integrated bag sample shall be taken simultaneously with, and for the same total length of time as, the sample run.

6.3.2 Select a nozzle size based on the range of velocity heads so that it is not necessary to change the nozzle size in order to maintain isokinetic sampling rates. During the run, do not change the nozzle. Ensure that the proper differential pressure gauge is chosen for the range of velocity heads encountered (see Section 2.2 of EPA Method 2).

6.3.3 Select a suitable probe liner and probe length so that all traverse points can be sampled. For large stacks, to reduce the length of the probe, consider sampling from opposite sides of the stack.

6.3.4 A minimum of 3 dscm (105.9 dscf) of sample volume is required for the determination of the Destruction and Removal Efficiency (DRE) of POHCs from incineration systems. Additional sample volume shall be collected as necessitated by analytical detection limit constraints. To determine the minimum sample volume required, refer to sample calculations in Section 10.0.

6.3.5 Determine the total length of sampling time needed to obtain the identified minimum volume by comparing the anticipated average sampling rate with the volume requirement. Allocate the same time to all traverse points defined by EPA Method 1. To avoid timekeeping errors, the length of time sampled at each traverse point should be an integer or an integer plus one-half min.

6.3.6 In some circumstances (e.g., batch cycles) it may be necessary to sample for shorter times at the traverse points and to obtain smaller gas-sample volumes. In these cases, the Administrator's approval must first be obtained.

6.4 Preparation of collection train:

6.4.1 During preparation and assembly of the sampling train, keep all openings where contamination can occur covered with Teflon film or aluminum foil until just prior to assembly or until sampling is about to begin.

6.4.2 Fill the sorbent trap section of the organic module with approximately 20 g of clean adsorbent resin. While filling, ensure that the trap packs uniformly, to eliminate the possibility of channeling. When freshly cleaned, many adsorbent resins carry a static charge, which will cause clinging to trap walls. This may be minimized by filling the trap in the presence of an antistatic device. Commercial antistatic devices include Model-204 and Model-210 manufactured by the 3M Company, St. Paul, Minnesota.

6.4.3 If an impinger train is used to collect moisture, place 100 mL of water in each of the first two impingers, leave the third impinger empty (or charge with caustic solution, as necessary), and transfer approximately 200-300 g of preweighed silica gel from its container to the fourth impinger. More silica gel may be used, but care should be taken to ensure that it is not entrained and carried out from the impinger during sampling. Place the container in a clean place for later use in the sample recovery. Alternatively, the weight of the silica gel plus impinger may be determined to the nearest 0.5 g and recorded.

6.4.4 Using a tweezer or clean disposable surgical gloves, place a labeled (identified) and weighed filter in the filter holder. Be sure that the filter is properly centered and the gasket properly placed to prevent the sample gas stream from circumventing the filter. Check the filter for tears after assembly is completed.

6.4.5 When glass liners are used, install the selected nozzle using a Viton-A O-ring when stack temperatures are <260°C (500°F) and a woven glass-fiber gasket when temperatures are higher. See APTD-0576 (Rom, 1972) for details. Other connecting systems utilizing either 316 stainless steel or Teflon ferrules may be used. When metal liners are used, install the nozzle as above, or by a leak-free direct mechanical connection. Mark the probe with heat-resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point.

6.4.6 Set up the train as in Figure 1. During assembly, do not use any silicone grease on ground-glass joints that are located upstream of the organic module. A very light coating of silicone grease may be used on all ground-glass joints that are located downstream of the organic module, but it should be limited to the outer portion (see APTD-0576) of the ground-glass joints to minimize silicone-grease contamination. Subject to the approval of the Administrator, a glass cyclone may be used between the probe and the filter holder when the total particulate catch is expected to exceed 100 mg or when water droplets are present in the stack. The organic module condenser must be maintained at a temperature of 17 ± 3°C. Connect all temperature sensors to an appropriate potentiometer/display unit. Check all temperature sensors at ambient temperature.

6.4.7 Place crushed ice around the impingers and the organic module condensate knockout.

6.4.8 Turn on the sorbent module and condenser coil coolant recirculating pump and begin monitoring the sorbent module gas entry temperature. Ensure proper sorbent module gas entry temperature before proceeding and again before any sampling is initiated. It is extremely important that the XAD-2 resin temperature never exceed 50°C (122°F), because thermal decomposition will occur. During testing, the XAD-2 temperature must not exceed 20°C (68°F) for efficient capture of the semivolatile species of interest.

6.4.9 Turn on and set the filter and probe heating systems at the desired operating temperatures. Allow time for the temperatures to stabilize.

6.5 Leak-check procedures

6.5.1 Pre-test leak-check:

6.5.1.1 Because the number of additional intercomponent connections in the Semi-VOST train (over the M5 Train) increases the possibility of leakage, a pre-test leak-check is required.

6.5.1.2 After the sampling train has been assembled, turn on and set the filter and probe heating systems at the desired operating temperatures. Allow time for the temperatures to stabilize. If a Viton A O-ring or other leak-free connection is used in assembling the probe nozzle to the probe liner, leak-check the train at the sampling site by plugging the nozzle and pulling a 381-mm Hg (15-in. Hg) vacuum.
(NOTE: A lower vacuum may be used, provided that it is not exceeded during the test.)

6.5.1.3 If an asbestos string is used, do not connect the probe to the train during the leak-check. Instead, leak-check the train by first attaching a carbon-filled leak-check impinger (shown in Figure 4) to the inlet of the filter holder (cyclone, if applicable) and then plugging the inlet and pulling a 381-mm Hg (15-in. Hg) vacuum. (Again, a lower vacuum may be used, provided that it is not exceeded during the test.) Then, connect the probe to the train and leak-check at about 25-mm Hg (1-in. Hg) vacuum; alternatively, leak-check the probe with the rest of the sampling train in one step at 381-mm Hg (15-in. Hg) vacuum. Leakage rates in excess of 4% of the average sampling rate or >0.00057 m^3/min (0.02 cfm), whichever is less, are unacceptable.

6.5.1.4 The following leak-check instructions for the sampling train described in APTD-0576 and APTD-0581 may be helpful. Start the pump with fine-adjust valve fully open and coarse-adjust valve completely closed. Partially open the coarse-adjust valve and slowly close the fine-adjust valve until the desired vacuum is reached. Do not reverse direction of the fine-adjust valve; this will cause water to back up into the organic module. If the desired vacuum is exceeded, either leak-check at this higher vacuum or end the leak-check, as shown below, and start over.

CROSS SECTIONAL VIEW

Leak Testing Apparatus

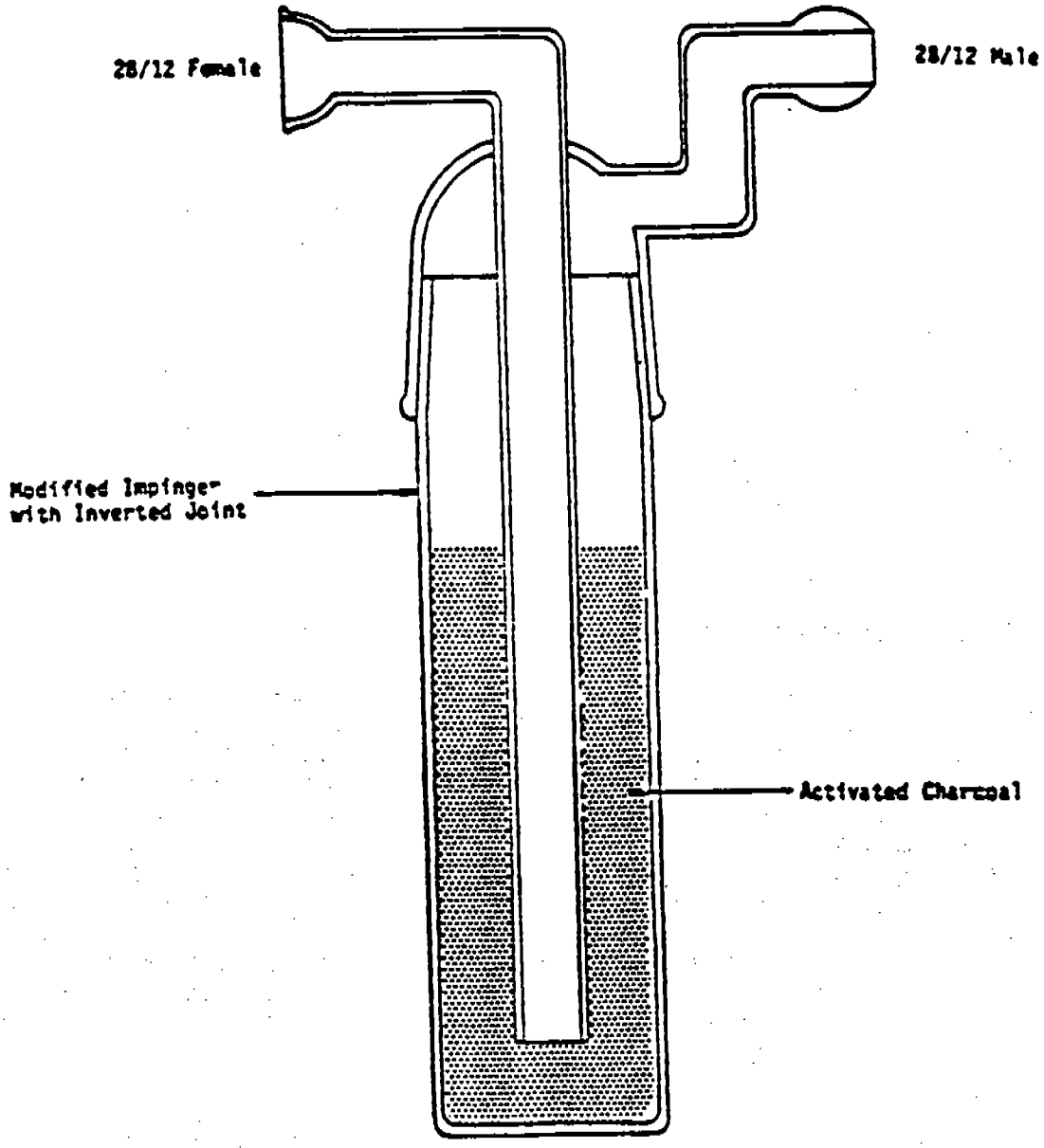


Figure 4. Leak-check impinger.

6.5.1.5 When the leak-check is completed, first slowly remove the plug from the inlet to the probe, filter holder, or cyclone (if applicable). When the vacuum drops to 127 mm (5 in.) Hg or less, immediately close the coarse-adjust valve. Switch off the pumping system and reopen the fine-adjust valve. Do not reopen the fine-adjust valve until the coarse-adjust valve has been closed. This prevents the water in the impingers from being forced backward into the organic module and silica gel from being entrained backward into the third impinger.

6.5.2 Leak-checks during sampling run:

6.5.2.1 If, during the sampling run, a component (e.g., filter assembly, impinger, or sorbent trap) change becomes necessary, a leak-check shall be conducted immediately after the interruption of sampling and before the change is made. The leak-check shall be done according to the procedure outlined in Paragraph 6.5.1, except that it shall be done at a vacuum greater than or equal to the maximum value recorded up to that point in the test. If the leakage rate is found to be no greater than 0.00057 m^3/min (0.02 cfm) or 4% of the average sampling rate (whichever is less), the results are acceptable, and no correction will need to be applied to the total volume of dry gas metered. If a higher leakage rate is obtained, the tester shall void the sampling run. (It should be noted that any "correction" of the sample volume by calculation by calculation reduces the integrity of the pollutant concentrations data generated and must be avoided.)

6.5.2.2 Immediately after a component change, and before sampling is reinitiated, a leak-check similar to a pre-test leak-check must also be conducted.

6.5.3 Post-test leak-check:

6.5.3.1 A leak-check is mandatory at the conclusion of each sampling run. The leak-check shall be done with the same procedures as those with the pre-test leak-check, except that it shall be conducted at a vacuum greater than or equal to the maximum value reached during the sampling run. If the leakage rate is found to be no greater than 0.00057 m^3/min (0.02 cfm) or 4% of the average sampling rate (whichever is less), the results are acceptable, and no correction need be applied to the total volume of dry gas metered. If, however, a higher leakage rate is obtained, the tester shall either record the leakage rate, correct the sample volume (as shown in the calculation section of this method), and consider the data obtained of questionable reliability, or void the sampling run.

6.6 Sampling-train operation:

6.6.1 During the sampling run, maintain an isokinetic sampling rate to within 10% of true isokinetic, unless otherwise specified by the Administrator. Maintain a temperature around the filter of 120 ± 14°C (248 ± 25°F) and a gas temperature entering the sorbent trap at a maximum of 20°C (68°F).

6.6.2 For each run, record the data required on a data sheet such as the one shown in Figure 5. Be sure to record the initial dry-gas meter reading. Record the dry-gas meter readings at the beginning and end of each sampling time increment, when changes in flow rates are made before and after each leak-check, and when sampling is halted. Take other readings required by Figure 5 at least once at each sample point during each time increment and additional readings when significant changes (20% variation in velocity-head readings) necessitate additional adjustments in flow rate. Level and zero the manometer. Because the manometer level and zero may drift due to vibrations and temperature changes, make periodic checks during the traverse.

6.6.3 Clean the stack access ports prior to the test run to eliminate the chance of sampling deposited material. To begin sampling, remove the nozzle cap, verify that the filter and probe heating systems are at the specified temperature, and verify that the pitot tube and probe are properly positioned. Position the nozzle at the first traverse point, with the tip pointing directly into the gas stream. Immediately start the pump and adjust the flow to isokinetic conditions. Nomographs, which aid in the rapid adjustment of the isokinetic sampling rate without excessive computations, are available. These nomographs are designed for use when the Type S pitot-tube coefficient is 0.84 $\pm$ 0.02 and the stack-gas equivalent density (dry molecular weight) is equal to 29 $\pm$ 4. APTD-0576 details the procedure for using the nomographs. If the stack-gas molecular weight and the pitot-tube coefficient are outside the above ranges, do not use the nomographs unless appropriate steps (Shigehara, 1974) are taken to compensate for the deviations.

6.6.4 When the stack is under significant negative pressure (equivalent to the height of the impinger stem), take care to close the coarse-adjust valve before inserting the probe into the stack, to prevent water from backing into the organic module. If necessary, the pump may be turned on with the coarse-adjust valve closed.

6.6.5 When the probe is in position, block off the openings around the probe and stack access port to prevent unrepresentative dilution of the gas stream.

6.6.6 Traverse the stack cross section, as required by EPA Method 1 or as specified by the Administrator, being careful not to bump the probe nozzle into the stack walls when sampling near the walls or when removing or inserting the probe through the access port, in order to minimize the chance of extracting deposited material.

6.6.7 During the test run, make periodic adjustments to keep the temperature around the filter holder and the organic module at the proper levels; add more ice and, if necessary, salt to maintain a temperature of <20°C (68°F) at the condenser/silica gel outlet. Also, periodically check the level and zero of the manometer.

Plant _____
Location _____
Operator _____
Date _____
Run No. _____
Sample Box No. _____
Meter Box No. _____
Meter $\Delta H@$ _____
C Factor _____
Pitot Tube Coefficient C_p _____

Schematic of Stack Cross Section

Ambient Temperature _____
Barometric Pressure _____
Assumed Moisture % _____
Probe Length, m (ft) _____
Nozzle Identification No. _____
Average Calibrated Nozzle Diameter, cm (in) _____
Probe Heater Setting _____
Leak Rate, m^3/min, (cfm) _____
Probe Liner Material _____
Static Pressure, mm Hg (in. Hg) _____
Filter No. _____

Traverse Point Number	Sampling Time (θ) min.	Vacuum mm Hg (in. Hg)	Stack Temperature (T_s) °C(°F)	Velocity Head ($\sqrt{P_s}$) mm (in) H_2O	Pressure Differential Across Orifice Meter mm (H_2O) (in H_2O)	Gas Sample Volume m_3 (ft_3)	Gas Sample Temp. at Dry Gas Meter Inlet °C(°F)	Gas Sample Temp. at Dry Gas Meter Outlet °C(°F)	Filter Holder Temperature °C(°F)	Temperature of Gas Entering Sorbet Trap °C(°F)	Temperature of Gas Leaving Condenser or Last Impinger
Total							Avg.	Avg.			
Average											

Figure 5. Particulate field data.

6.6.8 If the pressure drop across the filter or sorbent trap becomes too high, making isokinetic sampling difficult to maintain, the filter/sorbent trap may be replaced in the midst of a sample run. Using another complete filter holder/sorbent trap assembly is recommended, rather than attempting to change the filter and resin themselves. After a new filter/sorbent trap assembly is installed, conduct a leak-check. The total particulate weight shall include the summation of all filter assembly catches.

6.6.9 A single train shall be used for the entire sample run, except in cases where simultaneous sampling is required in two or more separate ducts or at two or more different locations within the same duct, or in cases where equipment failure necessitates a change of trains. In all other situations, the use of two or more trains will be subject to the approval of the Administrator.

6.6.10 Note that when two or more trains are used, separate analysis of the front-half (if applicable) organic-module and impinger (if applicable) catches from each train shall be performed, unless identical nozzle sizes were used on all trains. In that case, the front-half catches from the individual trains may be combined (as may the impinger catches), and one analysis of front-half catch and one analysis of impinger catch may be performed.

6.6.11 At the end of the sample run, turn off the coarse-adjust valve, remove the probe and nozzle from the stack, turn off the pump, record the final dry-gas meter reading, and conduct a post-test leak-check. Also, leak-check the pitot lines as described in EPA Method 2. The lines must pass this leak-check in order to validate the velocity-head data.

6.6.12 Calculate percent isokineticity (see Section 10.8) to determine whether the run was valid or another test run should be made.

7.0 SAMPLE RECOVERY

7.1 Preparation:

7.1.1 Proper cleanup procedure begins as soon as the probe is removed from the stack at the end of the sampling period. Allow the probe to cool. When the probe can be safely handled, wipe off all external particulate matter near the tip of the probe nozzle and place a cap over the tip to prevent losing or gaining particulate matter. Do not cap the probe tip tightly while the sampling train is cooling down because this will create a vacuum in the filter holder, drawing water from the impingers into the sorbent module.

7.1.2 Before moving the sample train to the cleanup site, remove the probe from the sample train and cap the open outlet, being careful not to lose any condensate that might be present. Cap the filter inlet.

Remove the umbilical cord from the last impinger and cap the impinger. If a flexible line is used between the organic module and the filter holder, disconnect the line at the filter holder and let any condensed water or liquid drain into the organic module.

7.1.3 Cap the filter-holder outlet and the inlet to the organic module. Separate the sorbent trap section of the organic module from the condensate knockout trap and the gas-conditioning section. Cap all organic module openings. Disconnect the organic-module knockout trap from the impinger train inlet and cap both of these openings. Ground-glass stoppers, Teflon caps, or caps of other inert materials may be used to seal all openings.

7.1.4 Transfer the probe, the filter, the organic-module components, and the impinger/condenser assembly to the cleanup area. This area should be clean and protected from the weather to minimize sample contamination or loss.

7.1.5 Save a portion of all washing solutions (methanol/methylene chloride, Type II water) used for cleanup as a blank. Transfer 200 mL of each solution directly from the wash bottle being used and place each in a separate, prelabeled glass sample container.

7.1.6 Inspect the train prior to and during disassembly and note any abnormal conditions.

7.2 Sample containers:

7.2.1 **Container no. 1:** Carefully remove the filter from the filter holder and place it in its identified Petri dish container. Use a pair or pairs of tweezers to handle the filter. If it is necessary to fold the filter, ensure that the particulate cake is inside the fold. Carefully transfer to the Petri dish any particulate matter or filter fibers that adhere to the filter-holder gasket, using a dry nylon bristle brush or sharp-edged blade, or both. Label the container and seal with 1-in.-wide Teflon tape around the circumference of the lid.

7.2.2 **Container no. 2:** Taking care that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover particulate matter or any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components first with methanol/methylene chloride (1:1 v/v) into a glass container. Distilled water may also be used. Retain a water and solvent blank and analyze in the same manner as with the samples. Perform rinses as follows:

7.2.2.1 Carefully remove the probe nozzle and clean the inside surface by rinsing with the solvent mixture (1:1 v/v methanol/-methylene chloride) from a wash bottle and brushing with a nylon bristle brush. Brush until the rinse shows no visible particles; then make a final rinse of the inside surface with the solvent mix. Brush and rinse the inside parts of the Swagelok fitting with the solvent mix in a similar way until no visible particles remain.

7.2.2.2 Have two people rinse the probe liner with the solvent mix by tilting and rotating the probe while squirting solvent into its upper end so that all inside surfaces will be wetted with solvent. Let the solvent drain from the lower end into the sample container. A glass funnel may be used to aid in transferring liquid washes to the container.

7.2.2.3 Follow the solvent rinse with a probe brush. Hold the probe in an inclined position and squirt solvent into the upper end while pushing the probe brush through the probe with a twisting action; place a sample container underneath the lower end of the probe and catch any solvent and particulate matter that is brushed from the probe. Run the brush through the probe three times or more until no visible particulate matter is carried out with the solvent or until none remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above-prescribed manner at least six times (metal probes have small crevices in which particulate matter can be entrapped). Rinse the brush with solvent and quantitatively collect these washings in the sample container. After the brushing, make a final solvent rinse of the probe as described above.

7.2.2.4 It is recommended that two people work together to clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contamination.

7.2.2.5 Clean the inside of the front half of the filter holder and cyclone/cyclone flask, if used, by rubbing the surfaces with a nylon bristle brush and rinsing with methanol/methylene chloride (1:1 v/v) mixture. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. Carefully rinse out the glass cyclone and cyclone flask (if applicable). Brush and rinse any particulate material adhering to the inner surfaces of these components into the front-half rinse sample. After all solvent washings and particulate matter have been collected in the sample container, tighten the lid on the sample container so that solvent will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurs during transport. Label the container to identify its contents.

7.2.3 **Container no. 3:** The sorbent trap section of the organic module may be used as a sample transport container, or the spent resin may be transferred to a separate glass bottle for shipment. If the sorbent trap itself is used as the transport container, both ends should be sealed with tightly fitting caps or plugs. Ground-glass stoppers or Teflon caps may be used. The sorbent trap should then be labeled, covered with aluminum foil, and packaged on ice for transport to the laboratory. If a separate bottle is used, the spent resin should be quantitatively transferred from the trap into the clean bottle. Resin that adheres to the walls of the trap should be recovered using a rubber policeman or spatula and added to this bottle.

7.2.4 Container no. 4: Measure the volume of condensate collected in the condensate knockout section of the organic module to within ±1 mL by using a graduated cylinder or by weighing to within ±0.5 g using a triple-beam balance. Record the volume or weight of liquid present and note any discoloration or film in the liquid catch. Transfer this liquid to a prelabeled glass sample container. Inspect the back half of the filter housing and the gas-conditioning section of the organic module. If condensate is observed, transfer it to a graduated or weighing bottle and measure the volume, as described above. Add this material to the condensate knockout-trap catch.

7.2.5 Container no. 5: All sampling train components located between the high-efficiency glass- or quartz-fiber filter and the first wet impinger or the final condenser system (including the heated Teflon line connecting the filter outlet to the condenser) should be thoroughly rinsed with methanol/methylene chloride (1:1 v/v) and the rinsings combined. This rinse shall be separated from the condensate. If the spent resin is transferred from the sorbent trap to a separate sample container for transport, the sorbent trap shall be thoroughly rinsed until all sample-wetted surfaces appear clean. Visible films should be removed by brushing. Whenever train components are brushed, the brush should be subsequently rinsed with solvent mixture and the rinsings added to this container.

7.2.6 Container no. 6: Note the color of the indicating silica gel to determine if it has been completely spent and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere strongly to the impinger wall. Because the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, weigh the container and its contents to 0.5 g or better.

7.3 Impinger water:

7.3.1 Make a notation of any color or film in the liquid catch. Measure the liquid in the first three impingers to within ±1 mL by using a graduated cylinder or by weighing it to within ±0.5 g by using a balance (if one is available). Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

7.3.2 Discard the liquid after measuring and recording the volume or weight, unless analysis of the impinger catch is required (see Paragraph 4.1.3.7). Amber glass containers should be used for storage of impinger catch, if required.

7.3.3 If a different type of condenser is used, measure the amount of moisture condensed either volumetrically or gravimetrically.

7.4 Sample preparation for shipment: Prior to shipment, recheck all sample containers to ensure that the caps are well secured. Seal the lids of all containers around the circumference with Teflon tape. Ship all liquid samples upright on ice and all particulate filters with the particulate catch facing upward. The particulate filters should be shipped unrefrigerated.

8.0 ANALYSIS

8.1 Sample preparation:

8.1.1 General: The preparation steps for all samples will result in a finite volume of concentrated solvent. The final sample volume (usually in the 1- to 10-mL range) is then subjected to analysis by GC/MS. All samples should be inspected and the appearance documented. All samples are to be spiked with surrogate standards as received from the field prior to any sample manipulations. The spike should be at a level equivalent to 10 times the MDL when the solvent is reduced in volume to the desired level (i.e., 10 mL). The spiking compounds should be the stable isotopically labeled analog of the compounds of interest or a compound that would exhibit properties similar to the compounds of interest, be easily chromatographed, and not interfere with the analysis of the compounds of interest. Suggested surrogate spiking compounds are: deuterated naphthalene, chrysene, phenol, nitrobenzene, chlorobenzene, toluene, and carbon-13-labeled pentachlorophenol.

8.1.2 Condensate: The "condensate" is the moisture collected in the first impinger following the XAD-2 module. Spike the condensate with the surrogate standards. The volume is measured and recorded and then transferred to a separatory funnel. The pH is to be adjusted to pH 2 with 6 N sulfuric acid, if necessary. The sample container and graduated cylinder are sequentially rinsed with three successive 10-mL aliquots of the extraction solvent and added to the separatory funnel. The ratio of solvent to aqueous sample should be maintained at 1:3. Extract the sample by vigorously shaking the separatory funnel for 5 min. After complete separation of the phases, remove the solvent and transfer to a Kuderna-Danish concentrator (K-D), filtering through a bed of precleaned, dry sodium sulfate. Repeat the extraction step two additional times. Adjust the pH to 11 with 6 N sodium hydroxide and reextract combining the acid and base extracts. Rinse the sodium sulfate into the K-D with fresh solvent and discard the desiccant. Add Teflon boiling chips and concentrate to 10 mL by reducing the volume to slightly less than 10 mL and then bringing to volume with fresh solvent. In order to achieve the necessary detection limit, the sample volume can be further reduced to 1 mL by using a micro column K-D or nitrogen blow-down. Should the sample start to exhibit precipitation, the concentration step should be stopped and the sample redissolved with fresh solvent taking the volume to some finite amount. After adding a standard (for the purpose of quantitation by GC/MS), the sample is ready for analysis, as discussed in Paragraph 8.2.

8.1.3 Impinger: Spike the sample with the surrogate standards; measure and record the volume and transfer to a separatory funnel. Proceed as described in Paragraph 8.1.2.

8.1.4 XAD-2: Spike the resin directly with the surrogate standards. Transfer the resin to the all-glass thimbles by the following procedure (care should be taken so as not to contaminate the thimble by touching it with anything other than tweezers or other solvent-rinsed mechanical holding devices). Suspend the XAD-2 module directly over the thimble. The glass frit of the module (see Figure 2) should be in the up position. The thimble is contained in a clean beaker, which will serve to catch the solvent rinses. Using a Teflon squeeze bottle, flush the XAD-2 into the thimble. Thoroughly rinse the glass module with solvent into the beaker containing the thimble. Add the XAD-2 glass-wool plug to the thimble. Cover the XAD-2 in the thimble with a precleaned glass-wool plug sufficient to prevent the resin from floating into the solvent reservoir of the extractor. If the resin is wet, effective extraction can be accomplished by loosely packing the resin in the thimble. If a question arises concerning the completeness of the extraction, a second extraction, without a spike, is advised. The thimble is placed in the extractor and the rinse solvent contained in the beaker is added to the solvent reservoir. Additional solvent is added to make the reservoir approximately two-thirds full. Add Teflon boiling chips and assemble the apparatus. Adjust the heat source to cause the extractor to cycle 5-6 times per hr. Extract the resin for 16 hr. Transfer the solvent and three 10-mL rinses of the reservoir to a K-D and concentrate as described in Paragraph 8.1.2.

8.1.5 Particulate filter (and cyclone catch): If particulate loading is to be determined, weigh the filter (and cyclone catch, if applicable). The particulate filter (and cyclone catch, if applicable) is transferred to the glass thimble and extracted simultaneously with the XAD-2 resin.

8.1.6 Train solvent rinses: All train rinses (i.e., probe, impinger, filter housing) using the extraction solvent and methanol are returned to the laboratory as a single sample. If the rinses are contained in more than one container, the intended spike is divided equally among the containers proportioned from a single syringe volume. Transfer the rinse to a separatory funnel and add a sufficient amount of organic-free water so that the methylene chloride becomes immiscible and its volume no longer increases with the addition of more water. The extraction and concentration steps are then performed as described in Paragraph 8.1.2.

8.2 Sample analysis:

8.2.1 The primary analytical tool for the measurement of emissions from hazardous waste incinerators is GC/MS using fused-silica capillary GC columns, as described in Method 8270 in Chapter Four of this manual. Because of the nature of GC/MS instrumentation and the cost associated

with sample analysis, prescreening of the sample extracts by gas chromatography/flame ionization detection (GC/FID) or with electron capture (GC/ECD) is encouraged. Information regarding the complexity and concentration level of a sample prior to GC/MS analysis can be of enormous help. This information can be obtained by using either capillary columns or less expensive packed columns. However, the FID screen should be performed with a column similar to that used with the GC/MS. Keep in mind that GC/FID has a slightly lower detection limit than GC/MS and, therefore, that the concentration of the sample can be adjusted either up or down prior to analysis by GC/MS.

8.2.2 The mass spectrometer will be operated in a full scan (40-450) mode for most of the analyses. The range for which data are acquired in a GC/MS run will be sufficiently broad to encompass the major ions, as listed in Chapter Four, Method 8270, for each of the designated POHCs in an incinerator effluent analysis.

8.2.3 For most purposes, electron ionization (EI) spectra will be collected because a majority of the POHCs give reasonable EI spectra. Also, EI spectra are compatible with the NBS Library of Mass Spectra and other mass spectral references, which aid in the identification process for other components in the incinerator process streams.

8.2.4 To clarify some identifications, chemical ionization (CI) spectra using either positive ions or negative ions will be used to elucidate molecular-weight information and simplify the fragmentation patterns of some compounds. In no case, however, should CI spectra alone be used for compound identification. Refer to Chapter Four, Method 8270, for complete descriptions of GC conditions, MS conditions, and quantitative and quantitative identification.

9.0 CALIBRATION

9.1 Probe nozzle: Probe nozzles shall be calibrated before their initial use in the field. Using a micrometer, measure the inside diameter of the nozzle to the nearest 0.025 mm (0.001 in.). Make measurements at three separate places across the diameter and obtain the average of the measurements. The difference between the high and low numbers shall not exceed 0.1 mm (0.004 in.). When nozzles become nicked, dented, or corroded, they shall be reshaped, sharpened, and recalibrated before use. Each nozzle shall be permanently and uniquely identified.

9.2 Pitot tube: The Type S pitot tube assembly shall be calibrated according to the procedure outlined in Section 4 of EPA Method 2, or assigned a nominal coefficient of 0.84 if it is not visibly nicked, dented, or corroded and if it meets design and intercomponent spacing specifications.

9.3 Metering system:

9.3.1 Before its initial use in the field, the metering system shall be calibrated according to the procedure outlined in APTD-0576. Instead of physically adjusting the dry-gas meter dial readings to correspond to the wet-test meter readings, calibration factors may be used to correct the gas meter dial readings mathematically to the proper values. Before calibrating the metering system, it is suggested that a leak-check be conducted. For metering systems having diaphragm pumps, the normal leak-check procedure will not detect leakages within the pump. For these cases the following leak-check procedure is suggested: Make a 10-min calibration run at 0.00057 m^3/min (0.02 cfm); at the end of the run, take the difference of the measured wet-test and dry-gas meter volumes and divide the difference by 10 to get the leak rate. The leak rate should not exceed 0.00057 m^3/min (0.02 cfm).

9.3.2 After each field use, the calibration of the metering system shall be checked by performing three calibration runs at a single intermediate orifice setting (based on the previous field test). The vacuum shall be set at the maximum value reached during the test series. To adjust the vacuum, insert a valve between the wet-test meter and the inlet of the metering system. Calculate the average value of the calibration factor. If the calibration has changed by more than 5%, recalibrate the meter over the full range of orifice settings, as outlined in APTD-0576.

9.3.3 Leak-check of metering system: That portion of the sampling train from the pump to the orifice meter (see Figure 1) should be leak-checked prior to initial use and after each shipment. Leakage after the pump will result in less volume being recorded than is actually sampled. The following procedure is suggested (see Figure 6): Close the main valve on the meter box. Insert a one-hole rubber stopper with rubber tubing attached into the orifice exhaust pipe. Disconnect and vent the low side of the orifice manometer. Close off the low side orifice tap. Pressurize the system to 13-18 cm (5-7 in.) water column by blowing into the rubber tubing. Pinch off the tubing and observe the manometer for 1 min. A loss of pressure on the manometer indicates a leak in the meter box. Leaks, if present, must be corrected.

NOTE: If the dry-gas-meter coefficient values obtained before and after a test series differ by >5%, either the test series shall be voided or calculations for test series shall be performed using whichever meter coefficient value (i.e., before or after) gives the lower value of total sample volume.

9.4 Probe heater: The probe-heating system shall be calibrated before its initial use in the field according to the procedure outlined in APTD-0576. Probes constructed according to APTD-0581 need not be calibrated if the calibration curves in APTD-0576 are used.

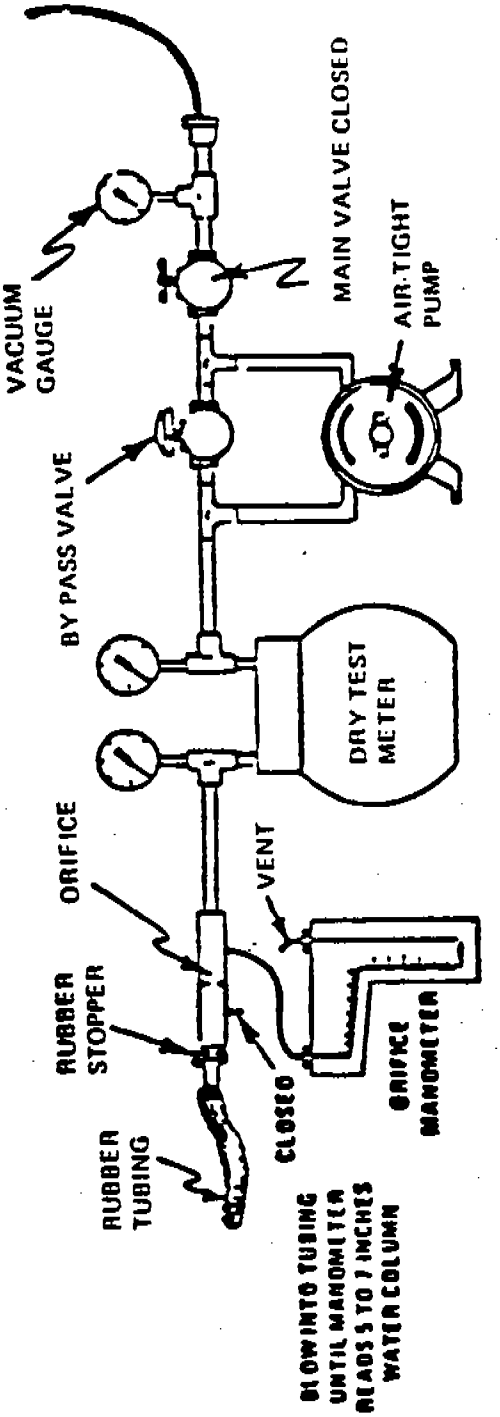


Figure 6. Leak check of meter box.

9.5 Temperature gauges: Each thermocouple must be permanently and uniquely marked on the casting; all mercury-in-glass reference thermometers must conform to ASTM E-1 63C or 63F specifications. Thermocouples should be calibrated in the laboratory with and without the use of extension leads. If extension leads are used in the field, the thermocouple readings at ambient air temperatures, with and without the extension lead, must be noted and recorded. Correction is necessary if the use of an extension lead produces a change >1.5%.

9.5.1 Impinger, organic module, and dry-gas meter thermocouples: For the thermocouples used to measure the temperature of the gas leaving the impinger train and the XAD-2 resin bed, three-point calibration at ice-water, room-air, and boiling-water temperatures is necessary. Accept the thermocouples only if the readings at all three temperatures agree to ±2°C (3.6°F) with those of the absolute value of the reference thermometer.

9.5.2 Probe and stack thermocouple: For the thermocouples used to indicate the probe and stack temperatures, a three-point calibration at ice-water, boiling-water, and hot-oil-bath temperatures must be performed; it is recommended that room-air temperature be added, and that the thermometer and the thermocouple agree to within 1.5% at each of the calibration points. A calibration curve (equation) may be constructed (calculated) and the data extrapolated to cover the entire temperature range suggested by the manufacturer.

9.6 Barometer: Adjust the barometer initially and before each test series to agree to within ±25 mm Hg (0.1 in. Hg) of the mercury barometer or the corrected barometric pressure value reported by a nearby National Weather Service Station (same altitude above sea level).

9.7 Triple-beam balance: Calibrate the triple-beam balance before each test series, using Class-S standard weights; the weights must be within ±0.5% of the standards, or the balance must be adjusted to meet these limits.

10.0 CALCULATIONS

10.1 Carry out calculations. Round off figures after the final calculation to the correct number of significant figures.

10.2 Nomenclature:

A_n = Cross-sectional area of nozzle, m^2 (ft^2).

B_{ws} = Water vapor in the gas stream, proportion by volume.

C_d = Type S pitot tube coefficient (nominally 0.84 ± 0.02), dimensionless.

I = Percent of isokinetic sampling.

L_a = Maximum acceptable leakage rate for a leak-check, either pre-test or following a component change; equal to 0.00057 m^3/min (0.02 cfm) or 4% of the average sampling rate, whichever is less.

L_i = Individual leakage rate observed during the leak-check conducted prior to the "i^{th}" component change (i = 1, 2, 3...n) m^3/min (cfm).

L_p = Leakage rate observed during the post-test leak-check, m^3/min (cfm).

M_d = Stack-gas dry molecular weight, g/g-mole (lb/lb-mole).

M_w = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).

P_{bar} = Barometric pressure at the sampling site, mm Hg (in. Hg).

P_s = Absolute stack-gas pressure, mm Hg (in. Hg).

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

R = Ideal gas constant, 0.06236 mm Hg-m^3/K-g-mole (21.85 in. Hg-ft^3/°R-lb-mole).

T_m = Absolute average dry-gas meter temperature (see Figure 6), K (°R).

T_s = Absolute average stack-gas temperature (see Figure 6), K (°R).

T_{std} = Standard absolute temperature, 293K (528°R).

V_{lc} = Total volume of liquid collected in the organic module condensate knockout trap, the impingers, and silica gel, mL.

V_m = Volume of gas sample as measured by dry-gas meter, dscm (dscf).

$V_{m(std)}$ = Volume of gas sample measured by the dry-gas meter, corrected to standard conditions, dscm (dscf).

$V_{w(std)}$ = Volume of water vapor in the gas sample, corrected to standard conditions, scm (scf).

V_s = Stack-gas velocity, calculated by Method 2, Equation 2-9, using data obtained from Method 5, m/sec (ft/sec).

W_a = Weight of residue in acetone wash, mg.

γ = Dry-gas-meter calibration factor, dimensionless.

ΔH = Average pressure differential across the orifice meter (see Figure 2), mm H_2O (in. H_2O).

ρ_w = Density of water, 0.9982 g/mL (0.002201 lb/mL).

θ = Total sampling time, min.

θ_1 = Sampling time interval from the beginning of a run until the first component change, min.

θ_i = Sampling time interval between two successive component changes, beginning with the interval between the first and second changes, min.

θ_p = Sampling time interval from the final (n^{th}) component change until the end of the sampling run, min.

13.6 = Specific gravity of mercury.

60 = sec/min.

100 = Conversion to percent.

10.3 Average dry-gas-meter temperature and average orifice pressure drop: See data sheet (Figure 5, above).

10.4 Dry-gas volume: Correct the sample measured by the dry-gas meter to standard conditions (20°C, 760 mm Hg [68°F, 29.92 in. Hg]) by using Equation 1:

$$V_{m(std)} = V_m \frac{T_{std}}{T_m} \frac{P_{bar} + \Delta H/13.6}{P_{std}} = K_1 V_m \frac{P_{bar} + \Delta H/13.6}{T_m} \qquad (1)$$

where:

K_1 = 0.3858 K/mm Hg for metric units, or
K_1 = 17.64°R/in. Hg for English units.

It should be noted that Equation 1 can be used as written, unless the leakage rate observed during any of the mandatory leak-checks (i.e., the post-test leak-check or leak-checks conducted prior to component changes) exceeds L_a. If L_p or L_i exceeds L_a, Equation 1 must be modified as follows:

a. Case I (no component changes made during sampling run): Replace V_m in Equation 1 with the expression:

$$V_m - (L_p - L_a)$$

b. Case II (one or more component changes made during the sampling run): Replace V_m in Equation 1 by the expression:

$$V_m - (L_1 - L_a)\theta_1 - \sum_{i=2}^{n} (L_i - L_a)\theta_1 - (L_p - L_a)\theta_p$$

and substitute only for those leakage rates (L_1 or L_p) that exceed L_a.

10.5 Volume of water vapor:

$$V_{w(std)} = V_{lc} \frac{P_w}{M_w} \frac{RT_{std}}{P_{std}} = K_2 V_{lc} \quad (2)$$

where:

$K_2 = 0.001333$ m^3/mL for metric units, or
$K_2 = 0.04707$ ft^3/mL for English units.

10.6 Moisture content:

$$B_{ws} = \frac{V_{w(std)}}{V_{m(std)} + V_{w(std)}} \quad (3)$$

NOTE: In saturated or water-droplet-laden gas streams, two calculations of the moisture content of the stack gas shall be made, one from the impinger analysis (Equation 3) and a second from the assumption of saturated conditions. The lower of the two values of B_w shall be considered correct. The procedure for determining the moisture content based upon assumption of saturated conditions is given in the Note to Section 1.2 of Method 4. For the purposes of this method, the average stack-gas temperature from Figure 6 may be used to make this determination, provided that the accuracy of the in-stack temperature sensor is ±1°C (2°F).

10.7 Conversion factors:

From	To	Multiply by
scf	m^3	0.02832
g/ft^3	gr/ft^3	15.43
g/ft^3	lb/ft^3	2.205×10^{-3}
g/ft^3	g/m^3	35.31

10.8 Isokinetic variation:

10.8.1 Calculation from raw data:

$$I = \frac{100\ T_s[K_3 F_{1c} + (V_m/T_m)\ (P_{bar} + \Delta H/13.6)]}{60\theta V_s P_s A_n} \qquad (4)$$

where:

K_3 = 0.003454 mm Hg-m^3/mL-K for metric units, or
K_3 = 0.002669 in. Hg-ft^3/mL-°R for English units.

10.8.2 Calculation for intermediate values:

$$I = \frac{T_s V_{m(std)} P_{std} 100}{T_{std} V_s \theta A_n P_s 60(1-B_{ws})} = K_4 \frac{T_s V_{m(std)}}{P_s V_s A_n \theta (1-B_{ws})} \qquad (5)$$

where:

K_4 = 4.320 for metric units, or
K_4 = 0.09450 for English units.

10.8.3 Acceptable results: If 90% $\leq$ I $\leq$ 110%, the results are acceptable. If the results are low in comparison with the standard and I is beyond the acceptable range, or if I is less than 90%, the Administrator may opt to accept the results.

10.9 To determine the minimum sample volume that shall be collected, the following sequence of calculations shall be used.

10.9.1 From prior analysis of the waste feed, the concentration of POHCs introduced into the combustion system can be calculated. The degree of destruction and removal efficiency that is required is used to determine the maximum amount of POHC allowed to be present in the effluent. This may be expressed as:

$$\frac{(WF)\ (POHC_i\ conc)}{100}\ \frac{(100-\%DRE)}{100} = \text{Max } POHC_i \text{ Mass} \qquad (6)$$

where:

WF = mass flow rate of waste feed per hr, g/hr (lb/hr).

$POHC_i$ = concentration of Principal Organic Hazardous Compound (wt %) introduced into the combustion process.

DRE = percent Destruction and Removal Efficiency required.

Max POHC = mass flow rate (g/hr [lb/hr]) of POHC emitted from the combustion source.

10.9.2 The average discharge concentration of the POHC in the effluent gas is determined by comparing the Max POHC with the volumetric flow rate being exhausted from the source. Volumetric flow rate data are available as a result of preliminary Method 1-4 determinations:

$$\frac{\text{Max POHC}_i \text{ Mass}}{DV_{eff(std)}} = \text{Max POHC}_i \text{ conc} \qquad (7)$$

where:

$DV_{eff(std)}$ = volumetric flow rate of exhaust gas, dscm (dscf).

$POHC_i$ conc = anticipated concentration of the POHC in the exhaust gas stream, g/dscm (lb/dscf).

10.9.3 In making this calculation, it is recommended that a safety margin of at least ten be included:

$$\frac{LDL_{POHC} \times 10}{POHC_i \text{ conc}} = V_{TBC} \qquad (8)$$

where:

LDL_{POHC} = detectable amount of POHC in entire sampling train.
NOTE: The whole extract from an XAD-2 cartridge is seldom if ever, injected at once. Therefore, if aliquoting factors are involved, the LDL_{POHC} is not the same as the analytical (or column) detection limit.

V_{TBC} = minimum dry standard volume to be collected at dry-gas meter.

10.10 Concentration of any given POHC in the gaseous emissions of a combustion process:

1) Multiply the concentration of the POHC as determined in Method 8270 by the final concentration volume, typically 10 mL.

C_{POHC} (ug/mL) x sample volume (mL) = amount (ug) of POHC in sample (9)

where:

C_{POHC} = concentration of POHC as analyzed by Method 8270.

2) Sum the amount of POHC found in all samples associated with a single train.

Total (ug) = XAD-2 (ug) + condensate (ug) + rinses (ug) + impinger (ug) (10)

3) Divide the total ug found by the volume of stack gas sampled (m^3).

(Total ug)/(train sample volume) = concentration of POHC (ug/m^3) (11)

11.0 QUALITY CONTROL

11.1 Sampling: See EPA Manual 600/4-77-027b for Method 5 quality control.

11.2 Analysis: The quality assurance program required for this study includes the analysis of field and method blanks, procedure validations, incorporation of stable labeled surrogate compounds, quantitation versus stable labeled internal standards, capillary column performance checks, and external performance tests. The surrogate spiking compounds selected for a particular analysis are used as primary indicators of the quality of the analytical data for a wide range of compounds and a variety of sample matrices. The assessment of combustion data, positive identification, and quantitation of the selected compounds are dependent on the integrity of the samples received and the precision and accuracy of the analytical methods employed. The quality assurance procedures for this method are designed to monitor the performance of the analytical method and to provide the required information to take corrective action if problems are observed in laboratory operations or in field sampling activities.

11.2.1 Field Blanks: Field blanks must be submitted with the samples collected at each sampling site. The field blanks include the sample bottles containing aliquots of sample recovery solvents, unused filters, and resin cartridges. At a minimum, one complete sampling train will be assembled in the field staging area, taken to the sampling area, and leak-checked at the beginning and end of the testing (or for the same total number of times as the actual test train). The filter housing and probe of the blank train will be heated during the sample test. The train will be recovered as if it were an actual test sample. No gaseous sample will be passed through the sampling train.

11.2.2 Method blanks: A method blank must be prepared for each set of analytical operations, to evaluate contamination and artifacts that can be derived from glassware, reagents, and sample handling in the laboratory.

11.2.3 Refer to Method 8270 for additional quality control considerations.

12.0 METHOD PERFORMANCE

12.1 Method performance evaluation: Evaluation of analytical procedures for a selected series of compounds must include the sample-preparation procedures and each associated analytical determination. The analytical procedures should be challenged by the test compounds spiked at appropriate levels and carried through the procedures.

12.2 Method detection limit: The overall method detection limits (lower and upper) must be determined on a compound-by-compound basis because different compounds may exhibit different collection, retention, and extraction efficiencies as well as instrumental minimum detection limit (MDL). The method detection limit must be quoted relative to a given sample volume. The upper limits for the method must be determined relative to compound retention volumes (breakthrough).

12.3 Method precision and bias: The overall method precision and bias must be determined on a compound-by-compound basis at a given concentration level. The method precision value would include a combined variability due to sampling, sample preparation, and instrumental analysis. The method bias would be dependent upon the collection, retention, and extraction efficiency of the train components. From evaluation studies to date using a dynamic spiking system, method biases of -13% and -16% have been determined for toluene and 1,1,2,2-tetrachloroethane, respectively. A precision of 19.9% was calculated from a field test data set representing seven degrees of freedom which resulted from a series of paired, unspiked Semivolatile Organic Sampling trains (Semi-VOST) sampling emissions from a hazardous waste incinerator.

13.0 REFERENCES

1. Addendum to Specifications for Incinerator Testing at Federal Facilities, PHS, NCAPC, December 6, 1967.

2. Bursey, J., Homolya, J., McAllister, R., and McGangley, J., Laboratory and Field Evaluation of the Semi-VOST Method, Vols. 1 and 2, U.S. Environmental Protection Agency, EPA/600/4-851/075A, 075B (1985).

3. Martin, R.M., Construction Details of Isokinetic Source-Sampling Equipment, Research Triangle Park, NC, U.S. Environmental Protection Agency, April 1971, PB-203 060/BE, APTD-0581, 35 pp.

4. Rom, J.J., Maintenance, Calibration, and Operation of Isokinetic Source-Sampling Equipment, Research Triangle Park, NC, U.S. Environmental Protection Agency, March 1972, PB-209 022/BE, APTD-0576, 39 pp.

5. Schlickenrieder, L.M., Adams, J.W., and Thrun, K.E., Modified Method 5 Train and Source Assessment Sampling System: Operator's Manual, U.S. Environmental Protection Agency, EPA/600/8-85/003, (1985).

6. Shigehara, R.T., Adjustments in the EPA Nomography for Different Pitot Tube Coefficients and Dry Molecular Weights, Stack Sampling News, 2:4-11 (October 1974).

7. U.S. Environmental Protection Agency, CFR 40 Part 60, Appendix A, Methods 1-5.

8. Vollaro, R.F., A Survey of Commercially Available Instrumentation for the Measurement of Low-Range Gas Velocities, Research Triangle Park, NC, U.S. Environmental Protection Agency, Emissions Measurement Branch, November 1976 (unpublished paper).

PREPARATION OF XAD-2 SORBENT RESIN

1.0 SCOPE AND APPLICATION

1.1 XAD-2 resin as supplied by the manufacturer is impregnated with a bicarbonate solution to inhibit microbial growth during storage. Both the salt solution and any residual extractable monomer and polymer species must be removed before use. The resin is prepared by a series of water and organic extractions, followed by careful drying.

2.0 EXTRACTION

2.1 Method 1: The procedure may be carried out in a giant Soxhlet extractor. An all-glass thimble containing an extra-coarse frit is used for extraction of XAD-2. The frit is recessed 10-15 mm above a crenellated ring at the bottom of the thimble to facilitate drainage. The resin must be carefully retained in the extractor cup with a glass-wool plug and stainless steel screen because it floats on methylene chloride. This process involves sequential extraction in the following order.

Solvent	Procedure
Water	Initial rinse: Place resin in a beaker, rinse once with Type II water, and discard. Fill with water a second time, let stand overnight, and discard.
Water	Extract with H_2O for 8 hr.
Methyl alcohol	Extract for 22 hr.
Methylene chloride	Extract for 22 hr.
Methylene chloride (fresh)	Extract for 22 hr.

2.2 Method 2:

2.2.1 As an alternative to Soxhlet extraction, a continuous extractor has been fabricated for the extraction sequence. This extractor has been found to be acceptable. The particular canister used for the apparatus shown in Figure A-1 contains about 500 g of finished XAD-2. Any size may be constructed; the choice is dependent on the needs of the sampling programs. The XAD-2 is held under light spring tension between a pair of coarse and fine screens. Spacers under the bottom screen allow for even distribution of clean solvent. The three-necked flask should be of sufficient size (3-liter in this case) to hold solvent

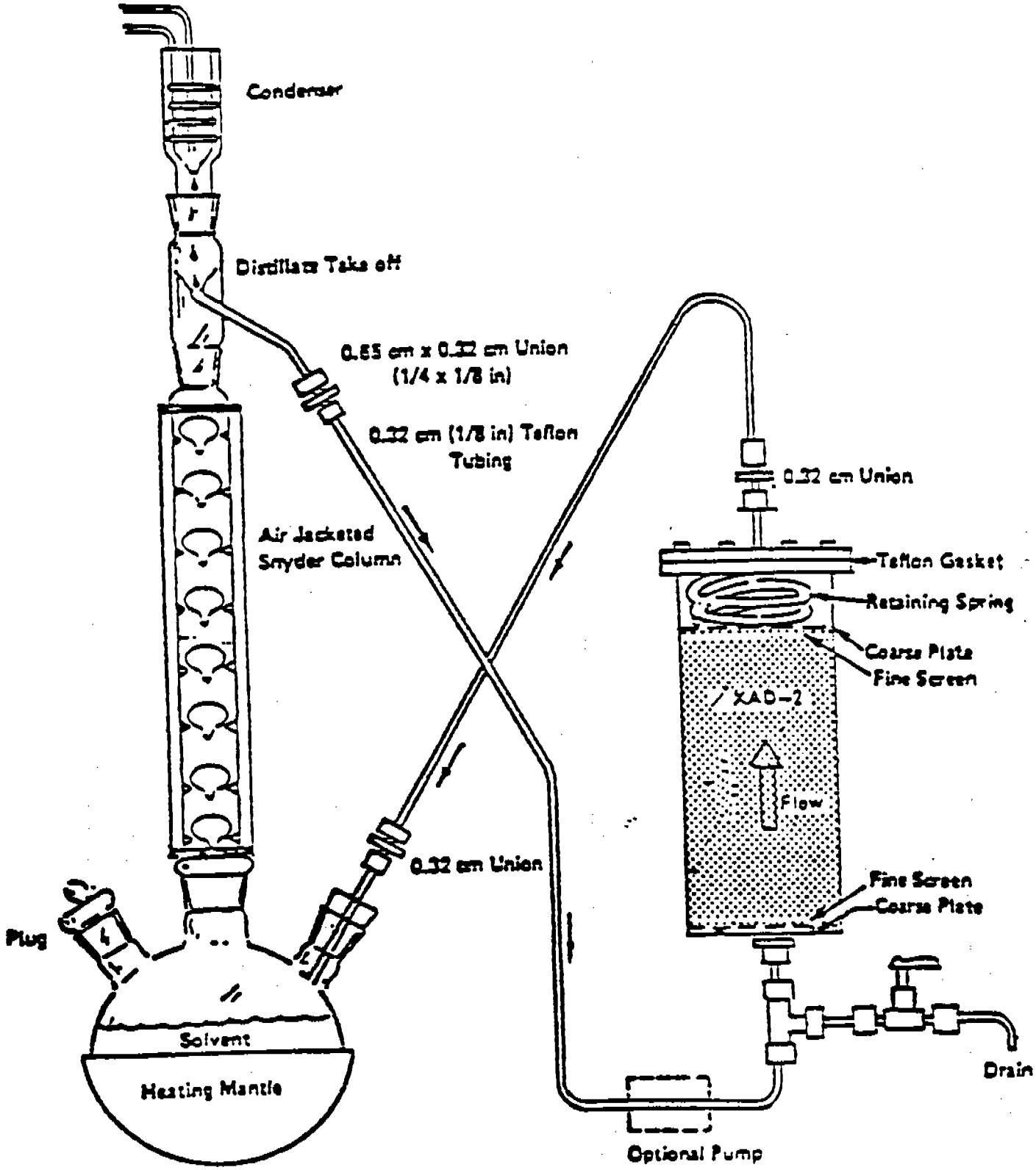


Figure A-1. XAD-2 cleanup extraction apparatus.

equal to twice the dead volume of the XAD-2 canister. Solvent is refluxed through the Snyder column, and the distillate is continuously cycled up through the XAD-2 for extraction and returned to the flask. The flow is maintained upward through the XAD-2 to allow maximum solvent contact and prevent channeling. A valve at the bottom of the canister allows removal of solvent from the canister between changes.

2.2.2 Experience has shown that it is very difficult to cycle sufficient water in this mode. Therefore the aqueous rinse is accomplished by simply flushing the canister with about 20 liters of distilled water. A small pump may be useful for pumping the water through the canister. The water extraction should be carried out at the rate of about 20-40 mL/min.

2.2.3 After draining the water, subsequent methyl alcohol and methylene chloride extractions are carried out using the refluxing apparatus. An overnight or 10- to 20-hr period is normally sufficient for each extraction.

2.2.4 All materials of construction are glass, Teflon, or stainless steel. Pumps, if used, should not contain extractable materials. Pumps are not used with methanol and methylene chloride.

3.0 DRYING

3.1 After evaluation of several methods of removing residual solvent, a fluidized-bed technique has proved to be the fastest and most reliable drying method.

3.2 A simple column with suitable retainers, as shown in Figure A-2, will serve as a satisfactory column. A 10.2-cm (4-in.) Pyrex pipe 0.6 m (2 ft) long will hold all of the XAD-2 from the extractor shown in Figure A-1 or the Soxhlet extractor, with sufficient space for fluidizing the bed while generating a minimum resin load at the exit of the column.

3.3 Method 1: The gas used to remove the solvent is the key to preserving the cleanliness of the XAD-2. Liquid nitrogen from a standard commercial liquid nitrogen cylinder has routinely proved to be a reliable source of large volumes of gas free from organic contaminants. The liquid nitrogen cylinder is connected to the column by a length of precleaned 0.95-cm (3/8-in.) copper tubing, coiled to pass through a heat source. As nitrogen is bled from the cylinder, it is vaporized in the heat source and passes through the column. A convenient heat source is a water bath heated from a steam line. The final nitrogen temperature should only be warm to the touch and not over 40°C. Experience has shown that about 500 g of XAD-2 may be dried overnight by consuming a full 160-liter cylinder of liquid nitrogen.

3.4 Method 2: As a second choice, high-purity tank nitrogen may be used to dry the XAD-2. The high-purity nitrogen must first be passed through a bed

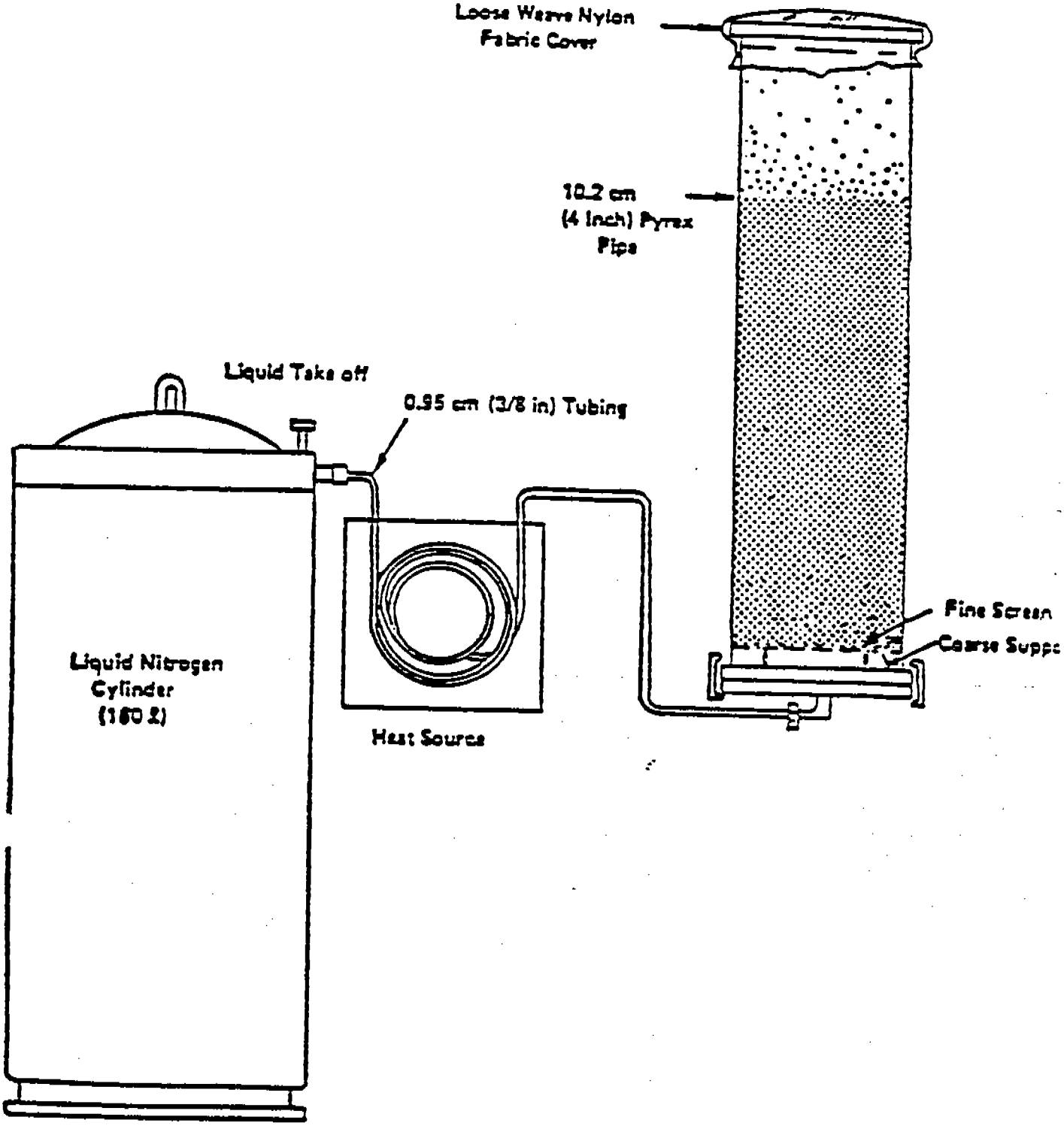


Figure A-2. XAD-2 fluidized-bed drying apparatus.

of activated charcoal approximately 150 mL in volume. With either type of drying method, the rate of flow should gently agitate the bed. Excessive fluidization may cause the particles to break up.

4.0 QUALITY CONTROL PROCEDURES

4.1 For both Methods 1 and 2, the quality control results must be reported for the batch. The batch must be reextracted if the residual extractable organics are >20 ug/mL by TCO analysis or the gravimetric residue is >0.5 mg/20 g XAD-2 extracted. (See also section 5.1, Method 0010.)

4.2 Four control procedures are used with the final XAD-2 to check for (1) residual methylene chloride, (2) extractable organics (TCO), (3) specific compounds of interest as determined by GC/MS, as described in Section 4.5 below, and (4) residue (GRAV).

4.3 Procedure for residual methylene chloride:

4.3.1 Description: A 1±0.1-g sample of dried resin is weighed into a small vial, 3 mL of toluene are added, and the vial is capped and well shaken. Five uL of toluene (now containing extracted methylene chloride) are injected into a gas chromatograph, and the resulting integrated area is compared with a reference standard. The reference solution consists of 2.5 uL of methylene chloride in 100 mL of toluene, simulating 100 ug of residual methylene chloride on the resin. The acceptable maximum content is 1,000 ug/g resin.

4.3.2 Experimental: The gas chromatograph conditions are as follows:

6-ft x 1/8-in. stainless steel column containing 10% OV-101 on 100/120 Supelcoport;

Helium carrier at 30 mL/min;

FID operated on 4 x 10^{-11} A/mV;

Injection port temperature: 250°C;

Detector temperature: 305°C;

Program: 30°C(4 min) 40°C/min 250°C (hold); and

Program terminated at 1,000 sec.

4.4 Procedure for residual extractable organics:

4.4.1 Description: A 20±0.1-g sample of cleaned, dried resin is weighed into a precleaned alundum or cellulose thimble which is plugged with cleaned glass wool. (Note that 20 g of resin will fill a thimble, and the

TOTAL CHROMATOGRAPHABLE ORGANIC MATERIAL ANALYSIS

1.0 SCOPE AND APPLICATION

1.1 In this procedure, gas chromatography is used to determine the quantity of lower boiling hydrocarbons (boiling points between 90° and 300°C) in the concentrates of all organic solvent rinses, XAD-2 resin and LC fractions - when Method 1 is used (see References, Method 0010) - encountered in Level 1 environmental sample analyses. Data obtained using this procedure serve a twofold purpose. First, the total quantity of the lower boiling hydrocarbons in the sample is determined. Then whenever the hydrocarbon concentrations in the original concentrates exceed 75 ug/m^3, the chromatography results are reexamined to determine the amounts of individual species.

The extent of compound identification is limited to representing all materials as normal alkanes based upon comparison of boiling points. Thus the method is not qualitative. In a similar manner, the analysis is semiquantitative; calibrations are prepared using only one hydrocarbon. They are replicated but samples routinely are not.

1.2 Application: This procedure applies solely to the Level 1 C7-C16 gas chromatographic analysis of concentrates of organic extracts, neat liquids, and of LC fractions. Throughout the procedure, it is assumed the analyst has been given a properly prepared sample.

1.3 Sensitivity: The sensitivity of this procedure, defined as the slope of a plot of response versus concentration, is dependent on the instrument and must be verified regularly. TRW experience indicates the nominal range is of the order of 77 uV·V·sec·uL/ng of n-heptane and 79 uV·sec·ul/ng of n-hexadecane. The instrument is capable of perhaps one hundredfold greater sensitivity. The level specified here is sufficient for Level 1 analysis.

1.4 Detection limit: The detection limit of this procedure as written is 1.3 ng/uL for a 1 uL injection of n-decane. This limit is arbitrarily based on defining the minimum detectable response as 100 uv·sec. This is an easier operational definition than defining the minimum detection limit to be that amount of material which yields a signal twice the noise level.

1.5 Range: The range of the procedure will be concentrations of 1.3 ng/uL and greater.

1.6 Limitations

1.6.1 Reporting limitations: It should be noted that a typical environmental sample will contain compounds which: (a) will not elute in the specified boiling ranges and thus will not be reported, and/or (b)

resin will float out unless well plugged.) The thimble containing the resin is extracted for 24 hr with 200-mL of pesticide- grade methylene chloride (Burdick and Jackson pesticide-grade or equivalent purity). The 200-mL extract is reduced in volume to 10-mL using a Kuderna-Danish concentrator and/or a nitrogen evaporation stream. Five uL of that solution are analyzed by gas chromatography using the TCO analysis procedure. The concentrated solution should not contain >20 ug/mL of TCO extracted from the XAD-2. This is equivalent to 10 ug/g of TCO in the XAD-2 and would correspond to 1.3 mg of TCO in the extract of the 130-g XAD-2 module. Care should be taken to correct the TCO data for a solvent blank prepared (200 mL reduced to 10 mL) in a similar manner.

4.4.2 Experimental: Use the TCO analysis conditions described in the revised Level 1 manual (EPA 600/7-78-201).

4.5 GC/MS Screen: The extract, as prepared in paragraph 4.4.1, is subjected to GC/MS analysis for each of the individual compounds of interest. The GC/MS procedure is described in Chapter Four, Method 8270. The extract is screened at the MDL of each compound. The presence of any compound at a concentration >25 ug/mL in the concentrated extract will require the XAD-2 to be recleaned by repeating the methylene chloride step.

4.6 Methodology for residual gravimetric determination: After the TCO value and GC/MS data are obtained for the resin batch by the above procedures, dry the remainder of the extract in a tared vessel. There must be <0.5 mg residue registered or the batch of resin will have to be extracted with fresh methylene chloride again until it meets this criterion. This level corresponds to 25 ug/g in the XAD-2, or about 3.25 mg in a resin charge of 130 g.

will not elute from the column at all and thus will not be reported. Consequently, the organic content of the sample as reported is a lower bound and should be regarded as such.

1.6.2 Calibration limitations: Quantitation is based on calibration with n-decane. Data should therefore be reported as, e.g., mg C8/m^3 as n-decane. Since response varies linearly with carbon number (over a wide range the assumption may involve a 20% error), it is clear that heptane (C7) detected in a sample and quantitated as decane will be overestimated. Likewise, hexadecane (C16) quantitated as decane will be underestimated. From previous data, it is estimated the error involved is on the order of 6-7%.

1.6.3 Detection limitations: The sensitivity of the flame ionization detector varies from compound to compound. However, n-alkanes have a greater response than other classes. Consequently, using an n-alkane as a calibrant and assuming equal responses of all other compounds tends to give low reported values.

2.0 SUMMARY OF METHOD

2.1 A mL aliquot of all 10-mL concentrates is disbursed for GC-TCO analysis. With boiling point-retention time and response-amount calibration curves, the data (peak retention times and peak areas) are interpreted by first summing peak areas in the ranges obtained from the boiling point-retention time calibration. Then, with the response-amount calibration curve, the area sums are converted to amounts of material in the reported boiling point ranges.

2.2 After the instrument is set up, the boiling point-retention time calibration is effected by injecting a mixture of n-C7 through n-C16 hydrocarbons and operating the standard temperature program. Response-quantity calibrations are accomplished by injecting n-decane in n-pentane standards and performing the standard temperature program.

2.3 Definitions

2.3.1 GC: Gas chromatography or gas chromatograph.

2.3.2 C7-C16 n-alkanes: Heptane through hexadecane.

2.3.3 GCA temperature program: 4 min isothermal at 60°C, 10°C/min from 60° to 220°C.

2.3.4 TRW temperature program: 5 min isothermal at room temperature, then program from 30°C to 250°C at 15°C/min.

3.0 INTERFERENCES

Not applicable.

4.0 APPARATUS AND MATERIALS

4.1 Gas chromatograph: This procedure is intended for use on a Varian 1860 gas chromatograph, equipped with dual flame ionization detectors and a linear temperature programmer. Any equivalent instrument can be used provided that electrometer settings, etc., be changed appropriately.

4.2 Gases:

4.2.1 Helium: Minimum quality is reactor grade. A 4A or 13X molecular sieve drying tube is required. A filter must be placed between the trap and the instrument. The trap should be recharged after every third tank of helium.

4.2.2 Air: Zero grade is satisfactory.

4.2.3 Hydrogen: Zero grade.

4.3 Syringe: Syringes are Hamilton 701N, 10 uL, or equivalent.

4.4 Septa: Septa will be of such quality as to produce very low bleed during the temperature program. An appropriate septum is Supelco Microsep 138, which is Teflon-backed. If septum bleed cannot be reduced to a negligible level, it will be necessary to install septum swingers on the instrument.

4.5 Recorder: The recorder of this procedure must be capable of not less than 1 mV full-scale display, a 1-sec time constant and 0.5 in. per min chart rate.

4.6 Integrator: An integrator is required. Peak area measurement by hand is satisfactory but too time-consuming. If manual integration is required, the method of "height times width at half height" is used.

4.7 Columns:

4.7.1 Preferred column: 6 ft x 1/8 in. O.D. stainless steel column of 10% OV-101 on 100/120 mesh Supelcoport.

4.7.2 Alternate column: 6 ft x 1/8 in. O.D. stainless steel column of 10% OV-1 (or other silicon phase) on 100/120 mesh Supelcoport.

4.8 Syringe cleaner: Hamilton syringe cleaner or equivalent connected to a suitable vacuum source.

5.0 REAGENTS

5.1 Pentane: "Distilled-in-Glass" (reg. trademark) or "Nanograde" (reg. trademark) for standards and for syringe cleaning.

5.2 Methylene chloride: "Distilled-in-Glass" (reg. trademark) or "Nanograde" (reg. trademark) for syringe cleaning.

6.0 SAMPLING HANDLING AND PRESERVATION

6.1 The extracts are concentrated in a Kuderna-Danish evaporator to a volume less than 10 mL. The concentrate is then quantitatively transferred to a 10-mL volumetric flask and diluted to volume. A 1-mL aliquot is taken for both this analysis and possible subsequent GC/MS analysis and set aside in the sample bank. For each GC-TCO analysis, obtain the sample sufficiently in advance to allow it to warm to room temperature. For example, after one analysis is started, return that sample to the sample bank and take the next sample.

7.0 PROCEDURES

7.1 Setup and checkout: Each day, the operator will verify the following:

7.1.1 That supplies of carrier gas, air and hydrogen are sufficient, i.e., that each tank contains $>$ 100 psig.

7.1.2 That, after replacement of any gas cylinder, all connections leading to the chromatograph have been leak-checked.

7.1.3 That the carrier gas flow rate is 30 $\pm$ 2 mL/min, the hydrogen flow rate is 30 $\pm$ 2 mL/min, and the air flow rate is 300 $\pm$ 20 mL/min.

7.1.4 That the electrometer is functioning properly.

7.1.5 That the recorder and integrator are functioning properly.

7.1.6 That the septa have been leak-checked (leak-checking is effected by placing the soap bubble flow meter inlet tube over the injection port adaptors), and that no septum will be used for more than 20 injections.

7.1.7 That the list of samples to be run is ready.

7.2 Retention time calibration:

7.2.1 To obtain the temperature ranges for reporting the results of the analyses, the chromatograph is given a normal boiling point-retention time calibration. The n-alkanes, their boiling points, and data reporting ranges are given in the table below:

	NBP, °C	Reporting Range, °C	Report As
n-heptane	98	90-110	C7
n-octane	126	110-140	C8
n-nonane	151	140-160	C9
n-decane	174	160-180	C10
n-undecane	194	180-200	C11
n-dodecane	214	200-220	C12
n-tridecane	234	220-240	C13
n-tetradecane	252	240-260	C14
n-pentadecane	270	260-280	C15
n-hexadecane	288	280-300	C16

7.2.2 Preparation of standards: Preparing a mixture of the C7-C16 alkanes is required. There are two approaches: (1) use of a standards kit (e.g., Polyscience Kit) containing bottles of mixtures of selected n-alkanes which may be combined to produce a C7-C16 standard; or (2) use of bottles of the individual C7-C16 alkanes from which accurately known volumes may be taken and combined to give a C7-C16 mixture.

7.2.3 Procedure for retention time calibration: This calibration is performed at the start of an analytical program; the mixture is chromatographed at the start of each day. To attain the required retention time precision, both the carrier gas flow rate and the temperature program specifications must be observed. Details of the procedure depend on the instrument being used. The general procedure is as follows:

7.2.3.1 Set the programmer upper limit at 250°C. If this setting does not produce a column temperature of 250°C, find the correct setting.

7.2.3.2 Set the programmer lower limit at 30°C.

7.2.3.3 Verify that the instrument and samples are at room temperature.

7.2.3.4 Inject 1 uL of the n-alkane mixture.

7.2.3.5 Start the integrator and recorder.

7.2.3.6 Allow the instrument to run isothermally at room temperature for five min.

7.2.3.7 Shut the oven door.

7.2.3.8 Change the mode to Automatic and start the temperature program.

7.2.3.9 Repeat Steps 1-9 a sufficient number of times so that the relative standard deviation of the retention times for each peak is <5%.

7.3 Response calibration:

7.3.1 For the purposes of a Level 1 analysis, response-quantity calibration with n-decane is adequate. A 10-uL volume of n-decane is injected into a tared 10 mL volumetric flask. The weight injected is obtained and the flask is diluted to the mark with n-pentane. This standard contains about 730 ng n-decane per uL n-pentane. The exact concentration depends on temperature, so that a weight is required. Two serial tenfold dilutions are made from this standard, giving standards at about 730, 73, and 7.3 ng n-decane per uL n-pentane, respectively.

7.3.2 Procedure for response calibration: This calibration is performed at the start of an analytical program and monthly thereafter. The most concentrated standard is injected once each day. Any change in calibration necessitates a full calibration with new standards. Standards are stored in the refrigerator locker and are made up monthly.

7.3.2.1 Verify that the instrument is set up properly.

7.3.2.2 Set electrometer at 1×10^{-10} A/mV.

7.3.2.3 Inject 1 uL of the highest concentration standard.

7.3.2.4 Run standard temperature program as specified above.

7.3.2.5 Clean syringe.

7.3.2.6 Make repeated injections of all three standards until the relative standard deviations of the areas of each standard are ≤5%.

7.4 Sample analysis procedure:

7.4.1 The following apparatus is required:

7.4.1.1 Gas chromatograph set up and working.

7.4.1.2 Recorder, integrator working.

7.4.1.3 Syringe and syringe cleaning apparatus.

7.4.1.4 Parameters: Electrometer setting is 1×10^{-10} A/mV; recorder is set at 0.5 in./min and 1 mV full-scale.

7.4.2 Steps in the procedure are:

7.4.2.1 Label chromatogram with the data, sample number, etc.

7.4.2.2 Inject sample.

7.4.2.3 Start integrator and recorder.

7.4.2.4 After isothermal operation for 5 min, begin temperature program.

7.4.2.5 Clean syringe.

7.4.2.6 Return sample; obtain new sample.

7.4.2.7 When analysis is finished, allow instrument to cool. Turn chromatogram and integrator output and data sheet over to data analyst.

7.5 Syringe cleaning procedure:

7.5.1 Remove plunger from syringe.

7.5.2 Insert syringe into cleaner; turn on aspirator.

7.5.3 Fill pipet with pentane; run pentane through syringe.

7.5.4 Repeat with methylene chloride from a separate pipet.

7.5.5 Flush plunger with pentane followed by methylene chloride.

7.5.6 Repeat with methylene chloride.

7.6 Sample analysis decision criterion: The data from the TCO analyses of organic extract and rinse concentrates are first used to calculate the total concentration of C7-C16 hydrocarbon-equivalents (Paragraph 7.7.3) in the sample with respect to the volume of air actually sampled, i.e., ug/m^3. On this basis, a decision is made both on whether to calculate the quantity of each n-alkane equivalent present and on which analytical procedural pathway will be followed. If the total organic content is great enough to warrant continuing the analysis -- >500 ug/m^3 -- a TCO of less than 75 ug/m^3 will require only LC fractionation and gravimetric determinations and IR spectra to be obtained on each fraction. If the TCO is greater than 75 ug/m^3, then the first seven LC fractions of each sample will be reanalyzed using this same gas chromatographic technique.

7.7 Calculations:

7.7.1 Boiling Point - Retention Time Calibration: The required data for this calibration are on the chromatogram and on the data sheet. The data reduction is performed as follows:

7.7.1.1 Average the retention times and calculate relative standard deviations for each n-hydrocarbon.

7.7.1.2 Plot average retention times as abscissae versus normal boiling points as ordinates.

7.7.1.3 Draw in calibration curve.

7.7.1.4 Locate and record retention times corresonding to boiling ranges 90-100, 110-140, 140-160, 160-180, 180-200, 200-220, 220-240, 240-260, 260-280, 280-300°C.

7.7.2 Response-amount calibration: The required data for this calibration are on the chromatogram and on the data sheet. The data reduction is performed as follows:

7.7.2.1 Average the area responses of each standard and calculate relative standard deviations.

7.7.2.2 Plot response (uv·sec) as ordinate versus ng/uL as abscissa.

7.7.2.3 Draw in the curve. Perform least squares regression and obtain slope (uV·sec·uL/ng).

7.7.3 Total C7-C16 hydrocarbons analysis: The required data for this calculation are on the chromatogram and on the data sheet. The data reduction is performed as follows:

7.7.3.1 Sum the areas of all peaks within the retention time range of interest.

7.7.3.2 Convert this area (uV·sec) to ng/uL by dividing by the weight response for n-decane (uV·sec.uL/ng).

7.7.3.3 Multiply this weight by the total concentrate volume (10 mL) to get the weight of the C7-C16 hydrocarbons in the sample.

7.7.3.4 Using the volume of gas sampled or the total weight of sample acquired, convert the result of Step 7.7.3.3 above to ug/m^3.

7.7.3.5 If the value of total C7-C16 hydrocarbons from Step 7.7.3.4 above exceeds 75 ug/m^3, calculate individual hydrocarbon concentrations in accordance with the instructions in Paragraph 7.7.5.5 below.

7.7.4 Individual C7-C16 n-Alkane Equivalent Analysis: The required data from the analyses are on the chromatogram and on the data sheet. The data reduction is performed as follows:

7.7.4.1 Sum the areas of peaks in the proper retention time ranges.

7.7.4.2 Convert areas (uV·sec) to ng/uL by dividing by the proper weight response (uV·sec·uL/ng).

7.7.4.3 Multiply each weight by total concentrate volume (10 mL) to get weight of species in each range of the sample.

7.7.4.4 Using the volume of gas sampled on the total weight of sample acquired, convert the result of Step 7.7.4.3 above to ug/m^3.

8.0 QUALITY CONTROL

8.1 Appropriate QC is found in the pertinent procedures throughout the method.

9.0 METHOD PERFORMANCE

9.1 Even relatively comprehensive error propagation analysis is beyond the scope of this procedure. With reasonable care, peak area reproducibility of a standard should be of the order of 1% RSD. The relative standard deviation of the sum of all peaks in a fairly complex waste might be of the order of 5-10%. Accuracy is more difficult to assess. With good analytical technique, accuracy and precision should be of the order of 10-20%.

10.0 REFERENCES

1. Emissions Assessment of Conventional Stationary Combustion Systems: Methods and Procedure Manual for Sampling and Analysis, Interagency Energy/Environmental R&D Program, Industrial Environmental Research Laboratory, Research Triangle Park, NC 27711, EPA-600/7-79-029a, January 1979.

APPENDIX K

CALCULATION EQUATIONS

METHOD 2
CALCULATION EQUATIONS

$$\overline{V_s} = 85.49\ C_p\ (\sqrt{\Delta p})_{avg}\ \sqrt{\frac{T_{s(avg)}}{P_s\ M_s}}$$

$$Q_{s,\,d} = 60\ (1 - B_{ws})\ \overline{V_s}\ A\ (\frac{528}{T_{s\ (avg)}})\ (\frac{P_s}{29.92})$$

$$Q_a = 60\ \overline{V_s}\ A$$

$$\dot{m}_g = \frac{4.995\ Q_{s,\,d}\ G_d}{1 - B_{ws}}$$

$$RH^* = 100\ (vp_{twb} - 0.0003641\ P_s\ (T_{db} - T_{wb}))/vp_{tdb}$$

$$B^*_{ws} = RH(vp_{tdb})/P_s$$

$$\rho = \frac{4.585\ x\ 10^{-2}\ P_s M_s}{T_s\ (avg)}$$

*Alternate equations for calculating moisture content from wet bulb and dry bulb data.

SYMBOLS

A	=	Cross Sectional area of stack, SQ. FT.
A_n	=	Cross sectional area of nozzle, SQ. FT.
B_{ws}	=	Water vapor in gas stream, proportion by volume
C_p	=	Pitot tube coefficient, dimensionless
C_a	=	Concentration of particulate matter in stack gas, wet basis, GR/ACF
C_s	=	Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, GR/DSCF
EA	=	Excess air, percent by volume
γ	=	Dry test meter correction factor, dimensionless
G_d	=	Specific gravity (relative to air), dimensionless
I	=	Isokinetic variation, percent by volume
M_d	=	Molecular weight of stack gas, dry basis, g/g - mole.
$\dot{m}_g$	=	Mass flow of wet flue gas, LB/HR
$\dot{m}_p$	=	Particulate mass flow, LB/HR
M_s	=	Molecular weight of stack gas, wet basis, g/g mole.
M_p	=	Total amount of particulate matter collected, g
P_{bar}	=	Atmospheric pressure, IN. HG. (uncompensated)
P_g	=	Stack static gas pressure, IN. WC.
P_s	=	Absolute pressure of stack gas, IN. HG.
P_{std}	=	Standard absolute pressure, 29.92 IN. HG.
A_a	=	Actual volumetric stack gas flow rate, ACFM
$Q_{s,d}$	=	Dry volumetric stack gas flow rate corrected to standard conditions, DSCFM
RH	=	Relative humidity, %

T_{db}	=	Dry bulb temperature of stack gas, °F
T_{wb}	=	Wet bulb temperature of stack gas, °F
$T_{m(avg)}$	=	Absolute average dry gas meter temperature, °R
$T_{s(avg)}$	=	Absolute average stack temperature, °R
T_{std}	=	Standard absolute temperature, 528 °R (68 °F)
θ	=	Total sampling time, min.
V_{lc}	=	Total volume of liquid collected in impingers and silica gel, ml
V_m	=	Volume of gas sample as measured by dry gas meter, CF
$V_{m(std)}$	=	Volume of gas sample measured by the dry gas meter corrected to standard conditions, DSCF
$V_{w(std)}$	=	Volume of water vapor in the gas sample corrected to standard conditions, SCF
$\bar{V}_s$	=	Average actual stack gas velocity, FT/SEC
vp_{tdb}	=	Vapor pressure at T_{db}, IN. HG.
vp_{twb}	=	Vapor pressure at T_{wb}, IN. HG.
$\overline{\Delta H}$	=	Average pressure differential across the orifice meter, IN. WC.
ΔP	=	Velocity pressure of stack gas, IN. WC.
γ	=	Dry test meter correction coefficient, dimensionless
ρ	=	Actual gas density, LB/ACF

METHOD 3
CALCULATION EQUATIONS

$$\%EA = \frac{100(\%O_2 - 0.5\%\ CO)}{0.264\%\ N_2 - \%O_2 + 0.5\%\ CO}$$

$$M_d = 0.44(\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2 + \%CO)$$

$$M_s = M_d\ (I - B_{ws}) + 0.18\ B_{ws}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

METHOD 5
CALCULATION EQUATIONS

$$V_{m(std)} = 17.65\ V_m\ \gamma\ \left(\frac{P_{bar} + \overline{\Delta H}/13.6}{T_{m(avg)}}\right)$$

$$V_{w(std)} = 0.0472\ V_{lc}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

$$I = 0.0944\ \left(\frac{T_{s(avg)}\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (I - B_{ws})}\right)$$

$$C_s = \frac{15.43\ M_p}{V_{m(std)}}$$

$$C_a = \frac{272.3\ M_p\ P_s}{T_{s(avg)}\ (V_{w(std)} + V_{m(std)})}$$

$$(\dot{m}_p)_i = 8.5714\ x\ 10^{-3}\ C_s\ Q_{s,d}$$

$$(\dot{m}_p)_2 = \frac{1.3228 \times 10^{-1} M_p A}{\theta A_n}$$

$$\dot{m}_p = \frac{(\dot{m}_p)_1 + (\dot{m}_p)_2}{2}$$

CALCULATION EQUATIONS

METHOD 7

$$V_{m(std)} = 17.64\ (V_f - 25)\ [\frac{p_f}{T_f} - \frac{P_i}{T_i}]$$

$$C_s = 6.243\ x\ 10^{-5}\ \frac{M}{V_{m(std)}}$$

$$E = \frac{2090\ C_s F}{20.9 - \overline{B}_{o_2}}$$

$$C_s\ (GR/DSCF) = 7000\ C_s$$

$$C_s\ (MG/DSCM) = 1.60186\ x\ 10^{7}\ C_s$$

$$C_s\ (ppm\text{-}dry) = 8.37552\ x\ 10^{6}\ C_s$$

$$C_s\ (ppm\text{-}3\%\ O_2) = 8.37552\ x\ 10^{6}\ C_s\ \{1 + [\frac{\overline{B}_{o_2} - 3}{20.9 - B_{o_2}}]\}$$

$$C_s\ (ppm\text{-}wet) = 8.37552\ x\ 10^{6}\ C_s\ (1 - \frac{MC}{100})$$

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SYMBOLS

$\bar{B}\ O_2$	=	Average oxygen content in flue gas, % v/v
C_s	=	Concentration of nitrogen oxides in flue gas, dry basis, corrected to standard conditions, LB/DSCF
C_s (GR/DSCF)	=	Concentration of nitrogen oxides in flue gas, dry basis, corrected to standard conditions, GR/DSCF
C_s (MG/DSCM)	=	Concentration of nitrogen oxides in flue gas, dry basis, corrected to standard conditions, MG/DSCM
E	=	Emission factor, LB/10^6BTU
F	=	F-Factor for given fuel type, DSCF/10^4BTU
M	=	Mass of nitrogen oxides as nitrogen dioxide in gas sample, ug
MC	=	Moisture content of flue gas, %
P_f	=	Final absolute pressure in flask, IN. HG
P_i	=	Initial absolute pressure in flask, IN. HG
C_s (ppm-dry)	=	Concentration of nitrogen oxides in flue gas, dry basis, (v/v), ppm
C_s (ppm-3% O_2)	=	Concentration of nitrogen oxides in flue gas, dry basis, corrected to 3% O_2, (v/v) ppm
C_s (ppm-wet)	=	Concentration of nitrogen oxides in flue gas, wet basis, (v/v), ppm
T_f	=	Final absolute temperature in flask, °R
T_i	=	Initial absolute temperature in flask, °R
V_f	=	Volume of flask and valve, cc
$V_{m(std)}$	=	Sample volume at standard conditions, dry basis, cc

CALCULATION EQUATIONS

METHOD 10

$$CO\cdot PPM\cdot DRY = CO_{CO_2} - free, dry, avg\ (1 - CO_2, d/100)$$

$$CO\cdot PPM\cdot WET = CO\cdot PPM\cdot DRY\ (1 - MC/100)$$

$$GR/DSCF = 5.0885\ X\ 10^{-4}\ (CO\cdot PPM\cdot DRY)$$

$$mg/dscm = 1.165\ (CO\cdot PPM\cdot DRY)$$

$$\dot{m} = 8.5714\ x\ 10^{-3}\ (GR/DSCF)\ (Q_{s,d})$$

$$E = \frac{2.9857\ x\ 10^{-3}\ F_d\ (GR/DSCF)}{20.9 - O_{2,\,d}}$$

where:

$CO_{CO_2} - free, dry, avg$

= average of two determinations of carbon monoxide on a dry, CO_2 - free integrated flue gas sample reported in ppm by volume

$CO_{2,\,d}$ = carbon dioxide concentration of flue gas on a dry percent by volume basis

$O_{2,\,d}$ = oxygen concentration of flue gas on a dry percent by volume basis

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MC	=	moisture content of flue gas on a percent by volume basis
CO·PPM·DRY	=	carbon monoxide concentration in ppm by volume on a dry basis
CO·PPM·WET	=	carbon monoxide concentration in ppm by volume on a wet or actual basis
GR/DSCF	=	concentration of carbon monoxide in flue gas on a grains per dry standard cubic foot basis (68 °F, 29.92 IN. HG.)
mg/dscm	=	concentration of carbon monoxide in flue gas on a milligrams per dry standard cubic meter basis (60 °F, 29.92 IN. HG.)
$\dot{m}$	=	emissions or mass rate of carbon monoxide on a LB/HR basis
$Q_{s,d}$	=	volumetric flow rate of flue gas in dry standard cubic feet per minute
E	=	emission factor of carbon monoxide in pounds of carbon monoxide emitted per million BTU heat input (LB/MMBTU)
F_d	=	F-Factor of respective fuel in dry standard cubic feet of exhaust gas at 0% oxygen per million BTU of heat input (DSCF/MMBTU)

METHOD 25A

Total Gaseous Organics Calculation Equation

GR C/SCF $= 2.180 \times 10^{-4}$ (ppm, w)

GR C/DSCF $= 2.180 \times 10^{-4}$ (ppm, w)/(1-MC/100)

LB C/HR $= 8.5714 \times 10^{-5}$ (GR/DSCF) (DSCFM)

where:

GR C/SCF = grains of total gaseous organics as carbon per actual (wet) standard cubic foot

GR C/DSCF = grains of total gaseous organics as carbon per dry standard cubic foot

LB C/HR = pounds of total gaseous organics as carbon emitted per hour

Note 1: The Ratfisch Model RS 55 Heated FID Analyzer as normally operated with a heated filter, sample line and heated detector oven gives ppm, w.

Note 2: ppm, C = ppm as carbon = 3(ppm propane)

INTERPOLL LABORATORIES, INC

Concentration Calculation Equations for Benzene

1. **Structure:**



C_6H_6

2. **Molecular weight:**

78.11 g/g-mole

3. **Mass/volume Concentration:**

$$Cug/Nm3 = \frac{35.314\ m}{Vstd}$$

where m = Total mass of Benzene in sample in micrograms (ug), and

Vstd = Total volume of exhaust gas or air sampled in dry standard cubic feet (DSCF).

4. **Volume/volume Concentration:**

$$C_{ppmv}^{C_6H_6} = \left(\frac{mg}{Nm^3}\right) \times \left(\frac{24{,}054\ mL}{78.11\ mg}\right) = ppmV$$

$$C_{ppmv}^{C_6H_6} = 0.3080 \left(C_{Cmg/Nm3}^{C_6H_6}\right)$$

$$Cppmv = 3.08 \times 10^{-} \cdot Cug/Nm^3$$

5. **Notes:**

Per Excel spreadsheet

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Derived by: D. DESPEN | Date: 9-10-90

Form S-511

CALCULATION EQUATIONS

Chromotropic Acid Method for Formaldehyde

$$m_t = \frac{m_a V_{soln}}{V_{aliq}}$$

where:

m_t	=	mass of formaldehyde in total sample in ug
m_a	=	mass of formaldehyde in aliquot in ug
V_{soln}	=	volume of total sample in cc (500 cc normally)
V_{aliq}	=	volume of aliquot taken for analysis in cc
PPM·DRY	=	$\frac{0.0283\ m_t}{V_{std}}$
PPM·WET	=	PPM.DRY (1-MC/100)
GR/DSCF	=	5.45×10^{-4} (PPM·DRY)
mg/dscm	=	1.249 (PPM·DRY)
$\dot{m}$	=	8.5714×10^{-3} (GR/DSCF) ($Q_{s,d}$)

where:

PPM·DRY	=	concentration of formaldehyde in parts per million by volume on a dry basis
PPM·WET	=	concentration of formaldehyde in parts per million by volume on an actual or wet basis
MC	=	moisture content of gas on a percent by volume basis
GR/DSCF	=	concentration of formaldehyde in gas on a grains per dry standard cubic foot basis (68 °F, 29.92 IN. HG.)
$\dot{m}$	=	emission or mass rate of formaldehyde in pounds per hour (LB/HR)
V_{std}	=	dry gas volume as measured by the dry gas meter, corrected to standard conditions (at 68 °F and 1 atmosphere) DSCF

CALCULATION EQUATIONS

Gas Chromatographic Method for Phenol in Air

PPM·DRY $= \frac{9.03 \times 10^{-3}\ \dot{m}}{V_{std}}$

PP·WET = PPM·DRY (1-MC/100)

GR/DSCF $= 1.709 \times 10^{-3}$ (PPM·DRY)

mg/dscm = 3.913 (PPM·DRY)

$\dot{m} = 8.5714 \times 10^{-3}$ (GR/DSCF) ($Q_{s,d}$)

where:

PPM·DRY = concentration of phenol in gas in parts per million by volume on a dry basis

PPM·WET = concentration of phenol in gas in parts per million by volume on an actual or wet basis

MC = moisture content of gas on a percent by volume basis

GR/DSCF = concentration of phenol in gas on a grains per dry standard cubic foot basis (68 °F, 29.92 IN. HG.)

$\dot{m}$ = emission or mass rate of phenol in pounds per hour (LB/HR)

$Q_{s,d}$ = volumetric flow rate of stack gas in dry standard cubic feet per minute (DSCFM)

CALCULATION OF PAH EMISSION RATES

in g/sec and 10^{-6} g/sec

$\dot{m}$ (g/sec)

$$= \quad 4.716 \times 10^{-10} \; C_s \; (ug/m^3) \; \; Q_{s,d} \; (DSCFM)$$

$\dot{m}$ (10^{-3} g/sec)

$$= \quad 4.716 \times 10^{-7} \; \; Ca \; (ug/m^3) \; \; Q_{s,d} \; (DSCFM)$$

$\dot{m}$ (10^{-6} g/sec)

$$= \quad 4.716 \times 10^{-4} \; \; Cs \; (ug/m^3) \; \; Q_{s,d} \; (DSCFM)$$

where:

Q_s = ug/dsm^3

$Q_{s,d}$ = DSCF/MIN

INTERPOLL LABORATORIES, INC

Concentration Calculation Equations for MDI

1. Structure:	2. Molecular weight: 250.26 g/g-mole

3. Mass/volume Concentration:

$$Cug/Nm3 = \frac{35.314\ m}{Vstd}$$

where m = Total mass of MDI in sample in micrograms (ug), and

Vstd = Total volume of exhaust gas or air sampled in dry standard cubic feet (DSCF).

4. Volume/volume Concentration:

$$Cppmv = \left(\frac{24.054\ ul}{250.26\ ug}\right)\left(\frac{1Nm^3}{1000L}\right)\left(\frac{35.314\ m}{Vstd}\right)$$

$$Cppmv = (9.612 \times 10^{-5})Cug/Nm3$$

5. Notes: * as Excel spreadsheet:
G:\STACK\EXCEL\TEMPLATE\MDI.TEM

Derived by: Sheri P.	Date: 4-27-95

Form S-511

		LOUISIANA PACIFIC			Report No. 6-7318
		HAYWARD, WI			
	Oxides of Nitrogen Calculations				
DRYER RTO STACK					
TEST 6		LB/HR Calculations			
RUN	NOx ppm	Flow	LB/DSCF	LB/HR	
1	20.7	71990	2.47E-06	10.67538	
2	18.1	70905	2.16E-06	9.193826	
3	20.2	71495	2.41E-06	10.34589	
AVG	**19.7**			**10.1**	
LINE 1 CORE DRYER DUCT					
TEST 7		LB/HR Calculations			
RUN	NOx ppm	Flow	LB/DSCF	LB/HR	
1	35.3	22252	4.21E-06	5.6271	
2	37.9	23520	4.53E-06	6.38583	
3	35.7	22216	4.26E-06	5.681656	
AVG	**36.3**			**5.9**	
LINE 1 SURFACE DRYER DUCT					
TEST 8		LB/HR Calculations			
RUN	NOx ppm	Flow	LB/DSCF	LB/HR	
1	20.6	21479	2.46E-06	3.169729	
2	68.3	22195	8.15E-06	10.85967	
3	74	21107	8.84E-06	11.1892	
AVG	**54.3**			**8.4**	
PRESS VENT RTO STACK					
TEST 10		LB/HR Calculations			
RUN	NOx ppm	Flow	LB/DSCF	LB/HR	
1	24.4	74155	2.91E-06	12.96197	
2	24.1	75440	2.88E-06	13.02446	
3	23.6	74754	2.82E-06	12.63826	
AVG	**24.0**			**12.9**	
LINE 1 PRESS RTO INLET					
TEST 13		LB/HR Calculations			
RUN	NOx ppm	Flow	LB/DSCF	LB/HR	
1	11.4	74064	1.36E-06	6.048572	
2	4.9	74787	5.85E-07	2.625204	
3	3.3	74063	3.94E-07	1.750879	
AVG	**6.5**			**5.5**	
LINE 1 THERMAL OIL HEATER STACK					
TEST 18		LB/HR Calculations			
RUN	NOx ppm	Flow	LB/DSCF	LB/HR	
1	89.9	12735	1.07E-05	8.201617	
2	97.5	11660	1.16E-05	8.144117	
3	89.3	11910	1.07E-05	7.619107	
AVG	**92.2**			**8.0**	

Report No. 6-7318

LOUISIANA PACIFIC CORPORATION
Hayward, Wisconsin

BENZENE

TEST 5 Dryer RTO Stack

RUN	Vstd (DSCF)	MASS (ug)	CONC (ug/Nm3)	CONC (ppmv)	CONC (GR/DSCF)	FLOW (DSCFM)	E-RATE (LB/HR)
1	2.2	15	241	0.074159	0.00010522	71993	0.064929
2	2.21	17	272	0.083667	0.00011871	70905	0.072146
3	2.15	17	279	0.086002	0.00012202	71496	0.074778
AVG				**0.081276**			**0.07062**

TEST 15 Line 1 Thermal Oil Heater Stack

RUN	Vstd (DSCF)		MASS (ug)		CONC (ug/Nm3)		CONC (ppmv)		CONC (GR/DSCF)	FLOW (DSCFM)		E-RATE (LB/HR)
1	1.834	<	2.1	<	40	<	0.012454	<	1.767E-05	12735	<	0.001929
2	2.11	<	2.1	<	35	<	0.010825	<	1.5359E-05	11663	<	0.001535
3	1.92	<	2.1	<	39	<	0.011896	<	1.6879E-05	11906	<	0.001723
						<	**0.011725**				<	**0.00173**

Report No. 6-7318

LOUISIANA PACIFIC CORPORATION
Hayward, Wisconsin

Total HydroCarbons Calculations

DRYER RTO STACK

TEST #	RUN	MC%	CONC (ppmC,w)	GASFLOW (DSCFM)	MASSRATE (LB/HR)	AVERAGE (ppmC,w)	AVERAGE (LB/HR)
6	1	22.29	8.7	71993	1.51		
	2	23.6	12.3	70905	2.13		
	3	23.48	14.0	71496	2.44		
						11.666667	2.027773

LINE 1 CORE DRYER DUCT

TEST #	RUN	MC%	CONC (ppmC,w)	GASFLOW (DSCFM)	MASSRATE (LB/HR)	AVERAGE (ppmC,w)	AVERAGE (LB/HR)
7	1	27.75	312	22252	17.96		
	2	21.64	399	23520	22.38		
	3	28.00	375	22216	21.62		
						362	20.65145

LINE 1 SURFACE DRYER DUCT

TEST #	RUN	MC%	CONC (ppmC,w)	GASFLOW (DSCFM)	MASSRATE (LB/HR)	AVERAGE (ppmC,w)	AVERAGE (LB/HR)
8	1	30.84	740	21479	42.94		
	2	30.87	541	22195	32.46		
	3	31.01	560	21107	32.01		
						613.66667	35.80445

LOUISIANA PACIFIC CORPORATION
Hayward, Wisconsin

Total HydroCarbons Calculations

PRESS VENT RTO STACK

TEST #	RUN	MC%		CONC (ppmC,w)	GASFLOW (DSCFM)		MASSRATE (LB/HR)		AVERAGE (ppmC,w)		AVERAGE (LB/HR)
10	1	1.81	<	1	74155	<	0.14				
	2	1.60	<	1	75440	<	0.14				
	3	1.88	<	1	74754	<	0.14				
								<	1	<	0.142244

LINE 1 PRESS RTO INLET

TEST #	RUN	MC%	CONC (ppmC,w)	GASFLOW (DSCFM)	MASSRATE (LB/HR)	AVERAGE (ppmC,w)	AVERAGE (LB/HR)
13	1	1.26	23.4	74064	3.28		
	2	1.25	29.4	74787	4.16		
	3	1.28	38.7	74063	5.43		
						30.5	4.288472

	LOUISIANA PACIFIC CORPORATION					Report No. 6-7318			
	Hayward, Wisconsin								
TEST 6	DRYER RTO STACK								
	Gas Concentration Correction Calculations								
		NOx Calculations							
	Cbar				Cma				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	Co	(Upscale)	(Final)	(Initial)	Cm	Cgas
1	21.3	2	0	1.0	142	139	142	140.50	20.7
2	17.3	1	2	-0.5	142	140	139	139.50	18.1
3	19.3	-1	1	-1.0	142	144	140	142.00	20.2
Avg									19.6
		CO Calculations							
	Cbar				Cma				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	Co	(Upscale)	(Final)	(Initial)	Cm	Cgas
1	183.3	6	0	3.0	289	298	290	294.00	179
2	232.8	2	6	-2.0	289	302	298	300.00	225
3	205.7	4	2	1.0	289	290	296	293.00	203
Avg									202
		CO2 Calculations							
	Cbar				Cma				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	Co	(Upscale)	(Final)	(Initial)	Cm	Cgas
1	4.2	0.2	0	0.1	10.9	10.8	10.9	10.85	4.2
2	3.4	0.1	0.2	-0.1	10.9	10.7	10.8	10.75	3.5
3	4.2	0.2	0.1	0.1	10.9	11.2	10.7	10.95	4.2
Avg									3.9
		O2 Calculations							
	Cbar				Cma				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	Co	(Upscale)	(Final)	(Initial)	Cm	Cgas
1	16.3	-0.2	0	-0.1	13	13.2	13	13.10	16.2
2	16.9	0	0	0.0	13	12.9	13.1	13.00	16.9
3	16.2	-0.1	0	-0.1	13	13	12.9	12.95	16.3
Avg									16.4

TEST 7	LINE 1 CORE DRYER DUCT								
	Gas Concentration Correction Calculations								
		NOx Calculations							
	Cbar				*Cma*				
	OUR CONC	**ZERO**	**ZERO**		**CONC**	**Upscale**	**Upscale**		
RUN #	(ppm,d)	(Final)	(Initial)	*Co*	(Upscale)	(Final)	(Initial)	*Cm*	*Cgas*
1	36.0	2.54	2.14	0.2	240	247.03	239.87	243.45	35.3
2	37.9	1.22	2.54	-0.7	240	245.97	240.48	243.23	37.9
3	35.4	0	1.22	-0.6	240	241.7	241.7	241.70	35.7
Avg									36.3
		CO Calculations							
	Cbar				*Cma*				
	OUR CONC	**ZERO**	**ZERO**		**CONC**	**Upscale**	**Upscale**		
RUN #	(ppm,d)	(Final)	(Initial)	*Co*	(Upscale)	(Final)	(Initial)	*Cm*	*Cgas*
1	667.4	1.22	1.02	0.1	299	297.85	299.07	298.46	668.7
2	907.5	0	1.22	-0.6	299	297.85	297.85	297.85	909.8
3	774.6	0	0	0.0	299	297.85	297.85	297.85	777.6
Avg									785.
		CO2 Calculations							
	Cbar				*Cma*				
	OUR CONC	**ZERO**	**ZERO**		**CONC**	**Upscale**	**Upscale**		
RUN #	(ppm,d)	(Final)	(Initial)	*Co*	(Upscale)	(Final)	(Initial)	*Cm*	*Cgas*
1	4.5	0.02	0	0.01	10.5	10.45	10.5	10.48	4.5
2	4.6	0	0.02	-0.01	10.5	10.45	10.45	10.45	4.6
3	4.7	0	0	0.00	10.5	10.45	10.45	10.45	4.7
Avg									4.6
		O2 Calculations							
	Cbar				*Cma*				
	OUR CONC	**ZERO**	**ZERO**		**CONC**	**Upscale**	**Upscale**		
RUN #	(ppm,d)	(Final)	(Initial)	*Co*	(Upscale)	(Final)	(Initial)	*Cm*	*Cgas*
1	16.4	0.08	0.02	0.03	13.1	13.11	13.11	13.11	16.4
2	16.3	0	0.08	-0.04	13.1	13.17	13.11	13.14	16.2
3	16.2	0	0	0.00	13.1	13.39	13.17	13.28	16.0
Avg									16.2

TEST 8	LINE 1 SURFACE DRYER DUCT								
	Gas Concentration Correction Calculations								
		NOX Calculations							
	Cbar				*Cma*				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	*Co*	(Upscale)	(Final)	(Initial)	*Cm*	*Cgas*
1	20.6	0	0	0.0	72.1	72	72.1	72.05	20.6
2	68	0.5	0	0.3	72.1	71.5	72.1	71.80	68.3
3	73.5	1	0	0.5	72.1	71.2	72.1	71.65	74.0
Avg									54.3
		CO Calculations							
	Cbar				*Cma*				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	*Co*	(Upscale)	(Final)	(Initial)	*Cm*	*Cgas*
1	910	0	0	0.0	600	595	600	597.50	913.8
2	897	0.2	0	0.1	600	590	600	595.00	904.6
3	892	1	0	0.5	600	597	600	598.50	894.5
Avg									904.3

TEST 10	PRESS VENT RTO STACK								
	Gas Concentration Correction Calculations								
		NOx Calculations							
	Cbar				*Cma*				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	*Co*	(Upscale)	(Final)	(Initial)	*Cm*	*Cgas*
1	25.7	3	2	0.5	142	150	144	147.00	24.4
2	25.0	2	3	-0.5	142	150	150	150.00	24.1
3	25.2	2	2	0.0	142	153	150	151.50	23.6
Avg									24.0
		CO Calculations							
	Cbar				*Cma*				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	*Co*	(Upscale)	(Final)	(Initial)	*Cm*	*Cgas*
1	17.4	4	1	1.5	289	301	294	297.50	15.5
2	27.5	9	4	2.5	289	300	298	299.00	24.4
3	29.6	3	9	-3.0	289	299	300	299.50	31.1
Avg									23.7
		CO2 Calculations							
	Cbar				*Cma*				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	*Co*	(Upscale)	(Final)	(Initial)	*Cm*	*Cgas*
1	0.6	-0.1	0	-0.05	10.9	10.7	10.9	10.80	0.7
2	0.6	0	0	0.00	10.9	10.8	10.9	10.85	0.6
3	0.6	-0.1	0	-0.05	10.9	10.8	10.8	10.80	0.7
Avg									0.6
		O2 Calculations							
	Cbar				*Cma*				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	*Co*	(Upscale)	(Final)	(Initial)	*Cm*	*Cgas*
1	20.2	0.2	0	0.10	13.0	12.9	13.0	12.95	20.3
2	20.0	-0.1	0	-0.05	13.0	13.0	12.9	12.95	20.1
3	20.0	0	0	0.00	13.0	13.1	13.0	13.05	19.9
Avg									20.1

TEST 13	LINE 1 PRESS RTO INLET								
	Gas Concentration Correction Calculations								
		NOx Calculations							
	Cbar				Cma				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	Co	(Upscale)	(Final)	(Initial)	Cm	Cgas
1	12.6	2.69	0	1.3	72.1	72.14	72.33	72.24	11.4
2	4.8	0	0.37	-0.2	72.1	74	72.14	73.07	4.9
3	3.3	0	0	0.0	72.1	71	72.75	71.88	3.3
Avg									6.6
		CO Calculations							
	Cbar				Cma				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	Co	(Upscale)	(Final)	(Initial)	Cm	Cgas
1	10.1	0	0	0.0	299	296.63	298	297.32	10.2
2	7.5	0	0	0.0	299	292	296.63	294.32	7.6
3	3	0	0	0.0	299	298	292	295.00	3.0
Avg									6.9
		CO2 Calculations							
	Cbar				Cma				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	Co	(Upscale)	(Final)	(Initial)	Cm	Cgas
1	0.1	0.02	0	0.01	10.5	10.45	10.5	10.48	0.1
2	0.1	0	0	0.00	10.5	10.4	10.5	10.43	0.1
3	0.1	0	0	0.00	10.5	10.3	10.4	10.35	0.1
Avg									0.1
		O2 Calculations							
	Cbar				Cma				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	Co	(Upscale)	(Final)	(Initial)	Cm	Cgas
1	21.0	0.03	0.00	0.02	13.1	13	13.12	13.06	21.1
2	21.3	0.00	0.03	-0.02	13.1	13.1	13.18	13.14	21.2
3	21.2	0.00	0.00	0.00	13.1	13.03	13.1	13.07	21.3
Avg									21.2

TEST 18	LINE 1 THERMAL OIL HEATER STACK								
	Gas Concentration Correction Calculations								
		NOx Calculations							
	Cbar				*Cma*				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	*Co*	(Upscale)	(Final)	(Initial)	*Cm*	*Cgas*
1	90.3	2.44	0	1.2	145	144.65	145	144.83	89.9
2	97.7	1	0.31	0.3	145	145.57	144.65	145.11	97.5
3	89.7	1.22	1	0.1	145	145.57	145.57	145.57	89.3
Avg									92.3
		CO Calculations							
	Cbar				*Cma*				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	*Co*	(Upscale)	(Final)	(Initial)	*Cm*	*Cgas*
1	177	1.22	0	0.6	299	299.07	298.00	298.54	177.0
2	247.6	2	0	1.0	299	298.00	299.07	298.54	247.8
3	114	2	2	0.0	299	299.07	298.00	298.54	114.0
Avg									179.
		CO2 Calculations							
	Cbar				*Cma*				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	*Co*	(Upscale)	(Final)	(Initial)	*Cm*	*Cgas*
1	6.5	0	0	0.00	10.5	10.45	10.5	10.48	6.5
2	8.4	0	0	0.00	10.5	10.4	10.5	10.43	8.5
3	7.7	0	0	0.00	10.5	10.4	10.4	10.40	7.8
Avg									7.6
		O2 Calculations							
	Cbar				*Cma*				
	OUR CONC	ZERO	ZERO		CONC	Upscale	Upscale		
RUN #	(ppm,d)	(Final)	(Initial)	*Co*	(Upscale)	(Final)	(Initial)	*Cm*	*Cgas*
1	14.2	0.10	0.00	0.05	13.1	13.2	13.1	13.15	14.2
2	11.8	0.10	0.10	0.00	13.1	13.1	13.1	13.10	11.8
3	13.0	0.10	0.10	0.00	13.1	13.1	13.1	13.10	13.0
Avg									13.0

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Average Gas Concentration

(Eq. 6C - 1)

$$C_{gas} = (\bar{C} - C_o) \frac{CMA}{(C_M - C_o)}$$

$$C_o = \frac{C_{0i} + C_{0F}}{2}$$

where: C_{0i}: Initial zero response
C_{0F}: Final zero response

$$C_M = \frac{C_{si} + C_{SF}}{2}$$

where: C_{si}: Initial span response
C_{SF}: Final span response

C_{MA} = Span tank concentration

$\bar{C}$ = Data logger average

091595-G:\STACK\WP\FORMS\S-559b

									Report No. 6-7318		
				LOUISIANA PACIFIC							
				Hayward, Wisconsin							
PRESS VENT RTO STACK											
					MDI CALCULATIONS						
	TIME	**Vstd**		**Mass**	**Flow**		**Conc**		**Conc**		**Mass Rat**
RUN #	(HRS)	(DSCF)		(ug)	DSCFM		(mg/Nm3)		ppm		(LB/HR)
1	0800-0913	32.51	<	6.2	74678	<	0.007	<	0.00065	<	0.001884
2	0940-1052	31.72	<	6.2	74857	<	0.007	<	0.00066	<	0.001935
3	1117-1229	32.38	<	6.2	75110	<	0.007	<	0.00065	<	0.001902
AVG								<	**0.00065**	<	**0.0019**

APPENDIX L

OPERATIONAL DATA

* TESTED WITH RTO BURNERS ONLY NO BTUE

HAYWARD LINE I DRYER , PRESS ,THERMAL OIL TESTS

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LINE 1 PRESS TESTING FEBRUARY 21, 1996 - PM,METH,BENZ,NOx...

20.69 =Plant Production rate in Tons per hour
420.67 =MDI resin usage in pounds per hour
1.02% =MDI resin usage as % of finished product
886.67 =Liquid phenolic resin usage in pounds per hour (100% solids)
2.14% =Liquid phenolic resin usage as % of finished product (100% solids)
301.33 =Wax usage in pounds per hour
0.73% =Wax usage as % of finished product

LINE 1 PRESS TESTING FEBRUARY 22, 1996 - MDI

20.53 =Plant Production rate in Tons per hour
421.00 =MDI resin usage in pounds per hour
1.03% =MDI resin usage as % of finished product
908.25 =Liquid phenolic resin usage in pounds per hour (100% solids)
2.21% =Liquid phenolic resin usage as % of finished product (100% solids)
293.00 =Wax usage in pounds per hour
0.71% =Wax usage as % of finished product

LINE 1 PRESS TESTING FEBRUARY 22, 1996 - FORMALDEHYDE

19.43 =Plant Production rate in Tons per hour
419.25 =MDI resin usage in pounds per hour
1.08% =MDI resin usage as % of finished product
904.00 =Liquid phenolic resin usage in pounds per hour (100% solids)
2.33% =Liquid phenolic resin usage as % of finished product (100% solids)
280.50 =Wax usage in pounds per hour
0.72% =Wax usage as % of finished product

LINE 1 THERMAL OIL HEATER FEBRUARY 21, - PM

20.15 =Production rate in Tons per hour
0.46 =K1 estimated Tons per hour of fuel burned based on fuel measurement
8.25 =K1 estimated mmBTU per hour input based on fuel measurement
0.61 =K2 estimated Tons per hour of fuel burned based on fuel measurement
11.01 =K2 estimated mmBTU per hour input based on fuel measurement
1.07 =Total tons of dry bark per hour input
19.27 =Total mmBTU per hour input

LINE 1 THERMAL OIL HEATER - FEBRUARY 20/21, - POM

20.35 =Production rate in Tons per hour
0.48 =K1 estimated Tons per hour of fuel burned based on fuel measurement
8.63 =K1 estimated mmBTU per hour input based on fuel measurement
0.68 =K2 estimated Tons per hour of fuel burned based on fuel measurement
12.22 =K2 estimated mmBTU per hour input based on fuel measurement
1.16 =Total tons of dry bark per hour input
20.85 =Total mmBTU per hour input

LINE 1 THERMAL OIL HEATER - FEBRUARY 21, - PHENOL

20.73 =Production rate in Tons per hour
0.46 =K1 estimated Tons per hour of fuel burned based on fuel measurement
8.25 =K1 estimated mmBTU per hour input based on fuel measurement
0.69 =K2 estimated Tons per hour of fuel burned based on fuel measurement
12.50 =K2 estimated mmBTU per hour input based on fuel measurement
1.15 =Total tons of dry bark per hour input
20.74 =Total mmBTU per hour input

LINE 1 THERMAL OIL HEATER - FEBRUARY 22, - METH,BENZ,NOx...

20.32 =Production rate in Tons per hour
0.45 =K1 estimated Tons per hour of fuel burned based on fuel measurement
8.06 =K1 estimated mmBTU per hour input based on fuel measurement
0.64 =K2 estimated Tons per hour of fuel burned based on fuel measurement
11.52 =K2 estimated mmBTU per hour input based on fuel measurement
1.09 =Total tons of dry bark per hour input
19.58 =Total mmBTU per hour input

HAYWARD LINE I FEBRUARY 20 th 1996
PM/METH/BENZ/NOx/CO/CO2/THC/M2/NOx
DATA TIME START= 09:45 END= 14:30 HOURS= 4.75

BOARD WEIGHTS - LBS
average weights determined by taking bundle weights divided by peices per unit over the testing period.

	1/2"
per/peice	55.54
per/ 8' x 16'	222.17

PLANT PRODUCTION RATE

4.75	=hours during testing
70	=pressloads
840	=no. of 8'x16' boards produced (pressloads x 12 boards per load)
186,621	=lbs of finished product (boards produced x weight of finished board)
39,289	=lbs of finished product per hour (lbs of finshed product / hours)
19.64	=tons of finished product per hour (lbs of finshed product per hour / 2000 lb)

FUEL BURNING RATE ESTIMATED BY DRY FUEL INPUT

SURFACE

10	=SURFACE fuel calibration in pounds per count
2,191	=SURFACE counts during testing hours
21,910	=SURFACE lbs of fuel burned during testing
4.75	=hours during testing
4,613	=lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
2.31	=tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
8,600	=estimated BTU content per pound of dry fuel,
39.7	=estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)
1,630	=average inlet temperature
52.55	=average incoming moisture percent
5.47	=average dry moisture percent

CORE

10	=CORE fuel calibration in pounds per count
2,032	=CORE counts during testing hours
20,320	=CORE lbs of fuel burned during testing
4.75	=hours during testing
4,278	=lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
2.14	=tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
8,600	=estimated BTU content per pound of dry fuel,
36.8	=estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)
1,597	=average inlet temperature
52.55	=average incoming moisture percent
6.20	=average dry moisture percent

DRYER THROUGHPUT RATE

8,891	=Total pounds of fuel burned per hour in Core and Surface Dryer
39,289	=lbs of finished product per hour (lbs of finshed product / hours)
48,179	=Pounds of material produced by the dryer per hour (dry basis, assumming fuel balances)
2,642	= weight of trim per hour at 6.3% of finished product
6,249	=weight of screened fines per hour (total fuel - trim)
12.97%	=resulting loss to fines as percentage of dryer throughput

HAYWARD TESTING FEBRUARY 20th - 22nd
Test schedule

Line 1 Dryer Outlet / RTO Outlet / E-Tube Outlet

	POLLUTANT	RUN #1	RUN #2	RUN #3
2-20	PM/METH/BENZ/ NOX/CO/CO2/THC	0950-1057	1140-1248	1320-1430
2-20	PHENOL	1520-1620	1635-1735	1750-1850

Line 1 Dryer RTO Stack

	POLLUTANT	RUN #1	RUN #2	RUN #3
2-21	FORMALDEHYDE	0830-0938	1020-1127	1205-1310
2-21	POM	1730-2037		
2-22	POM		0800-1102	1300-1556

Line 1 Press Vent RTO Stack

	POLLUTANT	RUN #1	RUN #2	RUN #3
2-21	PM/METH/BENZ/ NOX/CO/CO2/THC	1215-1316	1400-1501	1535-1636

Line 1 Press Vent RTO Stack

	POLLUTANT	RUN #1	RUN #2	RUN #3
2-22	MDI	0800-0913	0940-1052	1117-1229
2-22	FORMALDEHYDE	1335-1436	1450-1551	1608-1708

Line 1 Thermal Oil Stack

	POLLUTANT	RUN #1	RUN #2	RUN #3
2-20	POM	1550-1905		
2-21	POM		0835-1130	1329-1618

Line 1 Thermal Oil Stack

	POLLUTANT	RUN #1	RUN #2	RUN #3
2-21	PHENOL	0934-1038	1056-1158	1341-1441
2-21	PM	1535-1651	1725-1829	1900-2004

Line 1 Thermal Oil Stack

	POLLUTANT	RUN #1	RUN #2	RUN #3
2-22	BENZ/FORM/NOX CO/O2/CO2	0900-1005	1053-1157	1303-1403

APPROXIMATE TEST TIMES ONLY - SEE INTERPOLL SHEETS FOR EXACT TIMES.

2

HAYWARD LINE I DRYER TESTING FEBRUARY 20 - 22, 1996
Line 1 process data summary

LINE 1 DRYER TESTING FEBRUARY 20, 1996 PM/METH/BENZ...

19.64 =PressProduction rate in Tons per hour
48,179 = Production rate of both dryers in pounds per hour
2.31 =Surface fuel burned in tons per hour
2.14 =Core fuel burned in tons per hour
4.45 =Total fuel (both dryers) burned in tons per hour
52.6% =average incoming moisture percent (both dryers)
5.8% =average dry moisture percent (both dryers)
1,613 =average inlet temperature (both dryers)

LINE 1 DRYER TESTING FEBRUARY 21, 1996 PHENOL

19.55 =PressProduction rate in Tons per hour
47,750 = Production rate of both dryers in pounds per hour
2.28 =Surface fuel burned in tons per hour
2.05 =Core fuel burned in tons per hour
4.32 =Total fuel (both dryers) burned in tons per hour
52.6% =average incoming moisture percent (both dryers)
5.1% =average dry moisture percent (both dryers)
1,636 =average inlet temperature (both dryers)

LINE 1 DRYER TESTING FEBRUARY 21, 1996 FORMALDEHYDE

20.70 =PressProduction rate in Tons per hour
50,157 = Production rate of both dryers in pounds per hour
2.24 =Surface fuel burned in tons per hour
2.14 =Core fuel burned in tons per hour
4.38 =Total fuel (both dryers) burned in tons per hour
51.7% =average incoming moisture percent (both dryers)
5.5% =average dry moisture percent (both dryers)
1,635 =average inlet temperature (both dryers)

LINE 1 DRYER TESTING FEBRUARY 21&22, 1996 POM

19.27 =PressProduction rate in Tons per hour
46,933 = Production rate of both dryers in pounds per hour
2.21 =Surface fuel burned in tons per hour
1.98 =Core fuel burned in tons per hour
4.19 =Total fuel (both dryers) burned in tons per hour
52.7% =average incoming moisture percent (both dryers)
5.5% =average dry moisture percent (both dryers)
1,635 =average inlet temperature (both dryers)

HAYWARD LINE I FEBRUARY 20 th 1996
PHENOL
DATA TIME START= 15:15 END= 19:00 HOURS= 3.75

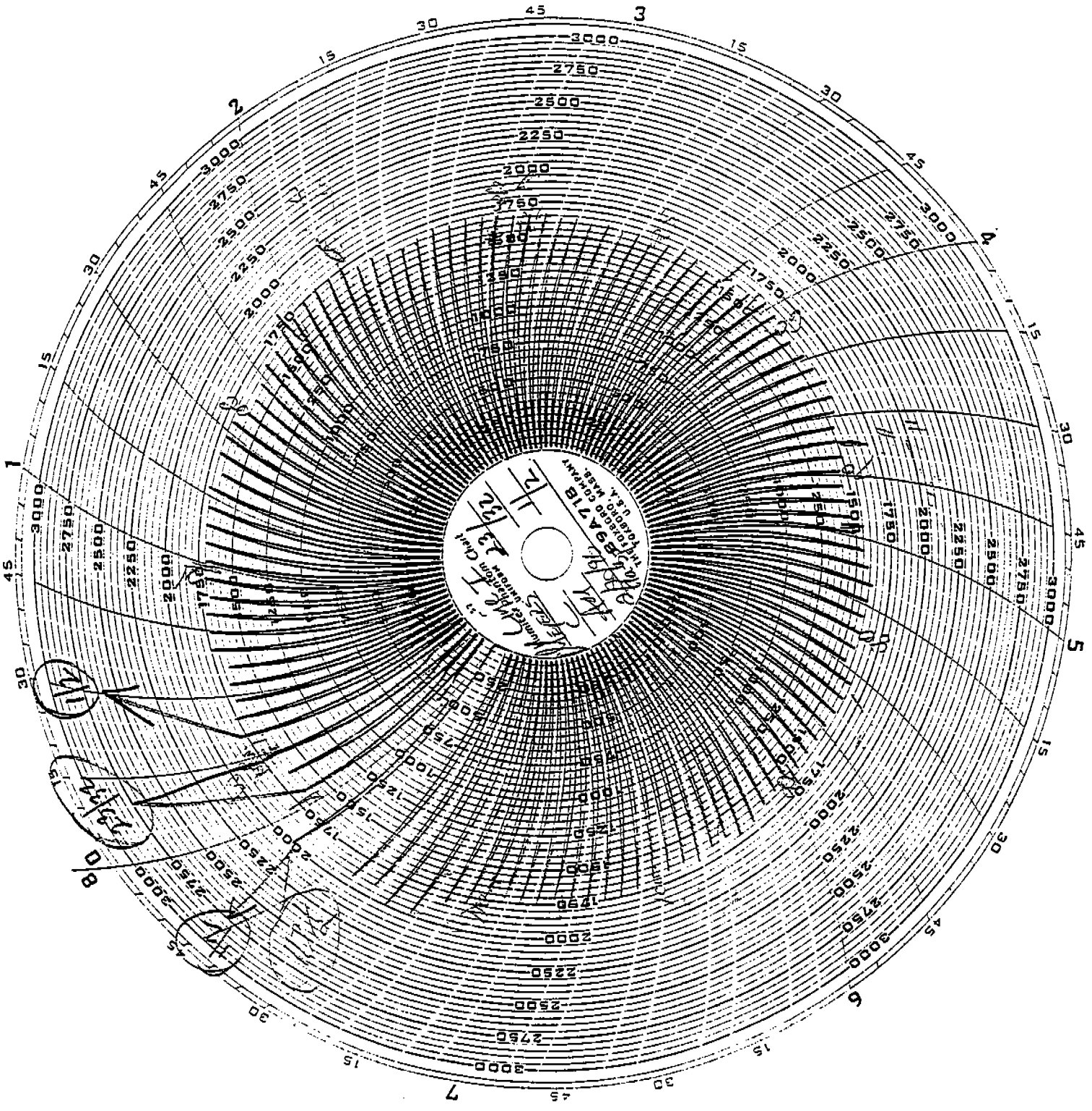
BOARD WEIGHTS - LBS
average weights determined by taking bundle weights divided by peices
per unit over the testing period.
1/2"
per/peice 55.54
per/ 8' x 16' 222.17

PLANT PRODUCTION RATE
3.75 =hours during testing
55 =pressloads
660 =no. of 8'x16' boards produced (pressloads x 12 boards per load)
146,631 =lbs of finished product (boards produced x weight of finished board)
39,102 =lbs of finished product per hour (lbs of finshed product / hours)
19.55 =tons of finished product per hour (lbs of finshed product per hour / 2000 lb)

FUEL BURNING RATE ESTIMATED BY DRY FUEL INPUT
SURFACE
10 =SURFACE fuel calibration in pounds per count
1,709 =SURFACE counts during testing hours
17,090 =SURFACE lbs of fuel burned during testing
3.75 =hours during testing
4,557 =lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
2.28 =tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
8,600 =estimated BTU content per pound of dry fuel,
39.2 =estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)
1,653 =average inlet temperature
52.55 =average incoming moisture percent
5.05 =average dry moisture percent
CORE
10 =CORE fuel calibration in pounds per count
1,534 =CORE counts during testing hours
15,340 =CORE lbs of fuel burned during testing
3.75 =hours during testing
4,091 =lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
2.05 =tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
8,600 =estimated BTU content per pound of dry fuel,
35.2 =estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)
1,619 =average inlet temperature
52.55 =average incoming moisture percent
5.16 =average dry moisture percent

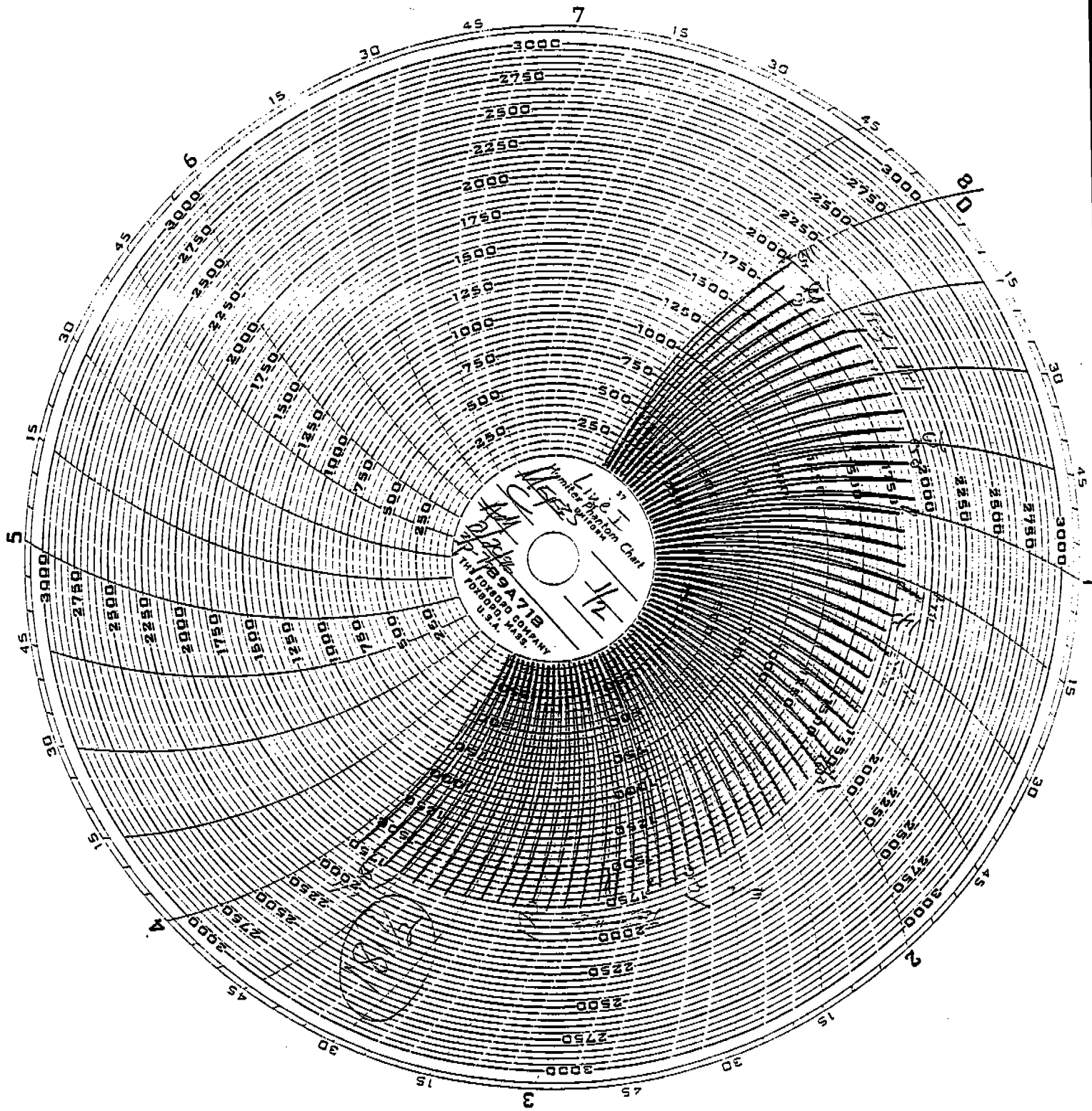
DRYER THROUGHPUT RATE
8,648 =Total pounds of fuel burned per hour in Core and Surface Dryer
39,102 =lbs of finished product per hour (lbs of finshed product / hours)
47,750 =Pounds of material produced by the dryer per hour (dry basis, assumming fuel balances)
2,629 = weight of trim per hour at 6.3% of finished product
6,019 =weight of screened fines per hour (total fuel - trim)
12.61% =resulting loss to fines as percentage of dryer throughput

PRESS CHART
2/20/96
0700 -1500



7

PRESS CHART
15:00 - 19:00



LOUISIANA-PACIFIC CORPORATION

PRESS REPORT - LINE (1) 2

DATE: 2-20-96

OPERATOR: Meyers SHIFT: Days CREW: C

THICKNESS: 23/32 H PRESS LDS: 3 23/32 H, 15 1 1/2

OVERALL TIMER: 270 DECOMPRESSION TIME: -30

PRESS TEMP: 215°C TOTAL REJECTS: —

LOG COUNT: 1517

LINE SPEED	THKNS.	FROM	TO
35	23/32H	7:00	712
52	1/2	712	829
55	"	829	223
45	"	223	300
55	"	3:00	300

F.C.O.S. HYD. RADIATOR: 730 TIME

PRESS BLOWN DOWN: 700

SPINNER HEADS FLUSHED: — TIME

SURFACE BLENDER HOSED: — TIME

FORMER HYD RADIATOR: — TIME

DOWNTIME FROM	DOWNTIME TO	DOWNTIME (MINS) M	E	O	KEY	REASONS FOR DOWNTIME
245	253	8				Locked at leaking Regulator on the Unloader Boom & adjusted the tarp for Light #1 of the Unloader Case. Also stayed down to build up Dry Bins for testing purposes.

DOWNTIME CODE: M - MECHANICAL (8) E - ELECTRICAL O - OPERATOR

Dryer DATA
fuel calibration lb/coun face core

date 2/10/96
by
page 1 of 2

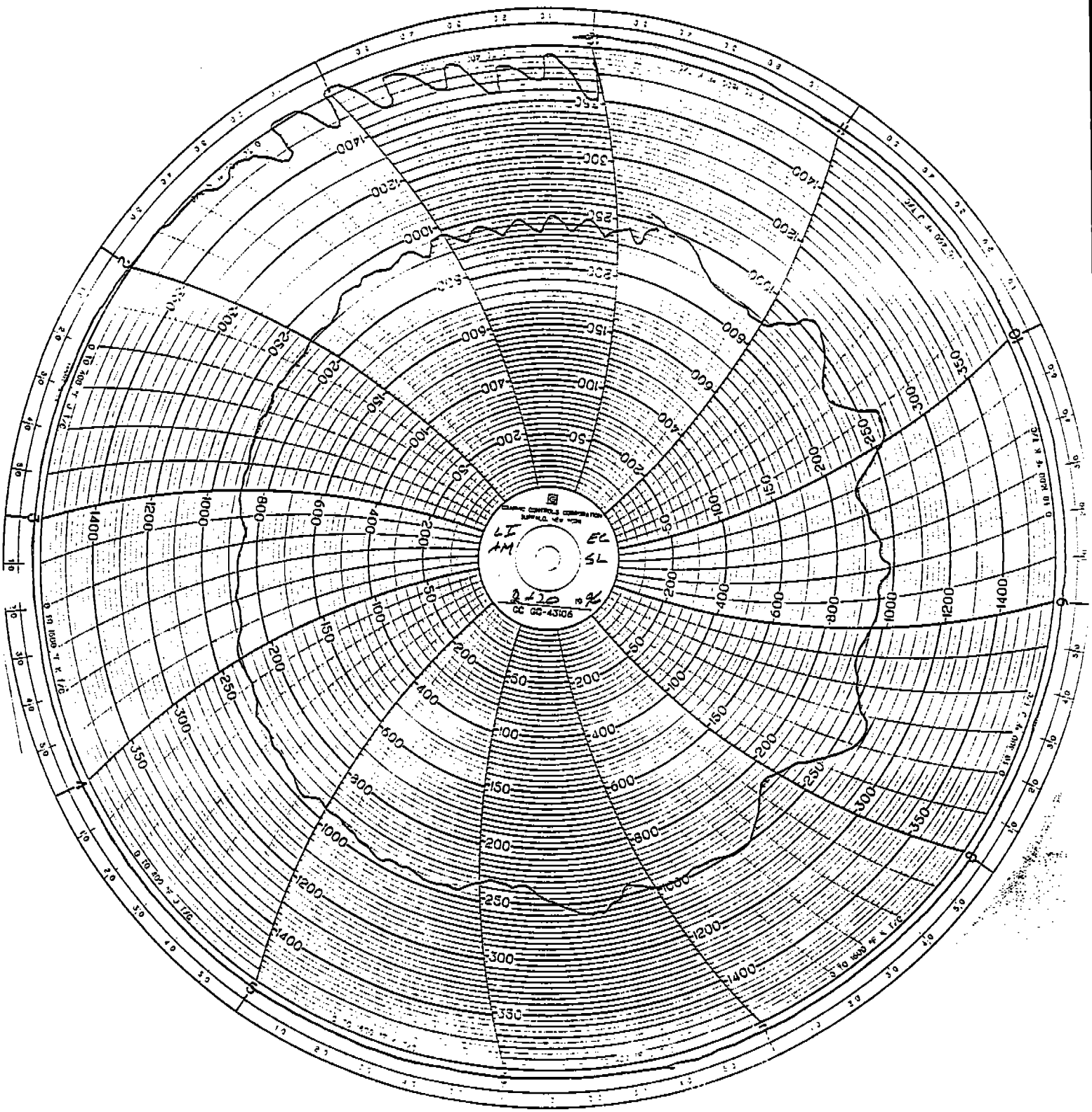
TIME	FACE OUT. SET POINT	FACE FEED RATE	FACE INLET TEMP	FACE OUTLET TEMP	FACE FUEL COUNT	FACE WET BIN LEVEL	CORE OUT. SET POINT	CORE FEED RATE	CORE INLET TEMP	CORE OUTLET TEMP	CORE FUEL COUNT	CORE WET BIN LEVEL	DRY BIN LEVEL FACE	DRY BIN LEVEL CORE	EVERY HOUR FLAKE MOISTURE IN	EVERY HOUR FLAKE MOISTURE FACE	EVERY HOUR FLAKE MOISTURE CORE
9:00	246	56	1634	230	933	100%	271	57	1659	257	857	100%	90%	80%	49.6	5.8	6.0
9:15	246	56	1632	227	1039	90%	271	57	1643	258	946	100%	95%	70%		5.8	6.2
9:30	246	56	1632	232	1158	90%	271	57	1643	261	1052	90%	95%	70%		5.6	6.0
9:45	246	56	1646	229	1259	90%	271	57	1604	258	1143	90%	95%	70%		6.4	6.4
10:00	246	56	1610	225	1381	95%	271	57	1609	252	1253	95%	95%	70%	52.2	6.0	6.8
10:15	246	56	1602	223	1475	90%	271	57	1577	252	1338	90%	90%	70%		5.8	6.4
10:30	246	55	1607	216	1604	70%	271	56	1575	255	1453	90%	95%	75%		6.2	6.0
10:45	246	55	1601	222	1711	70%	271	56	1569	252	1548	90%	95%	75%		6.0	6.0
11:00	246	53	1655	225	1837	70%	271	56	1571	251	1657	90%	95%	75%	51.2	6.8	6.0
11:15	246	54	1667	234	1956	75%	271	56	1604	252	1764	90%	95%	75%		5.6	6.8
11:30	246	53	1658	238	2066	80%	271	56	1642	255	1864	90%	95%	70%		5.6	6.6
11:45	246	53	1655	236	2178	90%	271	56	1620	256	1968	90%	95%	70%		5.4	6.6
12:00	246	51	1617	248	2294	90%	271	54	1621	262	2072	95%	90%	65%	52.6	4.8	6.0
12:15	248	51	1594	239	2410	85%	271	54	1576	262	2180	95%	90%	60%		5.0	6.0
12:30	248	51	1601	250	2526	80%	271	53	1565	268	2289	90%	85%	65%		5.8	5.6
12:45	248	52	1615	244	2645	70%	273	53	1542	270	2396	90%	70%	60%		5.2	6.2
1:00																	
1:15	248	53	1683	236	2894	60%	274	54	1607	265	2623	70%	60%	45%		5.6	7.2
1:30	248	50	1648	242	2991	50%	274	54	1633	264	2715	70%	60%	45%		5.8	6.6
1:45	256	52	1648	265	3100	50%	274	55	1632	268	2817	70%	60%	40%		4.0	5.8
2:00	256	54	1623	247	3223	30%	274	55	1618	262	2935	60%	50%	40%	51.2	5.0	6.4
2:15	256	55	1636	258	3333	30%	274	56	1620	276	3032	60%	40%	30%		4.6	5.4
2:30	256	56	1646	255	3450	40%	274	58	1627	271	3175	40%	45%	35%		4.6	5.4
2:45	256	57	1649	257	3567	50%	274	57	1625	271	3251	40%	50%	40%		4.0	5.2
3:00	256	57	1630	232	3678	55%	274	58	1585	286	3356	40%	60%	50%	51.0	5.6	6.2
3:15	256	52	1662	232	3799	60%	274	59	1570	284	3467	50%	65%	50%		5.6	6.4
3:30	256	55	1659	273	3915	70%	274	60	1582	280	3567	60%	60%	45%		3.6	6.6
3:45	256	56	1660	254	4029	70%	274	60	1617	268	3671	60%	60%	45%		6.0	6.2
4:00	256	56	1636	236	4144	60%	274	59	1634	271	3771	60%	50%	45%		5.4	5.6
4:15	256	56	1661	251	4258	75%	274	59	1632	275	3882	75%	50%	50%	52.8	4.5	5.3
4:30	256	57	1634	252	4401	75%	274	59	1601	283	4013	75%	55%	55%		4.6	5.8
4:45	256	57	1653	241	4501	65%	274	59	1660	277	4103	65%	60%	60%		5.6	4.6
5:00	256	53	1671	230	4609	50%	274	59	1680	275	4201	60%	60%	60%	53.6	5.8	6.4
5:15	256	53	1647	211	4723	40%	274	58	1587	267	4305	50%	60%	60%		3.8	6.0
5:30	256	56	1601	239	4835	30%	274	55	1655	278	4415	40%	60%	60%		5.2	2.8
5:45	256	56	1661	260	4955	40%	274	57	1620	291	4530	30%	60%	60%		6.8	4.0

Dryer DATA
fuel calibration lb/coun face core

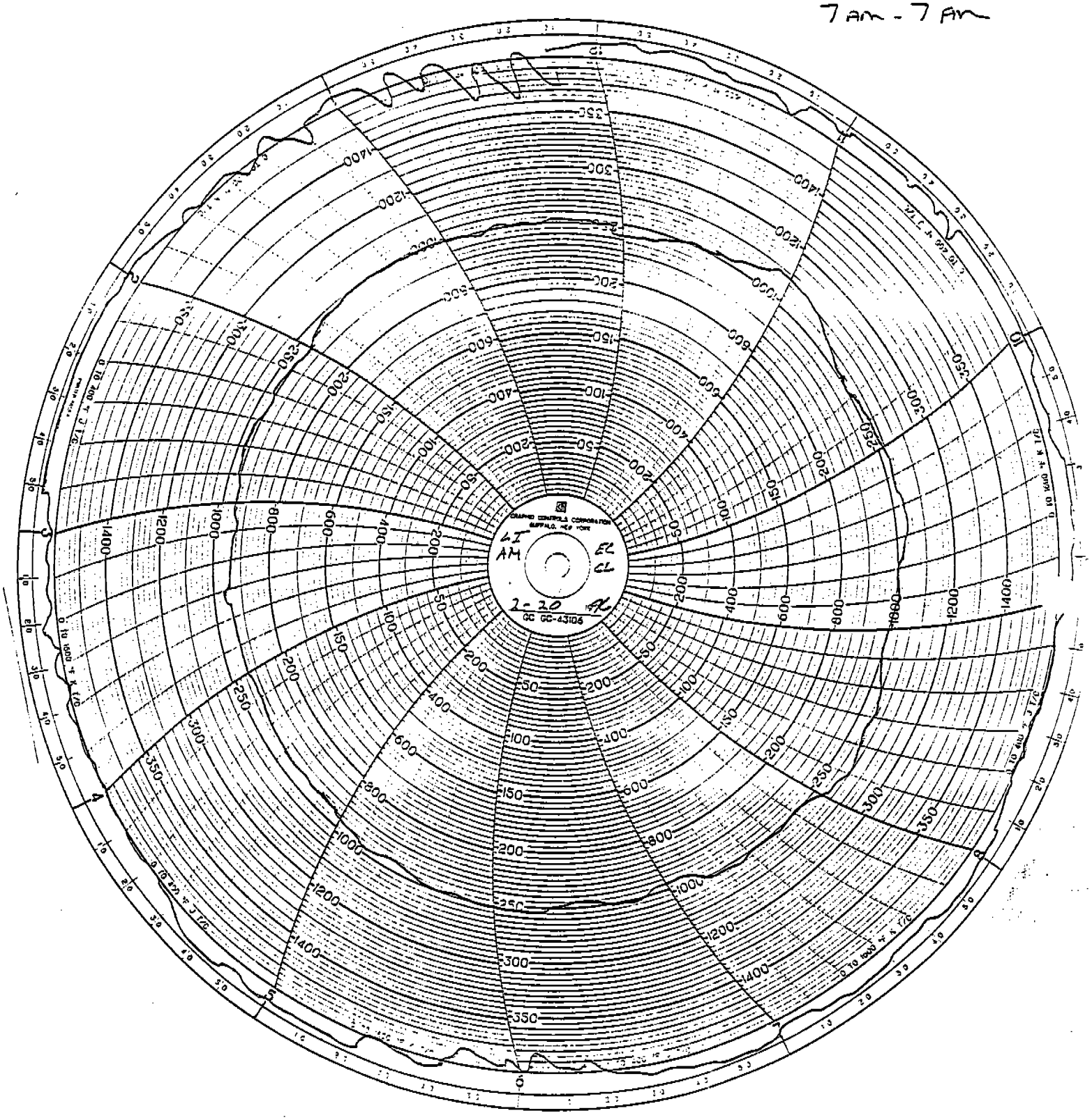
date 2/20/96
by
page 2 of 2

TIME	FACE OUT. SET POINT	FACE FEED RATE	FACE INLET TEMP	FACE OUTLET TEMP	FACE FUEL COUNT	FACE WET BIN LEVEL	CORE OUT. SET POINT	CORE FEED RATE	CORE INLET TEMP	CORE OUTLET TEMP	CORE FUEL COUNT	CORE WET BIN LEVEL	DRY BIN LEVEL FACE	DRY BIN LEVEL CORE	EVERY HOUR FLAKE MOISTURE IN	EVERY HOUR FLAKE MOISTURE FACE	EVERY HOUR FLAKE MOISTURE CORE
6:00	256	58	1669	251	5064	70%	274	60	1577	292	4611	30%	50%	50%	52.6	4.4	3.8
6:15	256	56	1664	234	5196	50%	274	60	1623	277	4736	50%	40%	40%		5.4	5.2
6:30	256	55	1679	226	5290	60%	274	60	1630	275	4816	60%	40%	40%		6.0	5.2
6:45	256	54	1643	257	5401	50%	274	60	1636	261	4915	50%	40%	40%		4.6	6.0
7:00	256	54	1634	263	5508	50%	274	60	1597	258	5001	50%	40%	40%		4.4	6.8

SURFACE DRYER
2/20/96



LINE I
CORE DRYER
2/20/96
7 AM - 7 AM



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LI Dryer RTO 2-20-96

RECORD EVERY 15 MIN. — HAYWARD AIR TESTING WORKSHEET

Time	RTO Chamber Bed Temp.					Inlet	Burners		Combust.	Exhaust	Press.	Gas
	#1	#2	#3	#4	#5	Press.	B#1	B#2	Temp.	Temp.	Drop	Usage
9:00	315	356	469	435	335	1.7	43.6	50.0	1515	254	26.1	0
9:15	319	351	468	442	329	1.5	25.0	25.8	1526	245	26.7	2
9:30	318	350	469	443	328	1.5	26.0	26.6	1531	247	26.8	4
9:45	317	348	473	441	329	1.1	50.8	28.8	1521	250	27.3	7
10:00	316	350	472	444	325	1.3	29.8	32.6	1514	241	26.7	9
10:15	315	351	473	446	324	1.2	27.8	31.7	1514	240	26.7	11
10:30	314	351	473	447	323	1.0	27.0	29.4	1514	239	26.2	14
10:45	314	350	476	444	325	1.2	24.0	31.8	1516	241	26.6	16
11:00	[illegible]	352	474	448	321	.6	36.1	32.3	1512	240	26.3	18
11:15	312	353	474	449	321	1.2	35.0	28.8	1513	242	26.6	20
11:30	312	354	476	449	320	.8	36.0	25.8	1513	241	26.3	23
11:45	311	355	475	451	320	1.3	34.3	27.7	1512	242	26.6	25
12:00	311	357	475	451	319	1.3	35.7	31.0	1513	246	26.7	27
12:15	310	356	475	451	320	1.5	36.1	22.7	1512	243	26.5	29
12:30	309	356	472	449	317	1.2	36.8	30.7	1512	240	26.8	32
12:45	308	357	473	448	317	1.1	25.1	29.6	1519	246	26.7	34
1:00	309	357	474	449	317	1.1	62.6	29.8	1512	245	26.8	37
1:15												
1:30	309	359	475	449	318	.9	36.8	34.9	1511	256	26.2	41
1:45	310	360	475	451	317	.9	37.2	26.8	1509	252	26.2	43
2:00	309	360	476	450	317	1.0	36.7	20.6	1508	253	26.3	46
2:15	310	358	477	449	318	1.2	35.0	28.2	1514	246	26.8	48
2:30	310	360	476	449	318	.9	36.3	33.6	1509	257	26.2	50
2:45	310	361	477	449	319	1.2	34.4	24.9	1513	252	26.1	52
3:00	310	362	476	449	319	1.0	34.2	24.0	1509	251	26.2	55
3:15	311	361	476	449	319	1.1	33.9	28.3	1509	246	26.6	57
3:30	311	361	475	449	319	1.1	35.8	27.7	1509	252	26.3	59
3:45	312	357	476	447	318	1.2	34.0	27.6	1511	242	26.5	62
4:00	313	355	478	445	320	.7	35.0	28.0	1509	240	26.2	64
4:15	314	356	476	447	321	.8	38.5	31.3	1510	241	26.1	66
4:30	314	355	474	446	320	.9	35.3	30.7	1509	240	26.5	68
4:45	315	354	474	446	322	1.0	36.8	30.1	1512	240	26.2	71
5:00	316	353	476	444	324	1.5	37.7	27.3	1510	242	26.5	73
5:15	317	353	477	442	326	1.2	56.3	31.8	1506	250	27.2	75
5:30	317	352	475	442	326	1.2	43.7	25.9	1509	244	26.8	77
5:45	318	352	476	440	328	.8	50.3	32.1	1510	250	27.2	80
6:00	317	351	476	439	328	.6	46.8	33.0	1511	250	27.2	82
6:15	317	352	476	439	329	.8	51.2	34.6	1511	250	27.4	84
6:30	317	352	476	435	330	.5	50.6	30.0	1511	251	27.4	86
6:45	317	353	476	438	331	.7	53.7	31.9	1509	250	27.5	89
7:00	317	352	475	437	331	.6	50.9	34.7	1511	250	27.4	91

KCF

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Unit 1 Dryer RTO
2/20/96

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DATE: 2-2A-96 - 1
SHIFT/CREW: 1ST OP C
OPERATOR: ATKINSON

UNIT/ THICKNESS	WEIGHT	HEIGHT	UNIT/ THICKNESS	WEIGHT	HEIGHT
1	#3693	36⅝ 705	31	#4475	40⅜
2		36⅝ 711	32	#4470	41⅛
3		36⅝ 7161	33	#4384	41⅛
4	#3741	36⅜ 724	34	#4610	41⅛
5		36⅛ 738	35	#4499	40⅜
1	#4346	39⅜ 736	36	#4511	41
2	#4320	40 744	37	#4511	40⅜
3	#4436	40⅜ 7501	38	#4545	41
4	#4423	40⅜ 7571	39	#4498	40⅜
5	#4489	41 804	40	#4493	41
6	#4410	40⅝ 8101	41	#4503	41
7	#4421	40⅝ 816	42	#4506	40⅜
8	#4408	40⅝ 8241	43	#4540	40⅜
9	#4425	40⅝ 8301	44	#4571	41⅛
10	#4406	40⅝ 8371	45	#4459	40⅝
11	#4442	40⅝ 8431	46	#4600	41
12	#4342	40⅝ 850	47	#4518	40⅝
13	#4287	40⅜ 856	48	#4488	40⅝
14	#4415	40⅜ 902	49	#4510	40⅜
15	#4377	40⅝ 9081	50	#4345	40
16	#4396	40½ 9141	51	#4384	39⅜
17	#4392	40⅛ 9221	52	#4419	40
18	#4387	40⅝ 9281	53	#4365	40
19	#4348	40⅛ 935	54	#4530	39⅜
20	#4373	40⅛ 7411	55	#4327	39½
21	#4442	40⅛ 7471	56	#4356	39⅜
22	#4443	40⅛ 9531	57	#4344	40⅛
23	#4453	40⅝ 9571	58	#4397	39⅜
24	#4387	40⅝ 1005	59	#4479	40⅛
25	#4438	41⅛ 1010	60	#4447	40⅝
26	#4351	40⅛ 1017	61	#4431	40⅛
27	#4381	40⅛ 1024	62	#4471	40⅜
28	#4371	40⅜ 1031	63	#4478	40⅛
29	#4400	40⅜ 1037	64	#4460	40⅜
30	#4395	40½ 1044	65	#4419	40⅜

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DATE: 1/20/96

SHIFT/CREW:

OPERATOR:

UNIT/ THICKNESS	WEIGHT	HEIGHT	UNIT/ THICKNESS	WEIGHT	HEIGHT
65/16	#4598	40 307	65 101	4497	140 5/8 649
67	#4614	41 1/8 315	102	4480	140 5/8 655
68	#4391	40 3/4 321			
69	#4433	40 5/8 327			
70	#4469	40 5/8 333			
71	#4491	40 5/8 340			
72	#4504	40 3/4 346			
73	#4507	40 3/4 353			
74	#4477	40 3/4 359			
75	#4473	40 5/8 405			
76	#4492	40 5/8 411			
77	#4472	40 5/8 4:19			
78	#4479	40 5/8 424			
79	#4448	40 3/8 431			
80	#4409	40 5/8 437			
81	#4334	40 4:44			
82	#1316	40 1/8 4:48			
83	#4341	40 5/8 4:54			
84	#4368	40 1/8 5:02			
85	#1360	40 5/8 5:08			
86	#4358	40 5/8 5:15			
87	#4348	40 1/8 520			
88	#4367	40 5/8 527			
89	#4376	40 3/8 533			
90	#4359	40 5/8 540			
91	#4378	40 3/8 546			
92	#4366	40 5/8 554			
93	#4423	40 3/8 559			
94	#4463	40 3/8 605			
95	#4500	40 5/8 612			
96	#4517	40 3/4 616			
97	#4502	40 1/2 6:25			
98	#4495	40 3/4 630			
99	#4491	40 3/4 637			
100	#4488	40 5/8 643			

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HAYWARD LINE I FEBRUARY 21 st 1996
FORMALDEHYDE
DATA TIME START= 08:30 END= 13:15 HOURS= 4.75

BOARD WEIGHTS - LBS
average weights determined by taking bundle weights divided by peices
per unit over the testing period.

	1/2"
per/peice	54.63
per/ 8' x 16'	218.51

PLANT PRODUCTION RATE

4.75	=hours during testing
75	=pressloads
900	=no. of 8'x16' boards produced (pressloads x 12 boards per load)
196,657	=lbs of finished product (boards produced x weight of finished board)
41,402	=lbs of finished product per hour (lbs of finshed product / hours)
20.70	=tons of finished product per hour (lbs of finshed product per hour / 2000 lb)

FUEL BURNING RATE ESTIMATED BY DRY FUEL INPUT

SURFACE

10	=SURFACE fuel calibration in pounds per count
2,128	=SURFACE counts during testing hours
21,280	=SURFACE lbs of fuel burned during testing
4.75	=hours during testing
4,480	=lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
2.24	=tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
8,600	=estimated BTU content per pound of dry fuel,
38.5	=estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)
1,646	=average inlet temperature
51.68	=average incoming moisture percent
5.03	=average dry moisture percent

CORE

10	=CORE fuel calibration in pounds per count
2,031	=CORE counts during testing hours
20,310	=CORE lbs of fuel burned during testing
4.75	=hours during testing
4,276	=lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
2.14	=tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
8,600	=estimated BTU content per pound of dry fuel,
36.8	=estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)
1,623	=average inlet temperature
51.68	=average incoming moisture percent
5.96	=average dry moisture percent

DRYER THROUGHPUT RATE

8,756	=Total pounds of fuel burned per hour in Core and Surface Dryer
41,402	=lbs of finished product per hour (lbs of finshed product / hours)
50,157	=Pounds of material produced by the dryer per hour (dry basis, assumming fuel balances)
2,784	= weight of trim per hour at 6.3% of finished product
5,972	=weight of screened fines per hour (total fuel - trim)
11.91%	=resulting loss to fines as percentage of dryer throughput

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LOUISIANA-PACIFIC CORPORATION

PRESS REPORT - LINE (1) 2 DATE: 2/21/96

OPERATOR Mock SHIFT: AM CREW: 1

THICKNESS 7/16 PRESS LDS: 6 7/16 180 1/2

OVERALL TIMER: 180 DECOMPRESSION TIME: 15 ± 2

PRESS TEMP: 215° TOTAL REJECTS:

LOG COUNT: 1470

LINE SPEED	THKNS.	FROM	TO
55	7/16	7:00	
55	1/2	7:00	
55	11	8:20	
45	11	1:20	
55	11	1:45	
45	11	4:30	
55	11	5:50	

F.C.O.S. HYD. RADIATOR: ✓ TIME

PRESS BLOWN DOWN: ✓

SPINNER HEADS FLUSHED: ✓ TIME

SURFACE BLENDER HOSED: ✓ TIME

FORMER HYD RADIATOR: ✓ TIME

DOWNTIME FROM	DOWNTIME TO	DOWNTIME (MINS) M	E	O	KEY	REASONS FOR DOWNTIME

DOWNTIME CODE: M - MECHANICAL O E - ELECTRICAL O - OPERATOR

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LOUISIANA-PACIFIC CORPORATION

PRESS REPORT - LINE (1) 2 DATE: 7-21-96

OPERATOR VISSER SHIFT: 5PM CREW: B

THICKNESS 1/2 PRESS LDS: 30½ 55 19/32 SE 87 15/32

OVERALL TIMER: 173 DECOMPRESSION TIME: 18

PRESS TEMP: 215° TOTAL REJECTS: ____

LOG COUNT: 1528

LINE SPEED	THKNS.	FROM	TO
55	1/2	7:00	
56	19/32 SE	855	
52	15/32	100	
48	15/32	500	
45	15/32	640	

F.C.O.S. HYD. RADIATOR: ____ TIME

PRESS BLOWN DOWN: ____

SPINNER HEADS FLUSHED: ____ TIME

SURFACE BLENDER HOSED: ____ TIME

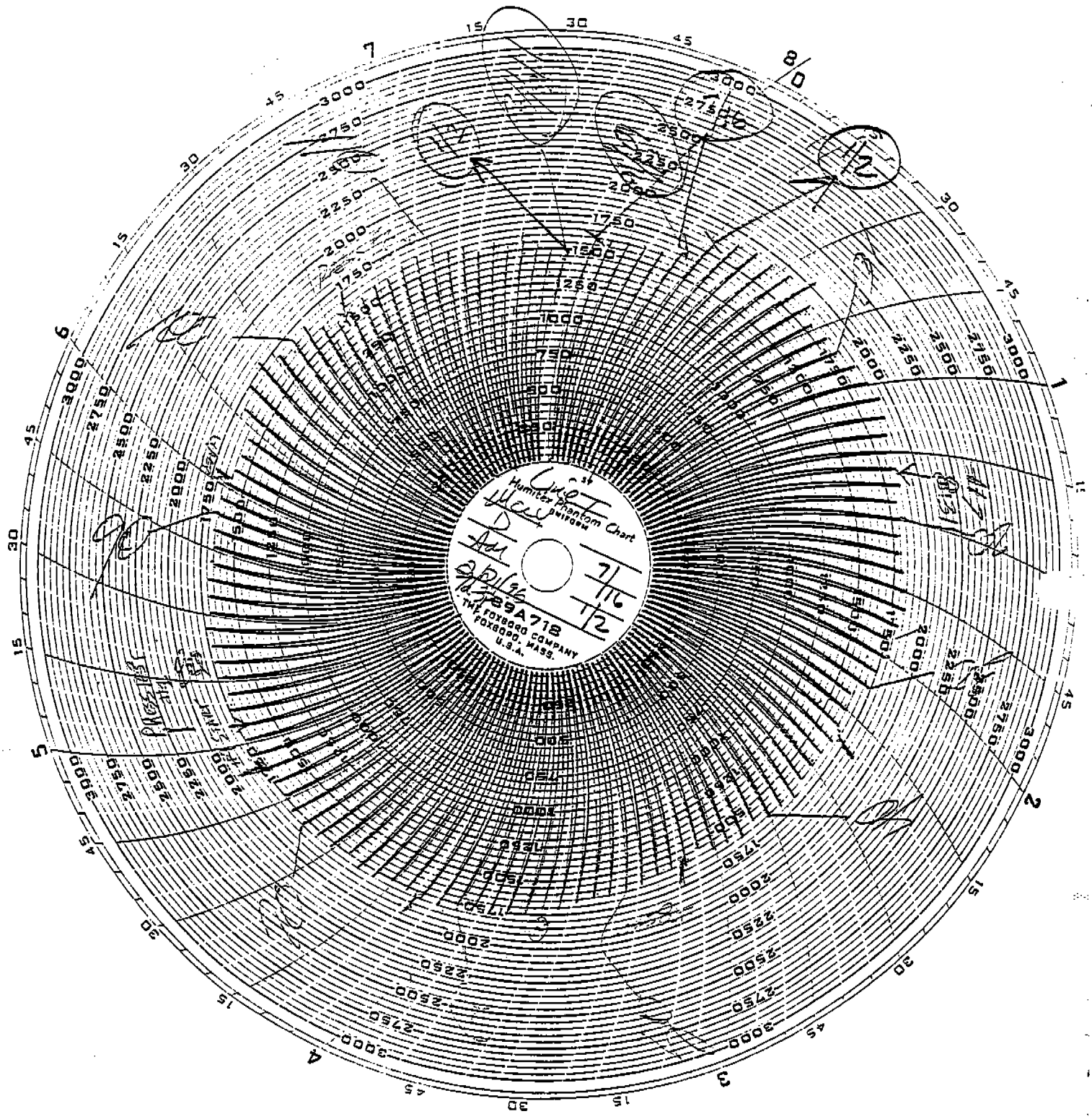
FORMER HYD RADIATOR: ____ TIME

DOWNTIME FROM	DOWNTIME TO	DOWNTIME (MINS) M	E	O	KEY	REASONS FOR DOWNTIME

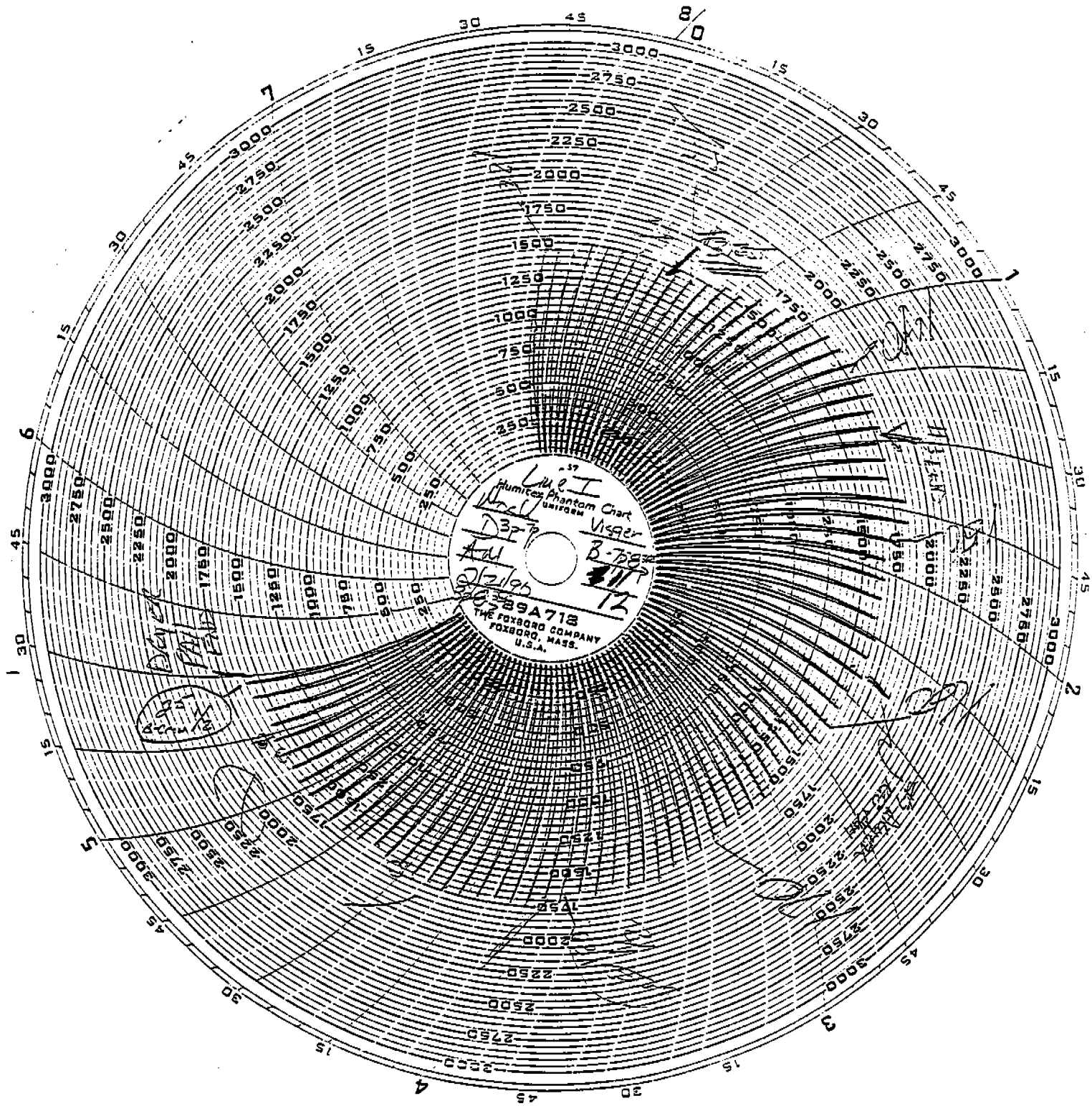
DOWNTIME CODE: M - MECHANICAL O E - ELECTRICAL O - OPERATOR

20

CONTAINMENT PRESS
CHART
2/21/96
0700-1500



Line 1
PRESS CHART
2/21/94
1500 - 2030



22

Dryer DATA
fuel calibration lb/coun face core

date 2/21/96
by
page 1 of 2

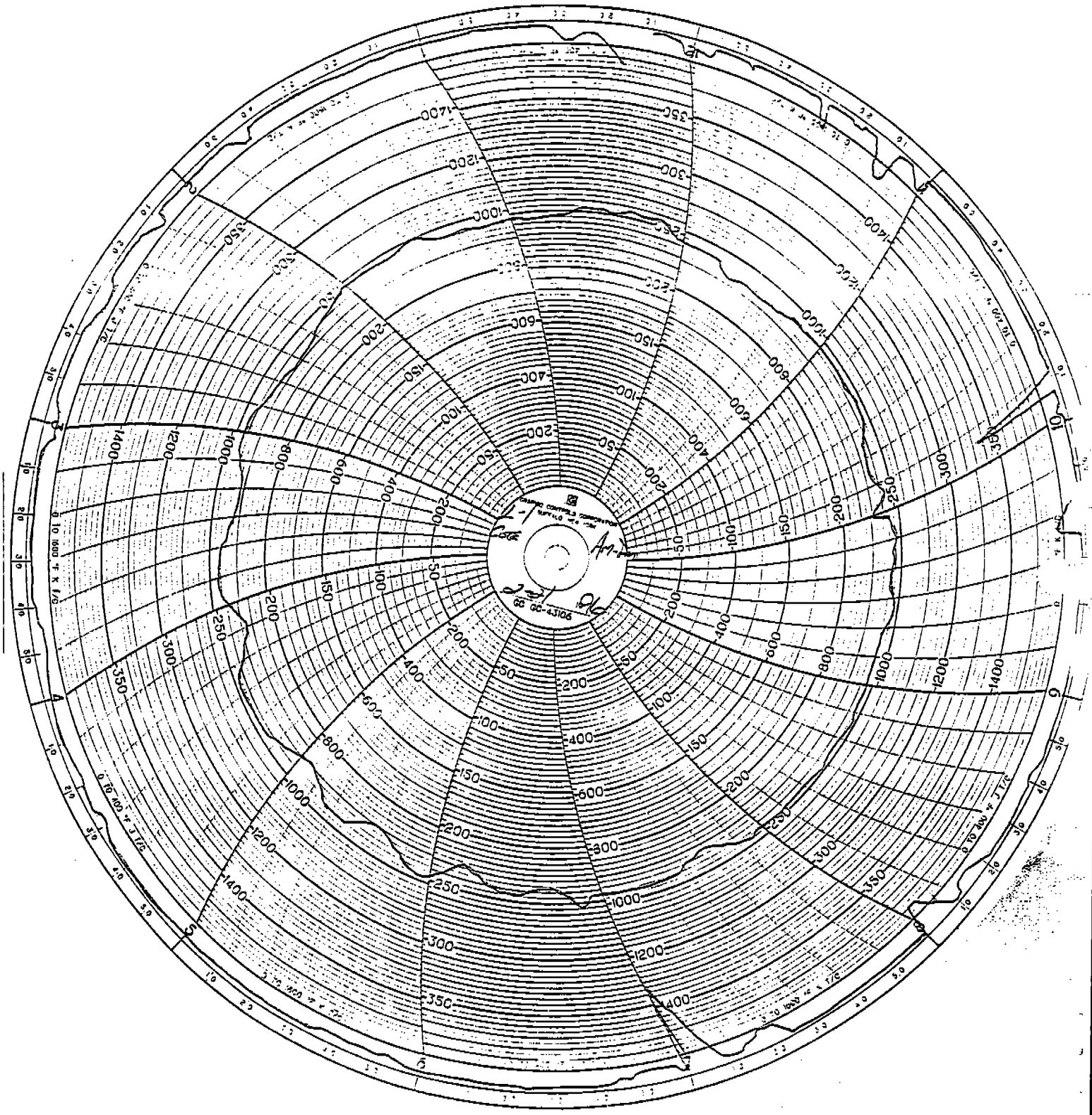
TIME	FACE OUT. SET POINT	FACE FEED RATE	FACE INLET TEMP	FACE OUTLET TEMP	FACE FUEL COUNT	FACE WET BIN LEVEL	CORE OUT. SET POINT	CORE FEED RATE	CORE INLET TEMP	CORE OUTLET TEMP	CORE FUEL COUNT	CORE WET BIN LEVEL	DRY BIN LEVEL FACE	DRY BIN LEVEL CORE	EVERY HOUR FLAKE MOISTURE IN	EVERY HOUR FLAKE MOISTURE FACE	EVERY HOUR FLAKE MOISTURE CORE
8:30	258	55	1647	242	685	60%	271	59	1578	271	653	50%	90%	75%	51.0	4.8	4.6
8:45	258	54	1668	240	794	60%	271	59	1669	2616	752	60%	90%	75%		5.0	4.8
9:00	258	55	1661	241	709	70%	269	61	1603	245	877	60%	90%	70%		5.2	5.0
9:15	258	57	1673	243	1019	70%	2617	61	1598	255	9616	60%	80%	70%		4.8	5.6
9:30	258	54	1636	239	1137	75%	2617	60	1613	250	1077	70%	75%	60%		5.1	6.6
9:45	258	56	1640	236	1245	75%	2617	59	1595	255	1181	75%	75%	60%	51.2	5.2	6.6
10:00	258	56	1678	247	1371	75%	2617	60	1616	259	1301	75%	75%	60%		4.8	5.6
10:15	258	56	1665	233	1480	75%	2617	58	1622	248	1404	75%	75%	60%		5.2	6.8
10:30	258	52	1678	234	1590	80%	267	56	1609	253	1511	90%	75%	70%	50.8	5.6	6.2
10:45	258	55	1650	250	1701	90%	267	59	1627	2616	1627	90%	75%	70%		4.6	4.8
11:00	258	55	1629	237	1816	100%	2623	58	1625	247	1734	100%	70%	70%		4.8	6.6
11:15	258	54	1637	248	1919	100%	2623	56	1606	252	1831	100%	70%	60%		4.8	6.2
11:30	258	55	1666	239	2038	100%	2623	57	1633	262	1943	100%	70%	70%	51.4	4.8	4.6
11:45	256	55	1624	239	2128	100%	2623	59	1658	257	2031	100%	70%	70%		5.6	5.8
12:00	258	55	1641	235	2250	100%	2623	56	1623	244	2146	100%	60%	60%		5.2	6.8
12:15	258	53	1623	244	2362	100%	2623	58	1622	261	2253	100%	60%	60%		4.8	5.4
12:30	258	54	1673	235	2474	100%	2623	57	1619	245	2360	100%	60%	60%	54.0	5.6	6.8
12:45	258	56	1644	251	2587	100%	2623	58	1639	258	2471	100%	60%	60%		4.8	6.2
1:00	258	55	1629	232	2702	100%	263	62	1665	253	2578	100%	50%	50%		5.2	6.4
1:15	258	53	1650	246	2816	100%	263	58	1671	252	2684	100%	40%	40%		4.6	7.2
1:30	258	55	1674	240	2939	90%	263	58	1604	255	2797	90%	50%	40%	52.0	4.8	6.0
1:45	258	53	1636	233	3048	40%	263	53	1613	264	2900	70%	50%	50%		5.2	5.6
2:00	250	55	1472	246	3154	60%	263	61	1610	262	2997	70%	50%	50%		4.8	5.0
2:15	250	57	1614	236	3262	50%	263	62	1671	260	3094	60%	50%	50%		5.6	6.0
2:30	250	53	1653	251	3384	50%	265	60	1663	251	3212	60%	50%	50%	51.6	5.4	6.6
2:45	251	54	1400	250	3484	50%	265	58	1650	259	3316	60%	60%	50%		5.0	6.0
3:00	251	56	1617	248	3606	50%	265	60	1589	265	3427	60%	50%	50%		4.8	5.2
3:15	251	58	1680	246	3720	60%	265	61	1649	265	3534	60%	40%	40%		4.8	5.2
3:30	251	57	1665	241	3832	60%	265	62	1624	262	3637	60%	40%	40%	52.0	4.8	5.6
3:45	251	54	1641	240	3947	70%	265	62	1623	263	3745	60%	40%	40%		5.2	5.6
4:00	251	56	1645	244	4063	75%	2616	62	1646	260	3854	70%	40%	40%		5.0	6.2
4:15	251	55	1604	257	4171	70%	2616	60	1660	264	3960	70%	40%	40%		4.6	6.0
4:30	250	58	1560	241	4280	70%	267	62	1588	264	4062	70%	40%	40%	51.8	4.0	5.6
4:45	250	58	1629	253	4388	75%	267	62	1664	267	4166	70%	50%	40%		4.0	5.2
5:00	250	57	1676	237	7510	75%	267	63	1689	261	4274	75%	50%	40%		4.8	6.8
5:15	250	53	1679	219	4605	75%	267	58	1688	250	4363	75%	60%	50%		6.0	6.4

Dryer DATA
fuel calibration lb/coun face core

date 2/21/96
by
page 2 of 2

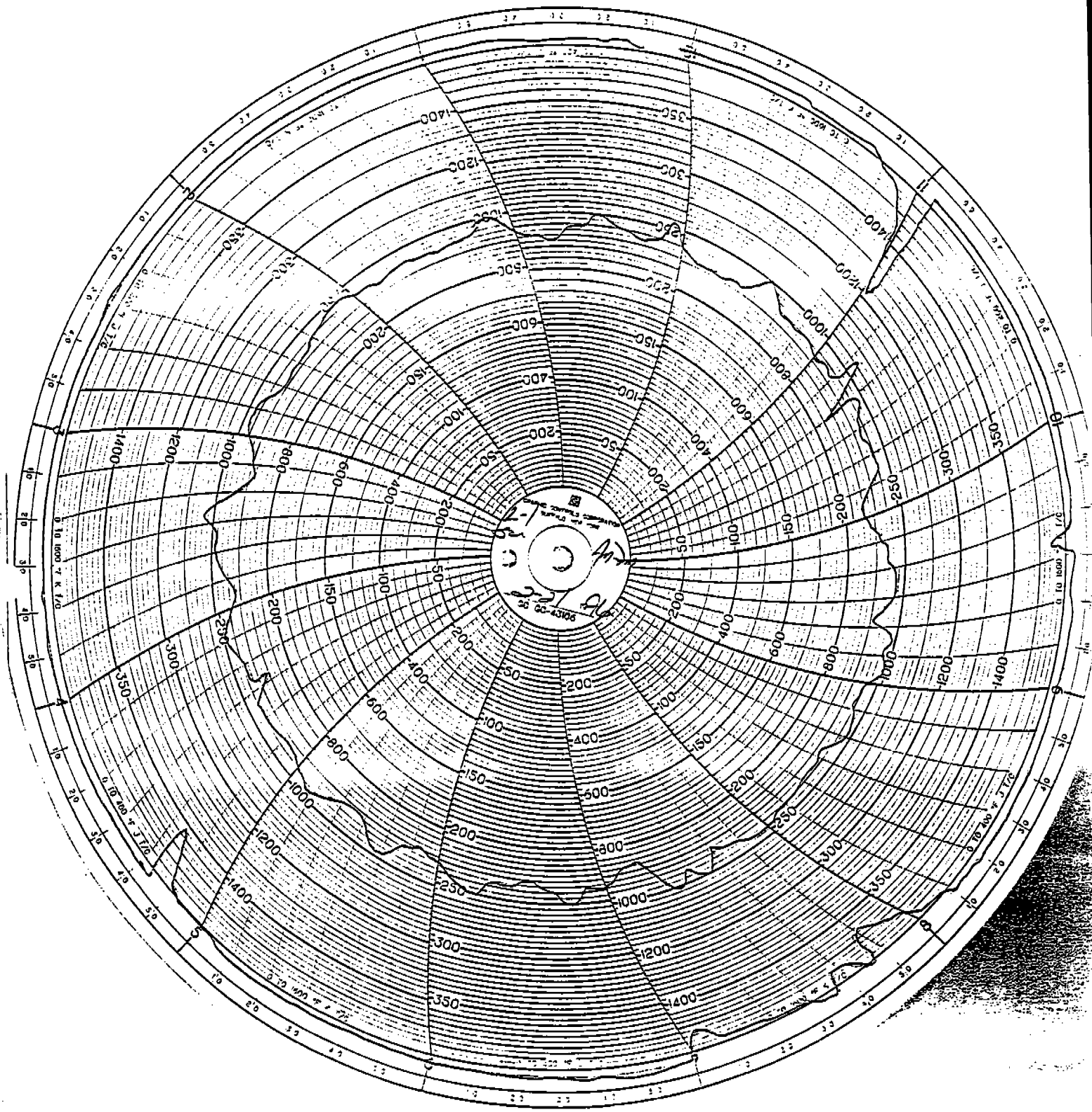
TIME	FACE OUT. SET POINT	FACE FEED RATE	FACE INLET TEMP	FACE OUTLET TEMP	FACE FUEL COUNT	FACE WET BIN LEVEL	CORE OUT. SET POINT	CORE FEED RATE	CORE INLET TEMP	CORE OUTLET TEMP	CORE FUEL COUNT	CORE WET BIN LEVEL	DRY BIN LEVEL FACE	DRY BIN LEVEL CORE	EVERY HOUR FLAKE MOISTURE IN	FACE	CORE
5:30	250	54	1662	247	4494	75%	267	58	1662	259	4453	70%	40%	50%	51.6	5.2	6.6
5:45	250	54	1630	247	4527	75%	267	57	1670	252	4579	75%	75%	60%		4.8	5.4
6:00	248	55	1423	246	4702	100%	2662	60	1573	264	46662	100%	75%	60%		5.2	5.0
6:15	248	55	1631	239	5015	100%	262	62	1660	255	4763	100%	70%	60%		5.6	5.8
6:30	248	53	1640	235	5175	100%	260	60	1680	255	4860	90%	70%	60%	51.1	5.0	6.0
6:45	248	55	1617	246	5321	75%	262	55	1629	255	4960	70%	70%	60%		4.8	6.0
7:00	248	55	1621	236	5341	70%	264	59	1637	262	5064	70%	70%	70%		5.2	6.0
7:15	248	51	1595	230	0019	75%	264	59	1645	259	0021	75%	75%	70%		5.6	6.0
7:30	248	53	1602	246	0131	75%	264	55	1649	252	0125	75%	70%	70%	52.4	5.0	6.8
7:45	248	52	1617	236	0240	70%	264	57	1589	262	0232	70%	70%	70%		5.8	6.0
8:00	248	51	1579	243	0357	70%	264	55	1601	255	0325	70%	60%	60%		5.2	7.5
8:15	248	55	1598	244	0476	60%	264	59	1584	263	0430	60%	60%	60%		5.2	5.4
8:30	248	50	1599	226	0570	60%	264	56	1621	253	0515	60%	50%	60%	51.8	5.8	6.6

LINE I
CORE DRYER
2/24/96
7 AM - 7 PM



25

LINE 1
SURFACE DRYER
2/21/96
7 AM - 7 PM

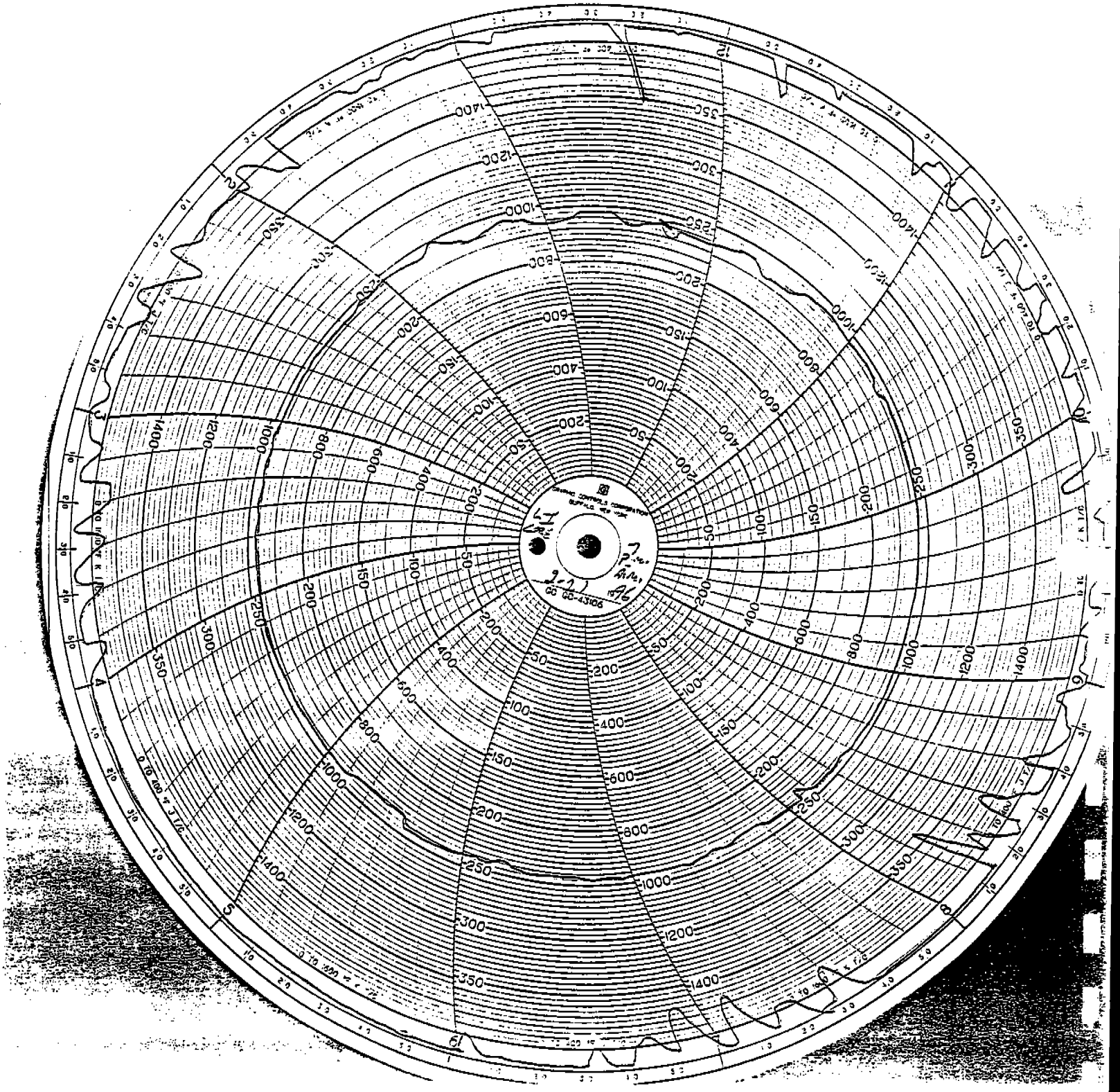


LINE I

CORE DRYER

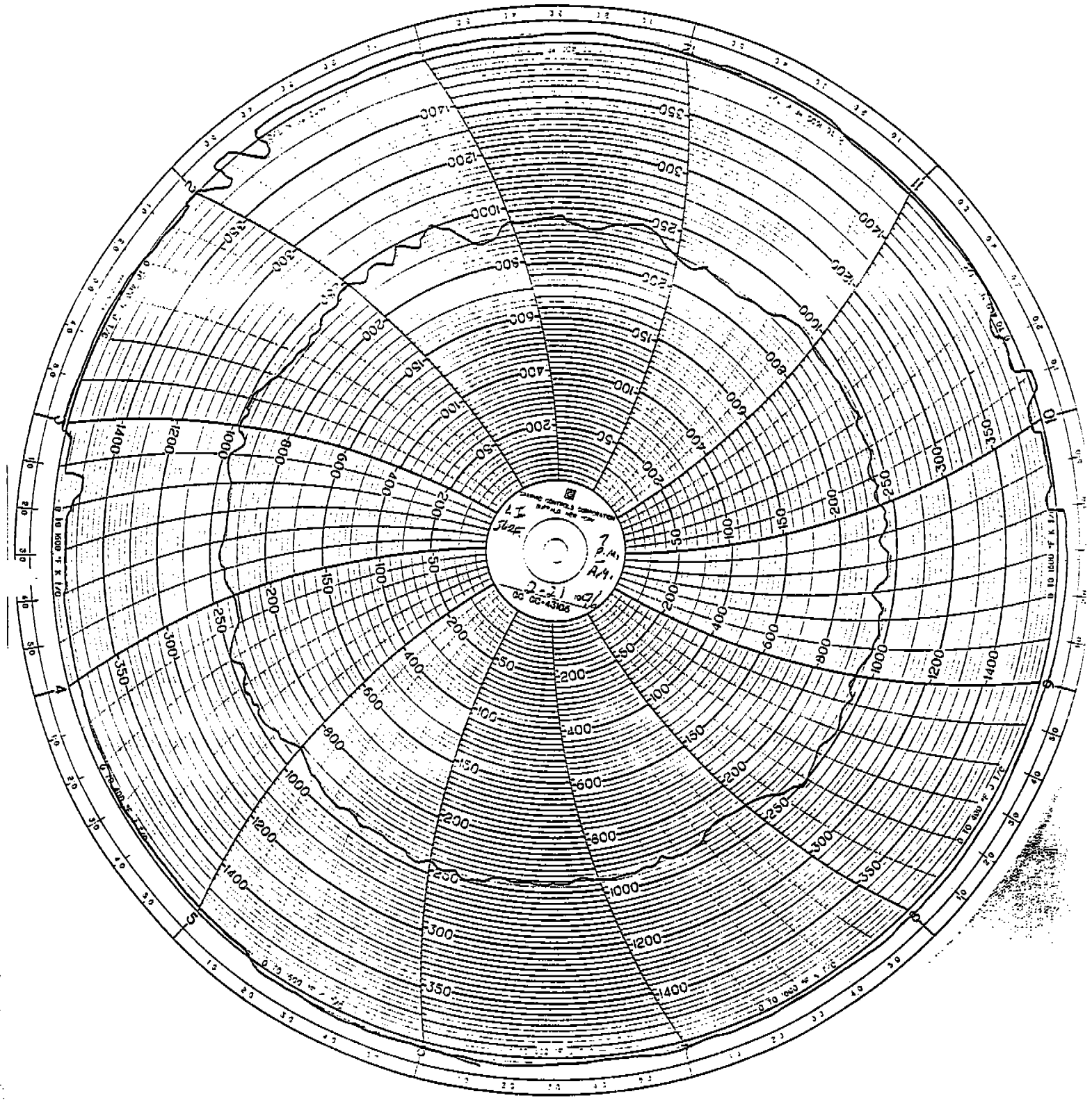
2/21/96

7pm - 7am



27

Line 1
Surface Dryer
2/21/96
7pm - 7am



Konus EFB Readings
Plant Hayward LP.
readings every 10 minutes

date 2/21/96
by Jason N.

time	K1 and K2						K3 and K4					
	Bed Volt	Bed Current	Ion Volt	Ion Current	EFB Press.	Baghouse Press.	Bed Volt	Bed Current	Ion Volt	Ion Current	EFB Press.	Baghouse Press.
4:30	13.5	0.2	20	1.2	.8	.4						
8:45	13.5	0.4	28	3.6	1	4						
9:00	13.5	0.2	30	4	1.4	.4						
9:15	13.0	0.2	30	4	1.6	.4						
9:30	13.0	0.2	29	4	1.9	.4						
9:45	13.0	0.2	29	4	1.9	.4						
10:00	13.0	0.2	30	4	2.2	4						
10:15	13.0	0.2	29	4	2.9	4						
10:30	13.0	0.2	30	4	3.4	4						
10:45	12.5	0.3	31	4	3.3	4						
11:00	13.0	0.3	30	4	2.9	4						
11:15	13.0	0.3	29	4	3	4						
11:30	13.0	0.3	29	4	2.8	4						
11:45	13.5	0.3	30	4	2.8	4						
12:00	13.0	0.3	30	4	3.4	4						
12:15	13.0	0.3	29	4	3.2	4						
12:30	12.5	0.3	28	4	2.8	4						
12:45	13.0	0.3	30	4	1.8	4						
1:00	12.0	0.3	30	4	1.4	4						
1:15	12.5	0.3	28	4	1.6	4						
1:30	12.5	0.3	30	4	1.6	4						
1:45	12.5	0.3	29	4	1.7	4						
2:00	12.5	0.3	29	4	1.5	4						
2:15	12.5	0.3	30	4	1.8	4						
2:30	12.5	0.3	29	4	1.4	4						
2:45	12.5	0.3	30	4	1.4	4.5						
3:00	12.5	0.3	29	4	1.4	4.5						
3:15	12.5	0.3	30	4	1.2	4						
3:30	12.5	0.3	29	4	1.4	4.2						
3:45	12.5	0.3	29	4	1.3	5						

L-30

Konus EFB Readings

Plant Hayward L.P.

readings every 10 minutes

date 2/21/96

by Jason N.

time	K1 and K2 Bed Volt	K1 and K2 Bed Current	K1 and K2 Ion Volt	K1 and K2 Ion Current	K1 and K2 EFB Press.	K1 and K2 Baghouse Press.	K3 and K4 Bed Volt	K3 and K4 Bed Current	K3 and K4 Ion Volt	K3 and K4 Ion Current	K3 and K4 EFB Press.	K3 and K4 Baghouse Press.
4:00	12.5	0.6	28.5	.4	1.	4						
4:15	12.5	0.3	30.0	.4	1	4						
4:30	12.0	0.3	29.0	4	.9	4						
4:45	12.0	0.3	29.0	4	.4	4						
5:00	12.5	0.3	29.0	4	.6	4						
5:15	12.5	0.3	29.0	4	.6	4						
5:30	12.0	0.3	31.0	4	.6	4						
5:45	12.5	0.3	30	4	.6	4						
6:00	12.5	0.3	29	4	.4	4						
6:15	12.5	0.3	29	4	.6	4						
6:30	12.5	0.3	29	4	.4	4						
6:45	12.5	0.3	29	4	.4	4						
7:00	12.5	0.3	28	4	.2	4						
7:15	12.5	0.3	28	4	0	4						
7:30	12.5	0.3	28	4	0	4						
7:45	12.5	0.3	28.5	4	0	4						
8:00	12.5	0.3	29	3.8	0	4						

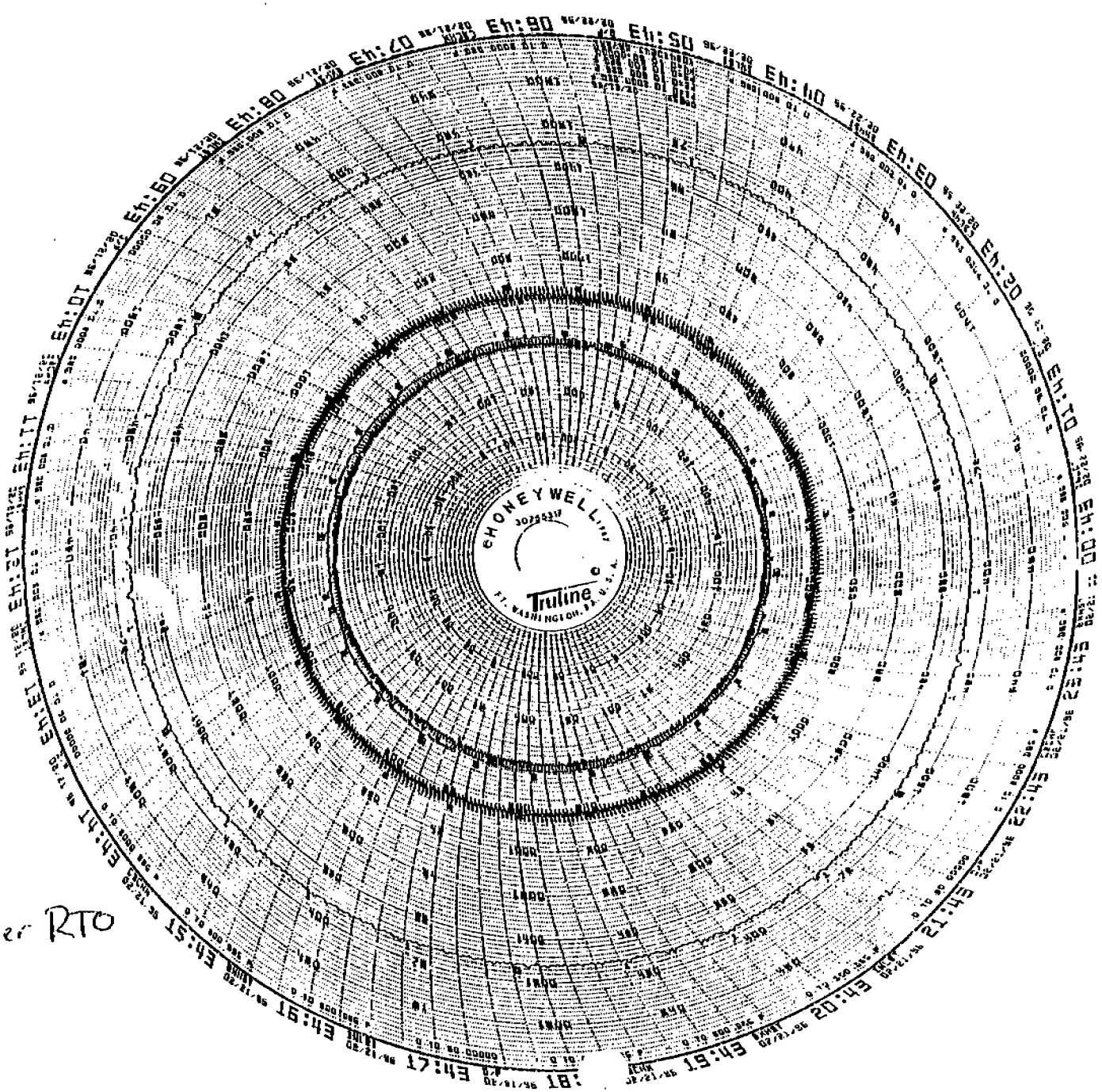
LI Dryer RTO 2-21-96

RECORD EVERY 15 MIN.	HAYWARD AIR TESTING WORKSHEET											
Time	RTO Chamber Bed Temp.					Inlet	Burners		Combust.	Exhaust	Press.	Gas
	#1	#2	#3	#4	#5	Press.	B#1	B#2	Temp.	Temp.	Drop	Usage
8:30	317	352	465	439	320	.7	33.8	37.4	1513	238	26.8	0
8:45	316	357	462	442	321	1.3	34.0	22.8	1508	252	26.4	2
9:00	314	360	464	439	324	.4	43.0	42.1	1502	256	26.4	4
9:15	314	360	467	437	326	1.4	40.6	50.5	1511	252	26.6	6
9:30	314	360	467	438	326	1.4	40.7	51.5	1511	249	26.7	8
9:45	314	361	467	439	326	1.7	40.6	45.2	1512	248	26.7	11
10:00	314	360	469	437	327	1.9	58.5	39.7	1515	249	26.7	13
10:15	315	359	471	436	327	1.7	39.7	32.8	1517	243	26.2	15
10:30	315	360	472	438	326	1.8	28.5	44.3	1522	243	26.4	18
10:45	316	356	474	436	327	1.0	35.5	27.4	1522	244	27.0	20
11:00	317	353	476	437	327	.5	33.4	32.1	1525	249	27.4	22
11:15	317	353	477	438	326	.5	31.1	24.7	1534	249	27.4	24
11:30	316	357	477	438	327	.7	34.8	31.5	1527	247	27.0	26
11:45	316	358	477	438	328	1.3	43.2	28.5	1515	246	26.9	29
12:00	318	355	476	438	327	.5	40.9	26.7	1520	250	27.1	31
12:15	317	357	478	438	328	.6	35.8	44.7	1524	248	27.3	33
12:30	318	356	479	439	328	.5	40.2	31.5	1523	251	27.3	35
12:45	315	360	475	437	328	1.7	30.3	38.3	1525	242	26.5	38
1:00	315	362	475	439	328	1.8	50.5	74.2	1515	245	26.4	40
1:15	318	358	479	436	330	.8	49.5	34.4	1517	247	27.1	42
1:30	316	363	474	441	329	1.8	42.9	33.3	1532	252	26.6	44
1:45	317	363	475	439	331	1.8	45.3	29.7	1519	245	26.4	46
2:00	317	361	476	437	331	1.6	47.5	35.3	1517	244	26.6	49
2:15	317	365	471	443	328	.4	44.0	38.3	1516	259	26.5	51
2:30	317	363	476	438	333	1.8	43.6	40.1	1516	247	26.5	53
2:45	317	364	472	441	331	1.3	58.0	47.5	1514	253	27.1	56
3:00	317	362	473	438	333	1.7	50.2	48.3	1515	245	26.5	58
3:15	317	364	472	439	333	1.8	46.0	45.0	1518	248	26.5	60
3:30	317	365	469	444	331	.5	46.3	42.1	1523	259	26.3	62
3:45	315	365	468	445	331	1.0	38.2	28.3	1525	260	26.4	64
4:00	318	365	468	445	332	.3	37.5	32.0	1520	258	26.2	66
4:15	320	361	467	448	329	1.0	33.2	31.9	1522	247	26.7	68
4:30	319	359	475	434	337	1.9	42.2	43.9	1519	252	26.5	70
4:45	319	363	467	447	330	1.1	50.8	22.4	1523	248	26.6	73
5:00	320	360	468	448	330	1.4	33.7	20.1	1521	245	26.6	75
5:15	321	360	468	449	331	1.3	35.4	30.2	1519	245	26.4	77
5:30	319	365	468	447	334	.9	41.9	35.4	1520	259	26.2	79
5:45	319	363	472	440	338	1.7	54.3	28.9	1521	245	26.2	81
6:00	318	361	465	446	332	.9	32.3	27.4	1516	248	26.7	84
6:15	318	356	466	443	330	.9	27.8	29.6	1522	240	26.4	86

2-1 Over AM 2-21-18

RECORD EVERY 15 MIN. HAYWARD AIR TESTING WORKSHEET

Time	RTO Chamber Bed Temp.					Inlet	Burners		Combust.	Exhaust	Press.	Gas
	#1	#2	#3	#4	#5	Press.	B#1	B#2	Temp.	Temp.	Drop	Usage
6:30	317	360	465	446	331	1.2	31.2	29.1	1516	254	26.3	88
6:45	320	352	472	439	335	.6	32.3	30.5	1520	244	26.9	90
7:00	318	360	465	446	332	1.0	31.7	30.8	1515	256	26.4	93
7:15	320	352	471	440	334	1.1	29.2	25.6	1522	244	27.0	95
7:30	319	358	465	447	332	1.2	31.3	27.2	1516	249	26.7	97
7:45	319	353	472	437	338	.7	37.4	45.1	1521	251	27.6	99
8:00	320	352	469	441	334	1.4	29.2	21.6	1523	242	27.0	102
8:15	318	354	466	444	331	.9	29.6	23.8	1531	240	26.8	104
8:30	316	356	470	435	334	1.0	51.2	29.0	1531	246	27.5	106



Line I Dryer RTO
2/21/96

33

DATE: 2 .21 96
SHIFT/CREW: 1 : T 1) crew
OPERATOR: [illegible]

UNIT/ 1/2" THICKNESS	WEIGHT	HEIGHT	UNIT/ THICKNESS	WEIGHT	HEIGHT
1 7:40	4414	39 3/4	36 11:21	4476	41
2 7:47	4435	39 3/4	37 :27	4490	40 3/4
3 :53	4423	39 3/4	38 :34	4481	41
4 8:01	4463	40	39 :40	4471	41
5 :06	4400	40 1/2	40 :46	4438	40 3/4
6 :12	4358	40 3/4	41 :53	4425	40 3/4
7 :18	4409	40 1/2	42 :59	4430	41
8 .26	4396	40 1/2	43 12:06	4409	40 3/4
9 .39	4358	40 3/4	44 :12	4387	40 3/4
10 :39	4350	40 1/2	45 :18	4374	40 3/4
11 :44	4305 CP	40 3/4	46 :24	4371	40 3/4
12 :51	4291	41	47 :31	4350	40 3/4
13 :57	4276	40 1/4	48 :36	4315	40 3/4
14 9:03	4327	41	49 :43	4355	40 3/4
15 9:11	4378	40 3/4	50 50	4376	40 1/2
16 :16	4356	41	51 :56	4377	41
17 :22	4376	40 3/4	52 1:02	4345	40 3/4
18 :28	4379	40 3/4	53 :08	4381	40 3/4
19 :35	4317	40 1/2	54 :15	4349	40 3/4
20 47		40 1/2	55 :20	4321	40 1/2
21 :51	4320	40 1/2	56 :27	4339	40 1/2
22 :54	4305	40 1/2	57 :35	4328	40 1/4
23 :59	4345	40 1/2	58 :42	4349	40 1/2
24 10:06	4321	40 1/2	59 :50	4537 CP	40 1/4
25 :12	4277	40 3/4	60 :57	4510	40 3/4
26 :18	4250	40 1/2	61 2:03	4470	41
27 :25	4205 CP	40 1/2	62 2:09	4362	40 3/4
28 :31	4255	40 1/2	63 :16	4350	41
29 :37	4252 CP	40 1/2	64 :22	4369	40 3/4
30 :44	4314	41	65 :28	4371	40 3/4
31 :50	4349	40 3/4	66 :35	4389	40 3/4
32 :56	4389	41	67 :42	4359	40 1/2
33 11:02	4393	41	68 :47	4343	40 1/2
34 :08	4440	40 3/4	69 :54	4341	40 3/4
35 :17	4460	41	70 3:00 CP	4317	40 1/2

DATE: _____

SHIFT/CREW: _____

OPERATOR: _____

UNIT/ THICKNESS	WEIGHT	HEIGHT	UNIT/ THICKNESS	WEIGHT	HEIGHT
71 3:05	4263	40 1/4	106 :57	4483	41
72 :12	4247	40 1/4			
73 :18	4228 CP	40 1/4	B 1:04	4460	41
74 :25	4281	40 1/2	2 :09	4457	40 3/4
75 :31	4301	40 1/2	3 :17	4443	40 3/4
76 :37	4273	40 1/4	4 :23	4435	40 3/4
77 :44	4321	40 1/2	5 :29	4430	40 3/4
78 :50	4301	40 1/2	6 :36	4414	40 3/4
79 :56	4362	40 1/2	7 :42	4409	40 3/4
80 4:02	4389	40 3/4	8 :48	4388	40 3/4
81 :09	4385	40 1/2	9 :54	4365	40 3/4
82 :14	4422	40 3/4	10 1:00	4364	40 3/4
83 :21	4455	41	11 :07	4393	41
84 :28	4461	40 3/4	12 :13	4401	40 3/4
85 :33	4446	40 3/4	13 :20	4396	40 3/4
86 :39	4437	40 3/4	14 :27	4377	40
87 :45	4432	40 3/4	15 :33	4373	40
88 :53	4393	40 1/2	16 :		
89 5:01	4496	40 1/2	17 :		
90 :09	4503	40 1/4			
91 :16	4436	40 1/4			
92 :25	4404	40 1/4			
93 :32	4407	40 1/2			
94 :40	4329	40			
95 :48	4342	40			
96 :55	4310	40 1/4			
97 6:01	4255 CP	40 1/2			
98 :07	4167	40			
99 :14	4222	40 1/2			
100 :21	4321	40 1/2			
101 :27	4340	40 1/2			
102 :33	4376	41			
103 :39	4401	40 3/4			
104 :45	4467	41			
105 :51	4487	41			

HAYWARD LINE I FEBRUARY 21st & 22nd 1996
POM

DATA TIME	START=	17:30	END=	20:45	HOURS=	3.25
DATA TIME	START=	08:00	END=	16:00	HOURS=	8.00
					TOTAL=	11.25

BOARD WEIGHTS - LBS
average weights determined by taking bundle weights divided by peices per unit over the testing period.

	1/2"
per/peice	54.42
per/ 8' x 16'	217.68

PLANT PRODUCTION RATE

11.25	=hours during testing
166	=pressloads
1992	=no. of 8'x16' boards produced (pressloads x 12 boards per load)
433,619	=lbs of finished product (boards produced x weight of finished board)
38,544	=lbs of finished product per hour (lbs of finshed product / hours)
19.27	=tons of finished product per hour (lbs of finshed product per hour / 2000 lb)

FUEL BURNING RATE ESTIMATED BY DRY FUEL INPUT

SURFACE

10	=SURFACE fuel calibration in pounds per count
4,973	=SURFACE counts during testing hours
49,730	=SURFACE lbs of fuel burned during testing
11.25	=hours during testing
4,420	=lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
2.21	=tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
8,600	=estimated BTU content per pound of dry fuel,
38.0	=estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)
1,644	=average inlet temperature
52.74	=average incoming moisture percent
5.14	=average dry moisture percent

CORE

10	=CORE fuel calibration in pounds per count
4,465	=CORE counts during testing hours
44,650	=CORE lbs of fuel burned during testing
11.25	=hours during testing
3,969	=lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
1.98	=tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
8,600	=estimated BTU content per pound of dry fuel,
34.1	=estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)
1,627	=average inlet temperature
52.74	=average incoming moisture percent
5.81	=average dry moisture percent

DRYER THROUGHPUT RATE

8,389	=Total pounds of fuel burned per hour in Core and Surface Dryer
38,544	=lbs of finished product per hour (lbs of finshed product / hours)
46,933	=Pounds of material produced by the dryer per hour (dry basis, assumming fuel balances)
2,592	= weight of trim per hour at 6.3% of finished product
5,798	=weight of screened fines per hour (total fuel - trim)
12.35%	=resulting loss to fines as percentage of dryer throughput

LOUISIANA-PACIFIC CORPORATION

PRESS REPORT - LINE (1) 2 DATE: 2-22-96

OPERATOR MACK SHIFT: AM CREW: 1

THICKNESS 15/32 PRESS LDS: 2 13/32 17 1/2

OVERALL TIMER: 2.05 DECOMPRESSION TIME: 18

PRESS TEMP: 215 TOTAL REJECTS: -

LOG COUNT: 1562

LINE SPEED	THKNS.	FROM	TO
45	15/32	700	
45	1/2	7:15	
55	11	7:45	
53	11	5:05	

F.C.O.S. HYD. RADIATOR: ✓ TIME

PRESS BLOWN DOWN: ✓

SPINNER HEADS FLUSHED: ✓ TIME

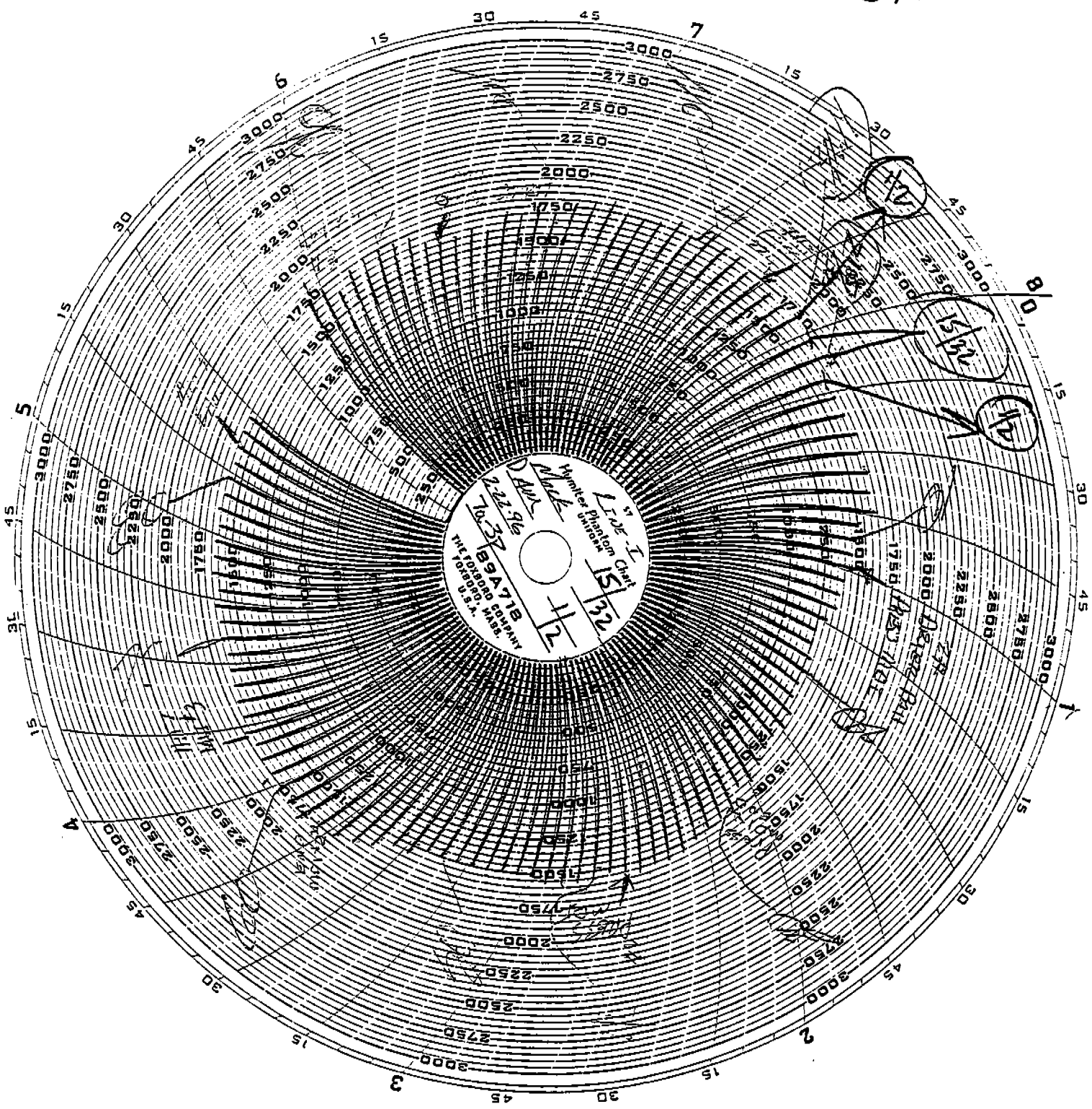
SURFACE BLENDER HOSED: ✓ TIME

FORMER HYD RADIATOR: ✓ TIME

DOWNTIME FROM	DOWNTIME TO	DOWNTIME (MINS) M	E	O	KEY	REASONS FOR DOWNTIME
12:31	12:55	24				Down to Build Bale

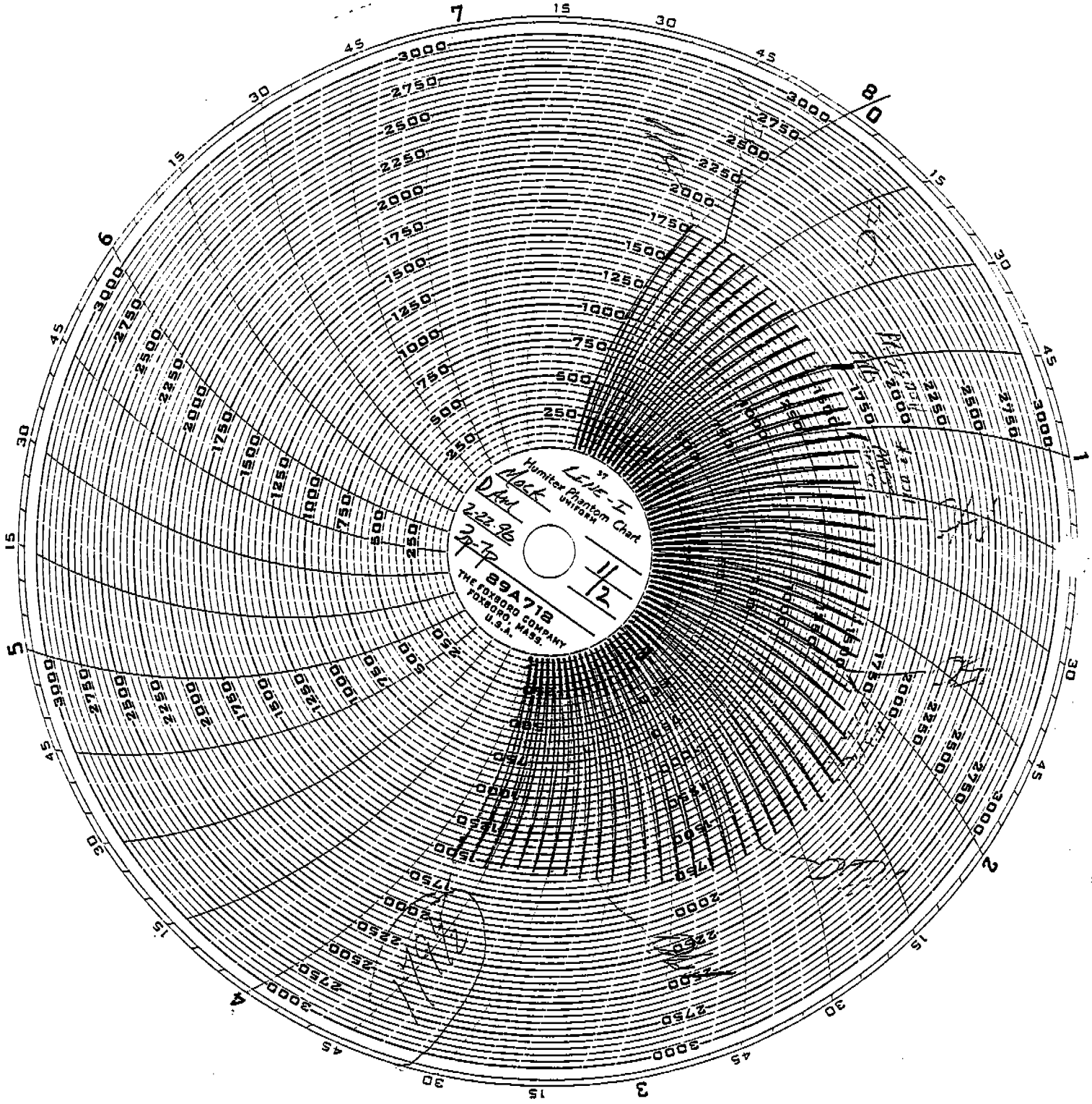
DOWNTIME CODE: M - MECHANICAL E - ELECTRICAL O - OPERATOR

LINE 1
PRESS CHART
2/22/96
0700-1500



38

LINE I
PRESS CHART
2/22/96
1500 - 1900



Dryer DATA
fuel calibration lb/coun face core

date 2/22/96
by
page 1 of 2

TIME	FACE OUT. SET POINT	FACE FEED RATE	FACE INLET TEMP	FACE OUTLET TEMP	FACE FUEL COUNT	FACE WET BIN LEVEL	CORE OUT. SET POINT	CORE FEED RATE	CORE INLET TEMP	CORE OUTLET TEMP	CORE FUEL COUNT	CORE WET BIN LEVEL	DRY BIN LEVEL FACE	DRY BIN LEVEL CORE	EVERY HOUR FLAKE MOISTURE IN	FACE	CORE
8:00	246	55	1573	240	0448	60%	265	57	1590	260	0397	70%	75%	75%		5.6	5.8
8:15	246	58	1643	253	0562	70%	265	59	1629	263	0499	75%	75%	75%		4.6	5.0
8:30	246	57	1681	234	0678	70%	265	60	1662	259	0604	75%	75%	75%	52.0	5.0	5.6
8:45	246	56	1651	224	0793	60%	265	58	1640	250	0707	70%	75%	70%		6.0	6.8
9:00	246	52	1657	230	0911	70%	265	55	1660	256	0812	75%	75%	70%		6.2	7.4
9:15	246	52	1652	253	1022	70%	265	53	1624	255	0910	80%	75%	70%		4.8	6.6
9:30	246	54	1675	246	1147	75%	265	57	1597	273	1015	100%	75%	70%	53.4	4.8	4.4
9:45	246	53	1623	238	1265	75%	265	53	1623	252	1120	100%	70%	70%		5.4	6.8
10:00	246	53	1621	255	1388	75%	265	55	1589	273	1228	90%	60%	60%		4.2	4.6
10:15	246	55	1674	251	1505	75%	265	55	1633	268	1331	90%	60%	60%		4.8	5.6
10:30	246	52	1673	236	1626	100%	265	53	1571	255	1434	100%	50%	60%	55.6	5.6	6.6
10:45	246	54	1680	251	1742	100%	265	57	1649	278	1533	100%	50%	50%		4.8	4.2
11:00	246	55	1667	247	1872	100%	265	57	1632	267	1635	100%	40%	50%		4.4	5.4
11:15	246	56	1711	245	1981	100%	265	58	1659	267	1744	100%	40%	40%		5.2	5.6
11:30	246	55	1710	244	2103	100%	265	58	1682	266	1851	100%	45%	45%	52.6	4.8	5.4
11:45	246	58	1679	243	2217	100%	265	60	1665	268	1955	100%	40%	45%		4.2	5.2
12:00	246	56	1681	231	2330	100%	265	60	1684	259	2055	100%	40%	40%		5.2	6.1
12:15	246	56	1678	231	2440	100%	265	60	1646	255	2155	100%	40%	40%		5.0	7.4
12:30	246	58	1687	236	2562	100%	265	58	1643	258	2268	100%	40%	40%	53.6	5.2	7.0
12:45	246	56	1670	237	2667	100%	265	58	1659	261	2363	100%	60%	60%		4.8	6.2
1:00	246	58	1669	242	2794	100%	265	60	1645	270	2476	100%	90%	70%		4.6	4.6
1:15	246	57	1705	222	2911	100%	265	61	1617	270	2580	100%	75%	70%		5.4	4.6
1:30	246	56	1693	230	3028	100%	265	58	1646	251	2688	100%	75%	70%	52.8	4.8	7.0
1:45	246	54	1697	233	3139	100%	265	58	1651	260	2789	90%	70%	70%		5.4	5.2
2:00	246	55	1690	235	32641	75%	265	59	1637	271	2902	90%	70%	70%		5.0	5.0
2:15	246	57	1687	249	3376	80%	265	60	1657	267	3000	80%	70%	70%		4.6	5.2
2:30	246	54	1680	229	3497	80%	265	58	1665	259	3105	80%	70%	70%	51.6	5.4	5.8
2:45	246	54	1675	237	3606	75%	265	58	1669	268	3203	75%	70%	70%		5.2	5.4
3:00	246	55	1675	246	3728	75%	265	57	1580	265	3312	75%	70%	70%		4.6	5.4
3:15	246	55	1680	239	3858	75%	265	57	1631	260	3420	75%	60%	60%		4.4	6.6
3:30	246	54	1664	236	3965	70%	265	56	1601	260	3521	75%	55%	50%	52.6	4.8	6.4
3:45	246	55	1654	233	4075	70%	265	56	1604	265	3622	75%	50%	45%		5.6	5.8
4:00	246	54	1637	229	4204	65%	265	57	1611	273	3734	75%	50%	50%		5.4	5.4
4:15	246	54	1639	234	4317	70%	265	56	1623	268	3837	75%	50%	45%		5.2	5.6
4:30	246	54	1646	250	4442	70%	265	58	1623	274	3950	75%	50%	45%	51.4	4.6	4.6
4:45	246	55	1650	244	4556	70%	265	57	1627	266	4051	75%	45%	45%		4.4	5.8

L-41

40

Dryer DATA
fuel calibration lb/coun face core

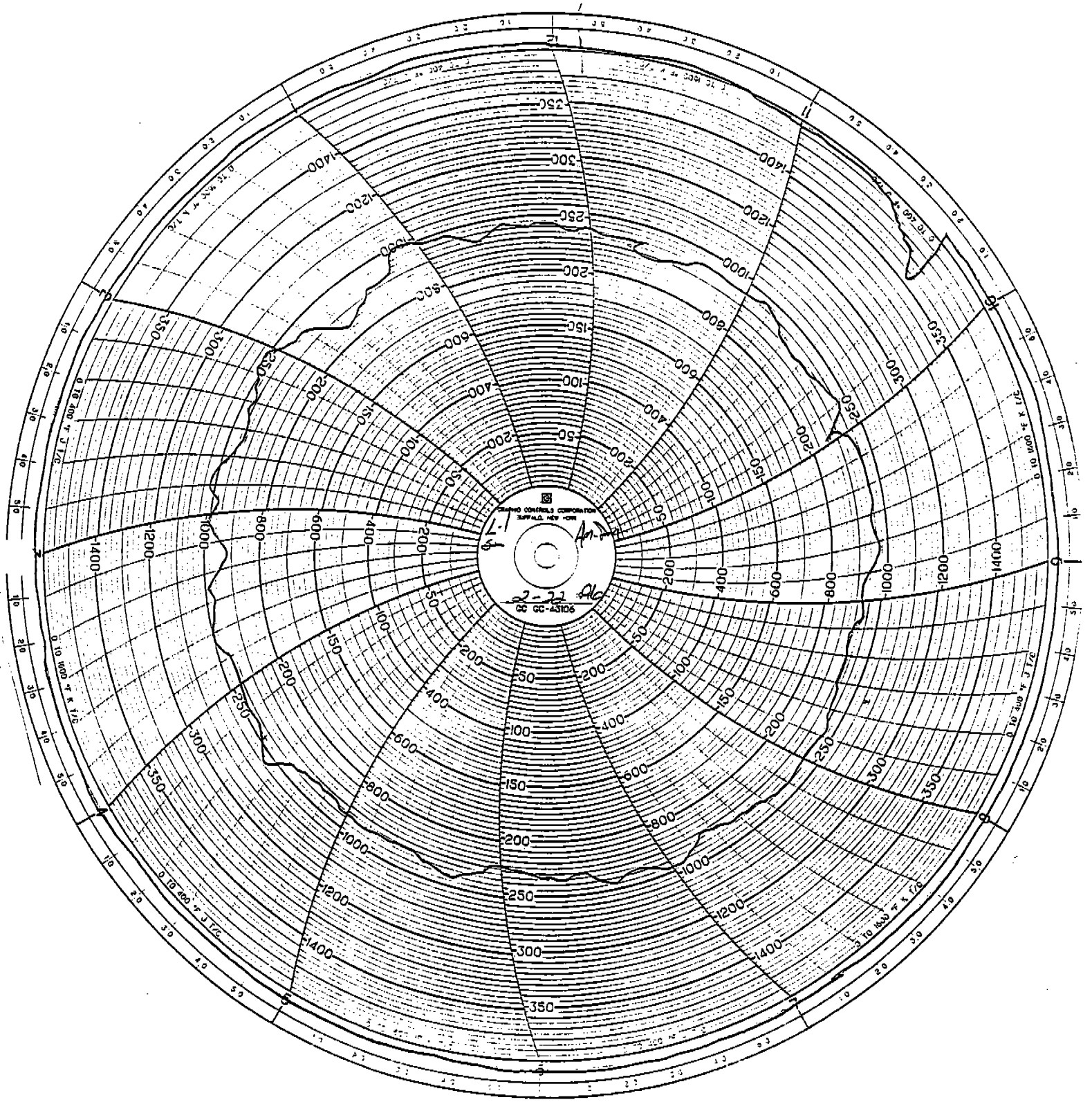
date 2/22/96
by
page 2 of 2

TIME	FACE OUT. SET POINT	FACE FEED RATE	FACE INLET TEMP	FACE OUTLET TEMP	FACE FUEL COUNT	FACE WET BIN LEVEL	CORE OUT. SET POINT	CORE FEED RATE	CORE INLET TEMP	CORE OUTLET TEMP	CORE FUEL COUNT	CORE WET BIN LEVEL	DRY BIN LEVEL FACE	DRY BIN LEVEL CORE	EVERY HOUR FLAKE MOISTURE IN	EVERY HOUR FLAKE MOISTURE FACE	EVERY HOUR FLAKE MOISTURE CORE
5:00	246	57	1655	246	4685	70%	265	60	1574	271	4165	80%	40%	40%		4.4	4.6
5:10	246	57	1592	243	4736	70%	265	60	1600	265	4213	80%	40%	40%		4.2	5.6

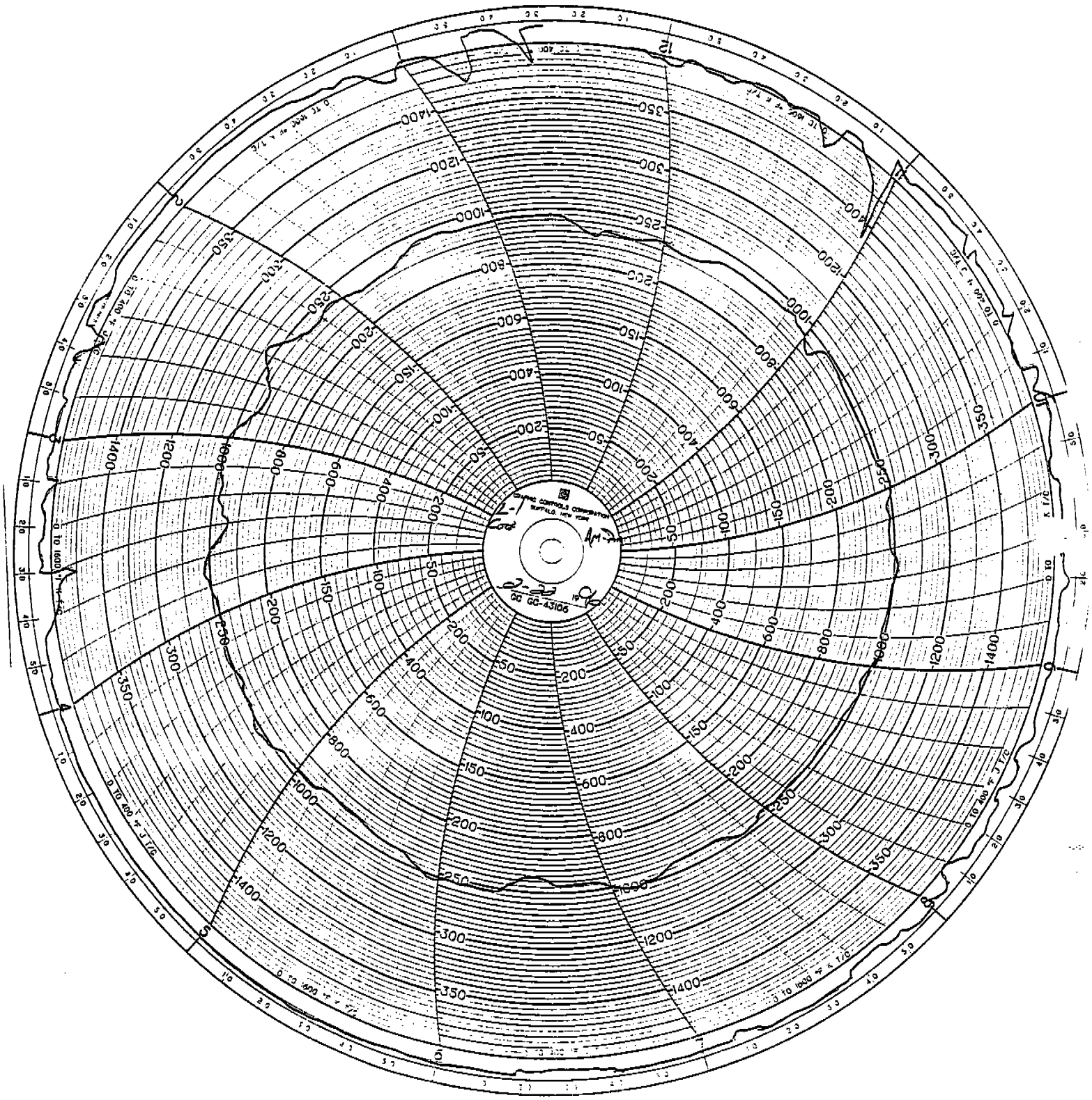
L-42

4h

LINE I
SURFACE DRYER
2/22/96
7AM-7PM



LINE I
CORE DRYER
2/22/96
7AM - 7PM



Konus EFB Readings

Plant Hayward L.P.

readings every 10 minutes

date 2/22/96

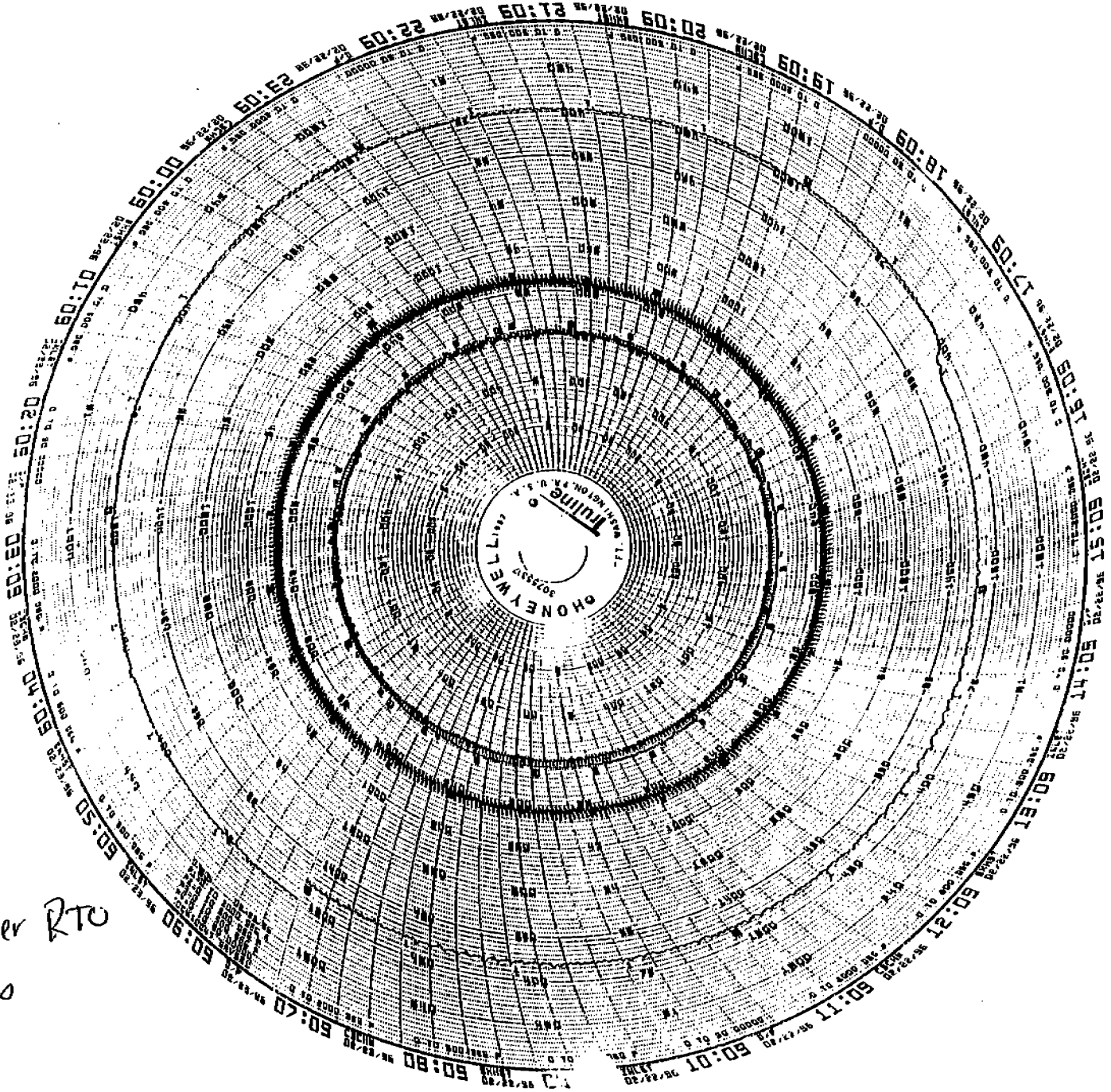
by Putnam

time	K1 and K2						K3 and K4					
	Bed Volt	Bed Current	Ion Volt	Ion Current	EFB Press.	Baghouse Press.	Bed Volt	Bed Current	Ion Volt	Ion Current	EFB Press.	Baghouse Press.
9:00	12.5	0.4	30	4	2.2	4						
9:15	13.0	0.4	28.5	4	2.0	4						
9:30	13.0	0.4	28.5	4	2.0	4						
9:45	13.0	0.4	28.5	4	2.2	4						
10:00	13.0	0.4	30	4	2.2	4						
10:15	13.0	0.4	30	4	2.2	4						
10:30	13.0	0.4	30	4	2.2	4						
10:45	12.5	0.4	28.5	4	2.2	4						
11:00	13.0	0.4	30	4	2.2	4						
11:15	13.0	0.4	30	4	2.4	4.5						
11:30	13.0	0.4	30	4	2.4	4						
11:45	13.0	0.4	30	4	2.4	4						
12:00	13.0	0.4	30	4	1.2	4						
12:15	13.0	0.4	30	4	1.2	4						
12:30	13.0	0.4	30	4	1.0	4						
1:45	13.0	0.4	28.5	4	0.8	4						
1:00	13.0	0.4	28	4	1.0	4						
1:15	13.0	0.4	30	4	1.0	4.5						
1:30	13.0	0.4	30	4	1.0	4.5						
1:45	13.0	0.4	30	4	0.8	4						
2:00	13.0	0.4	30	4	1.0	5						

LI Dryer RTO 2-22-96

RECORD EVERY 15 MIN. — HAYWARD AIR TESTING WORKSHEET

Time	RTO Chamber Bed Temp.					Inlet	Burners		Combust.	Exhaust	Press.	Gas
	#1	#2	#3	#4	#5	Press.	B#1	B#2	Temp.	Temp.	Drop	Usage
8:00 AM	316	350	470	431	335	0.5	41.6	23.6	1521	249	27.8	0
8:15	317	351	463	439	329	0.8	33.0	18.3	1518	240	26.4	2
8:30	314	360	463	437	333	1.4	28.6	25.2	1520	250	26.5	4
8:45	318	350	468	436	332	0.7	28.8	20.9	1528	244	26.8	6
9:00	315	357	468	434	335	1.3	39.6	24.0	1529	244	26.8	8
9:15	314	361	464	440	332	0.8	40.2	38.6	1515	254	26.9	10
9:30	316	361	463	442	332	0.3	46.1	49.5	1516	256	26.7	13
9:45	317	356	463	445	328	1.2	35.5	17.4	1517	249	26.6	15
10:00	318	350	471	436	333	0.4	42.6	33.0	1518	247	27.2	18
10:15	318	354	465	444	328	0.6	30.3	15.1	1529	240	26.6	20
10:30	317	356	464	446	327	1.3	28.2	46.6	1519	248	26.8	22
10:45	317	354	472	435	334	0.4	36.0	22.9	1524	250	27.5	24
11:00	318	356	466	446	327	1.1	24.7	27.2	1521	243	26.7	26
11:15	315	363	469	441	332	1.6	49.8	32.9	1520	249	26.4	28
11:30	317	360	475	437	334	0.9	33.0	28.6	1531	249	27.2	31
11:45	316	364	470	444	331	1.2	38.2	32.9	1522	255	26.7	33
Pm 12:00	320	357	472	445	328	1.3	27.9	28.2	1525	243	26.4	34
12:15	320	357	478	439	332	0.8	35.8	30.9	1527	252	27.1	37
12:30	317	366	470	447	327	1.0	29.5	40.6	1528	259	26.5	39
12:45	318	360	480	438	332	0.4	49.8	26.7	1522	253	27.6	40
1:00	316	362	477	437	329	1.2	35.0	31.1	1529	244	27.0	43
1:15	315	367	474	442	327	1.2	38.5	41.7	1519	252	26.8	45
1:30	319	360	476	446	322	0.9	27.6	20.7	1534	244	27.0	47
1:45	319	359	482	440	326	0.9	27.4	10.5	1538	247	27.0	50
2:00	316	370	476	444	325	0.2	30.6	37.2	1525	259	26.6	52
2:15	320	361	479	443	324	1.2	34.6	18.9	1523	244	26.5	54
2:30	316	371	479	442	328	1.4	47.1	46.3	1519	250	26.6	56
2:45	317	369	489	440	329	1.8	52.8	36.2	1517	245	26.6	58
3:00	320	361	481	443	325	1.4	26.8	18.1	1524	248	27.1	61
3:15	318	370	477	446	324	0.9	36.3	27.7	1519	260	26.6	63
3:30	320	362	482	442	323	1.2	25.0	17.4	1526	244	26.6	65
3:45	320	361	485	439	325	0.7	30.1	17.6	1523	249	27.1	67
4:00	320	361	486	439	325	0.2	33.9	18.4	1522	249	27.2	69
4:15	319	366	480	445	321	1.1	28.2	29.9	1519	247	26.9	72
4:30	317	368	486	435	329	1.2	45.3	41.1	1518	246	26.9	73
4:45	316	371	481	440	326	1.7	40.5	30.8	1521	259	26.8	76
5:00	318	364	487	435	327	0.4	38.0	30.2	1527	252	27.6	78
5:10	320	361	486	437	325	0.3	33.9	20.1	1527	248	27.1	79



Line I Dryer RTO
2/22/96

DATE: 2 22 96
SHIFT/CREW: 1st Dcrew
OPERATOR: Mussche

UNIT/ 1/2 THICKNESS		WEIGHT		HEIGHT		UNIT/ THICKNESS		WEIGHT		HEIGHT	
1	7:22	4261		39 1/4		36	11:12	4399		40 3/4	
2	:36	4376	CP	39		37	19	4411		41	
3	:45	4395		39 1/2		38	:24	4391		40 3/4	
4	:51	4395		39 1/2		39	:31	4393		41	
5	:58	4395		40		40	:37	4355		40 3/4	
6	8:04	4343		40 3/4		41	:43	4340		40 1/2	
7	:10	4306	CP	40 1/2		42	:50	4342		40 1/2	
8	:16	4273		40 3/4		43	:56	4301		40 3/4	
9	:23	4261		40 1/2		44	12:02	4269		40 3/4	
10	:29	4206	CP	40 1/2		45	:08	4263		40 3/4	
11	:36	4187		40 1/2		46	:14	4236		40 1/2	
12	:42	4228		40 1/2		47	:20	4216		40 3/4	
13	:48	4179	CP	40 1/2		48	:27	4179	CP	40 1/2	
14	:54	4236		40 3/4		49	:34	4202		40 1/2	
15	9:01	4199		40 3/4		50	1:03	4188		40 3/4	
16	:07	4179	CP	40 3/4		51	:10	4239		40 3/4	
17	:13	4279		40 3/4		52	:15	4409		40 3/4	
18	:20	4249		40 1/2		53	:21	4403		41	
19	:25	4259		40 3/4		54	:29	4462		41 1/4	
20	:31	4229		40 1/2		55	:35	4482		41	
21	:38	4263		40 3/4		56	:41	4412		41 1/4	
22	:44	4239		40 1/2		57	:48	4439	CP	41 1/4	
23	:51	4246		40 3/4		58	:54	4463		41	
24	:58	4248		40 3/4		59	:8	4434		40 3/4	
25	10:03	4333		40 3/4		60	1:05	4450		40 1/2	
26	10:09	4344		41		61	:13	4439		40 1/2	
27	:16	4332		41		62	:18	4462		40 1/4	
28	22	4432		41		64	:25	4436		40 1/2	
29	:27	4373		40 3/4		65	:31	4376		40 1/4	
30	:34	~~4411~~		41		66	:37	4408		40	
31	:40	~~4391~~		41		67	:44	4427		40	
32	:46			41		68	:50	4423		40	
33	:53			41		69	:56	4419		40 1/4	
34	:59			41		70	2:03	4376		40	
35	11:05			41		71	:09	4386		40	

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DATE: _____

SHIFT/CREW: _____

OPERATOR: _____

UNIT/ THICKNESS		WEIGHT	HEIGHT	UNIT/ THICKNESS	WEIGHT	HEIGHT
71	3:15	4381	40			
72	:22	4364	40			
73	:27	4344	39 3/4			
74	:34	4381	40			
75	:38	4310	40 1/2			
76	:46	4326	40 3/4			
77	:52	4337	40 3/4			
78	:59	4329	40 3/4			
79	4:00	4357	40 1/2			
80	:11	4341	40 1/4			
81	:17	4351	40 3/4			
82	:23	4339	40 1/2			
83	:29	4291	40 1/2			
84	:36	4315	40 3/4			
85	:41	4334	40 3/4			
86	:49	4377	40 1/2			
87	:55	4352	40 3/4			
88	5:01	4384	41			
89	:06	4373	40 3/4			
90			40 1/2			
~~91~~			~~40~~			
92		4499	40 1/2			
~~93~~						
94			40 1/2			
~~95~~						
96		4403	40 1/2			
98			40 1/2			
100		4360	40 1/4			
102			40			
104						

HAYWARD LINE I FEBRUARY 21st 1996
PRESS RTO (VENT/INLET)PM/METH/BENZ/NOx/CO/CO2/THC/M2/NOx
DATA TIM START= 12:15 END= 16:45 HOURS= 4.50

BOARD WEIGHTS - LBS
average weights determined by taking bundle weights divided by peices
per unit over the testing period.
1/2"
per/peice 54.63
per/ 8' x 16' 218.51

PLANT PRODUCTION RATE
4.50 =hours during testing
71 =pressloads
852 =no. of 8'x16' boards produced (pressloads x 12 boards per load)
186,169 =lbs of finished product (boards produced x weight of finished board)
41,371 =lbs of finished product per hour (lbs of finshed product / hours)
20.69 =tons of finished product per hour (lbs of finshed product per hour / 2000 lb)

RESIN USAGE TAKEN FROM MICRO - MOTIONS

TIME	MDI	PHENOL	WAX
12:15-1:15	421	887	303
2:00-3:00	420	885	301
3:25-4:25	421	888	300
AVERAGE	420.67	886.67	301.33

41,371 =average lbs. per hour finished product produced during testing
420.67 =average lbs. per hour of MDI resin used during testing
1.02% = MDI resin used as % of finished product

886.67 =average lbs. per hour of phenolic resin (100% solids) used during testing
2.14% =Phenolic resin used as % of finished product

301.33 =average lbs. per hour of wax (100% solids) used during testing
0.73% =wax used as % of finished product

Press Test # 1 2-21-96

12:15 1:15

Micro-Motions

Solids		Pounds	100% Solids
100%	MDI Core -	421	421
57%	PF Surf. -	1557	887
58%	Wax Core -	197	303
58%	Wax Surf. -	325	

Tanks

Solids		Before	After	Pounds	100% Solids
100%	Core MDI -	226.875	226.25	375	375
2 ÷ 61%	Surf PF -	37	37	—	
2 ÷ 57%	Day Tank PF -	485	1044	1860	530
2 ÷ 57%	Mix Tank PF -	761	18		
2 ÷ 58%	Wax -	124	121½	955	277

Factors per inch

MDI Tank - 600.466

PF Tank - 727.583

Wax Tank - 381.86

Factors per gallon

Day Tank - 10.11

Mix Tank - 10.11

50

Press Test # 2 2-21-96

2:00 3:00

Micro-Motions

Solids		Pounds	100% Solids
100%	MDI Core -	420	420
57%	PF Surf. -	1552	885
58%	Wax Core -	202	301
58%	Wax Surf. -	317	

Tanks

Solids		Before	After	Pounds	100% Solids
100%	Core MDI -	225.75	224.875	525 ~~334~~	525
2 ÷ 61%	Surf PF -	37	37		
2 ÷ 57%	Day Tank PF -	834	559 ~~567~~	~~2780~~	792
2 ÷ 57%	Mix Tank PF -	8	8		
2 ÷ 58%	Wax -	119.5	117.0	955	277

Factors per inch

MDI Tank - 600.466

PF Tank - 727.583

Wax Tank - 381.86

Factors per gallon

Day Tank - 10.11

Mix Tank - 10.11

Press Test #3 — 3:25 4:25

Micro-Motions

Solids		Pounds	100% Solids
100%	MDI Core -	421	421
57%	PF Surf. -	1558	888
58%	Wax Core -	206	300
58%	Wax Surf. -	311	

Tanks

Solids		Before	After	Pounds	100% Solids
100% Core	MDI -	224.75	224	450	450
2 ÷ 61% Surf	PF -	26.5	26.5		
2 ÷ 57% Day Tank	PF -	442	991	2639	752
2 ÷ 57% Mix Tank	PF -	820	10		
2 ÷ 58% Wax	-	1155	113	955	277

Factors per inch

MDI Tank - 600.466

PF Tank - 727.583

Wax Tank - 381.86

Factors per gallon

Day Tank - 10.11

Mix Tank - 10.11

LOUISIANA-PACIFIC CORPORATION

PRESS REPORT - LINE (1) 2 DATE: 2/21/96

OPERATOR Wood SHIFT: AM CREW: 1

THICKNESS 7/16 PRESS LDS: 6 7/16 180 1/2

OVERALL TIMER: 180 DECOMPRESSION TIME: 15+2

PRESS TEMP: 215° TOTAL REJECTS:

LOG COUNT: 1470

LINE SPEED	THKNS.	FROM	TO
53	7/16	7:00	
53	1/2	7:20	
55	11	8:20	
45	11	1:20	
55	11	1:45	
45	11	4:30	
55	11	5:50	

F.C.O.S. HYD. RADIATOR: ✓ TIME

PRESS BLOWN DOWN: ✓

SPINNER HEADS FLUSHED: ✓ TIME

SURFACE BLENDER HOSED: ✓ TIME

FORMER HYD RADIATOR: ✓ TIME

DOWNTIME FROM	DOWNTIME TO	DOWNTIME (MINS) M	E	O	KEY	REASONS FOR DOWNTIME

DOWNTIME CODE: M - MECHANICAL O E - ELECTRICAL O - OPERATOR

53

LOUISIANA-PACIFIC CORPORATION

PRESS REPORT - LINE (1) 2 DATE: 7-21-96

OPERATOR VISSER SHIFT: 2nd CREW: B

THICKNESS 1/2 PRESS LDS: 30½ 55 19/32 SE 87 15/32

OVERALL TIMER: 173 DECOMPRESSION TIME: 18

PRESS TEMP: 215° TOTAL REJECTS:

LOG COUNT: 1528

LINE SPEED	THKNS.	FROM	TO
55	1/2	7:00	
56	19/32 SE	855	
52	15/32	100	
48	15/32	500	
45	15/32	640	

F.C.O.S. HYD. RADIATOR: — TIME

PRESS BLOWN DOWN: —

SPINNER HEADS FLUSHED: — TIME

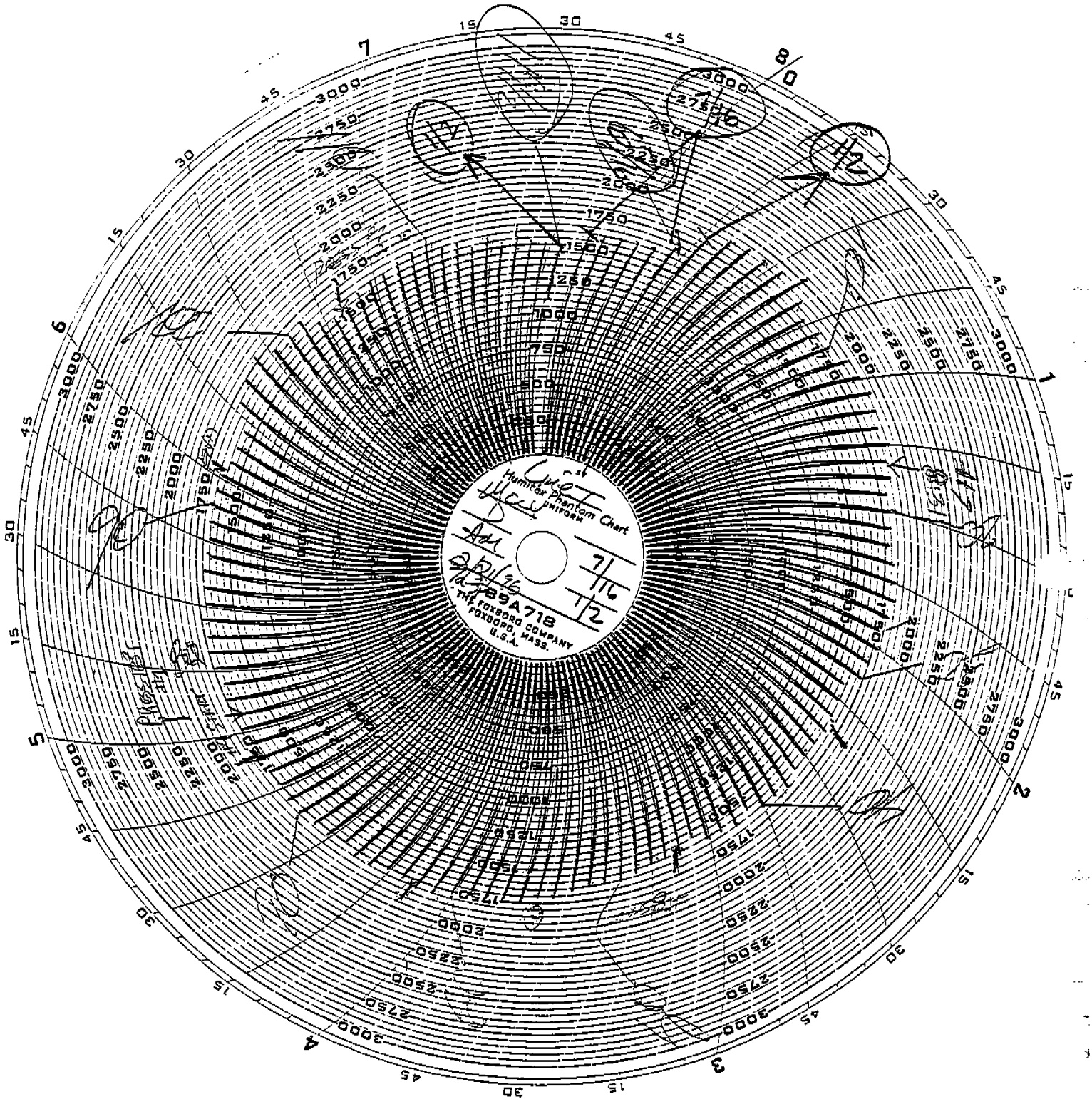
SURFACE BLENDER HOSED: — TIME

FORMER HYD RADIATOR: — TIME

DOWNTIME FROM	DOWNTIME TO	DOWNTIME (MINS) M	E	O	KEY	REASONS FOR DOWNTIME

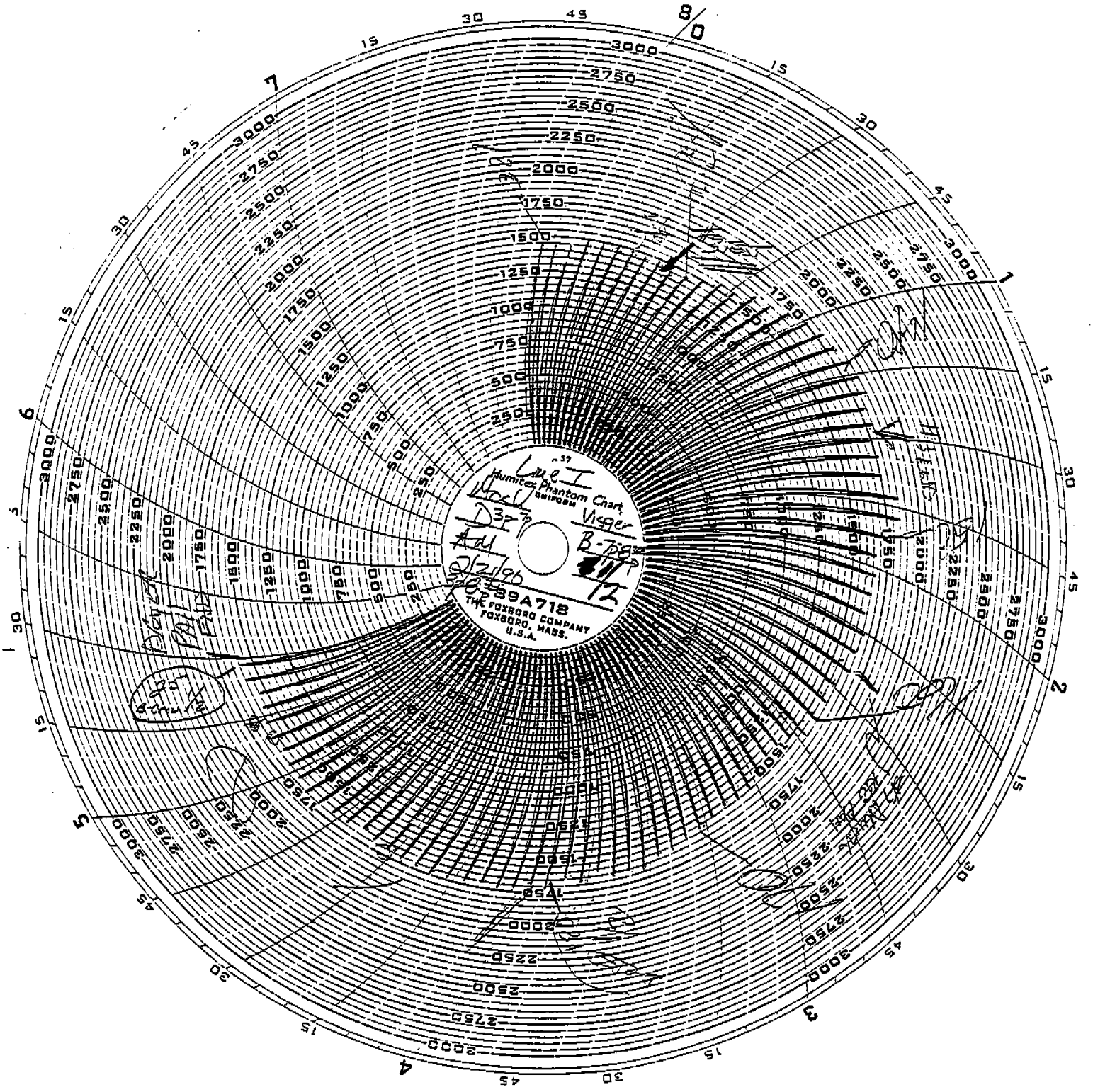
DOWNTIME CODE: M - MECHANICAL E - ELECTRICAL O - OPERATOR

LINE 1 PRESS
CHART
2/21/96
0700-1500



55

Line I
Press Chart
2/21/94
1500 - 2030



56

LI Dryer RTO 2-21-96

RECORD EVERY 15 MIN. — HAYWARD AIR TESTING WORKSHEET

Time	RTO Chamber Bed Temp.					Inlet	Burners		Combust.	Exhaust	Press.	Gas
	#1	#2	#3	#4	#5	Press.	B#1	B#2	Temp.	Temp.	Drop	Usage
8:30	317	352	465	439	320	.7	33.8	27.4	1513	238	26.8	0
8:45	316	357	462	442	321	1.3	34.0	22.8	1508	252	26.4	2
9:00	314	360	464	439	324	.4	43.0	42.1	1502	256	26.4	4
9:15	314	360	467	437	326	1.4	40.6	50.5	1511	252	26.6	6
9:30	314	360	467	438	326	1.4	40.7	51.5	1511	249	26.7	8
9:45	314	361	467	439	326	1.7	40.6	45.2	1512	248	26.7	11
10:00	314	360	469	437	327	1.9	58.5	39.7	1515	249	26.7	13
10:15	315	359	471	436	327	1.7	39.7	32.8	1517	243	26.2	15
10:30	315	360	472	438	326	1.8	29.5	44.3	1522	243	26.4	18
10:45	316	356	474	436	327	1.0	35.5	27.4	1522	244	27.0	20
11:00	317	353	476	437	327	.5	33.4	32.1	1525	249	27.4	22
11:15	317	353	477	438	326	.5	31.1	24.7	1534	249	27.4	24
11:30	316	357	477	438	327	.7	34.8	31.5	1527	247	27.0	26
11:45	316	358	477	438	328	1.3	43.2	28.5	1515	246	26.9	29
12:00	318	355	478	438	327	.5	40.9	26.7	1520	250	27.1	31
12:15	317	357	478	438	328	.6	35.8	44.7	1524	248	27.3	33
12:30	318	356	479	439	328	.5	40.2	31.5	1523	251	27.3	35
12:45	315	360	475	437	328	1.7	30.3	38.3	1525	242	26.5	38
1:00	315	362	475	439	328	1.8	50.5	74.2	1515	245	26.4	40
1:15	318	358	479	436	330	.8	49.5	34.4	1517	247	27.1	42
1:30	316	363	474	441	329	1.8	42.9	33.3	1532	252	26.6	44
1:45	317	363	475	439	331	1.8	45.3	29.7	1519	245	26.4	46
2:00	317	361	476	437	331	1.6	42.5	35.3	1517	244	26.6	49
2:15	317	365	471	443	328	.4	44.0	38.3	1516	259	26.5	51
2:30	317	363	476	438	333	1.8	43.6	40.1	1516	247	26.5	53
2:45	317	364	472	441	331	1.3	58.0	47.5	1514	253	27.1	56
3:00	317	362	473	438	333	1.7	50.2	48.3	1515	245	26.5	58
3:15	317	364	472	439	333	1.8	46.0	45.0	1518	248	26.5	60
3:30	317	365	469	444	331	.5	46.3	42.1	1523	259	26.3	62
3:45	315	365	468	445	331	1.0	38.2	28.3	1525	260	26.4	64
4:00	318	365	468	445	332	.3	37.5	32.0	1520	258	26.2	66
4:15	320	361	467	448	329	1.0	33.2	31.9	1522	249	26.7	68
4:30	319	359	475	434	337	1.9	42.2	43.9	1519	252	26.8	70
4:45	319	363	467	447	330	1.1	50.8	22.4	1523	248	26.6	73
5:00	320	360	468	448	330	1.4	33.7	20.1	1521	245	26.6	75
5:15	321	360	468	449	331	1.3	35.4	30.2	1519	245	26.4	77
5:30	319	365	468	447	334	.9	41.9	35.4	1520	259	26.2	79
5:45	319	363	472	440	338	1.7	54.3	28.9	1521	245	26.2	81
6:00	318	361	465	446	332	.9	32.3	27.4	1516	248	26.7	84
6:15	315	356	466	443	330	.9	27.8	29.6	1522	240	26.4	86

kc

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L I Dryer RTO 2-21-96

RECORD EVERY 15 MIN. HAYWARD AIR TESTING WORKSHEET

Time	RTO Chamber Bed Temp.					Inlet	Burners		Combust.	Exhaust	Press.	Gas
	#1	#2	#3	#4	#5	Press.	B#1	B#2	Temp.	Temp.	Drop	Usage
6:30	317	360	465	446	331	1.2	31.2	29.1	1516	254	26.3	88
6:45	320	352	472	439	335	.6	32.3	30.5	1520	244	26.9	90
7:00	318	360	465	446	332	1.0	31.7	30.8	1515	256	26.4	93
7:15	320	352	471	440	334	1.1	29.2	25.6	1522	244	27.0	95
7:30	319	358	465	447	332	1.2	31.3	27.2	1516	249	26.7	97
7:45	319	353	472	437	338	.7	37.4	45.1	1521	251	27.6	99
8:00	320	352	469	441	334	1.4	29.2	21.6	1523	242	27.0	102
8:15	318	354	466	444	331	.9	29.6	23.8	1531	240	26.8	104
8:30	316	356	470	435	339	1.0	51.2	29.0	1531	246	27.5	106

Line I Dryer RTO
2/21/96

HAYWARD LINE I FEBRUARY 22nd 1996
PRESS VENT RTO STACK - MDI
DATA TIM START= 08:00 END= 12:30 HOURS= 4.50

BOARD WEIGHTS - LBS
average weights determined by taking bundle weights divided by peices per unit over the testing period.

	1/2"
per/peice	54.21
per/ 8' x 16'	216.85

PLANT PRODUCTION RATE

4.50	=hours during testing
71	=pressloads
852	=no. of 8'x16' boards produced (pressloads x 12 boards per load)
184,758	=lbs of finished product (boards produced x weight of finished board)
41,057	=lbs of finished product per hour (lbs of finshed product / hours)
20.53	=tons of finished product per hour (lbs of finshed product per hour / 2000 lb)

RESIN USAGE TAKEN FROM MICRO - MOTIONS

TIME	MDI	PHENOL	WAX	
8:00-9:00	420	910	292	
9:00-10:00	421	907	296	
10:00-11:00	421	908	290	
11:00-12:00	422	908	294	
12:00-12:30	256	544	177	** HALF HOUR TOTALS
AVERAGE	421.00	908.25	293.00	

41,057	=average lbs. per hour finished product produced during testing
421.00	=average lbs. per hour of MDI resin used during testing
1.03%	= MDI resin used as % of finished product
908.25	=average lbs. per hour of phenolic resin (100% solids) used during testing
2.21%	=Phenolic resin used as % of finished product
293.00	=average lbs. per hour of wax (100% solids) used during testing
0.71%	=wax used as % of finished product

60

HAYWARD LINE I FEBRUARY 22nd 1996
PRESS VENT RTO STACK - FORMALDEHYDE
DATA TIM START= 13:30 END= 17:15 HOURS= 3.75

BOARD WEIGHTS - LBS
average weights determined by taking bundle weights divided by peices per unit over the testing period.

	1/2"
per/peice	54.21
per/ 8' x 16'	216.85

PLANT PRODUCTION RATE

3.75	=hours during testing
56	=pressloads
672	=no. of 8'x16' boards produced (pressloads x 12 boards per load)
145,725	=lbs of finished product (boards produced x weight of finished board)
38,860	=lbs of finished product per hour (lbs of finshed product / hours)
19.43	=tons of finished product per hour (lbs of finshed product per hour / 2000 lb)

RESIN USAGE TAKEN FROM MICRO - MOTIONS

TIME	MDI	PHENOL	WAX
1:00-2:00	416	899	278
2:00-3:00	421	906	281
3:00-4:00	421	906	282
4:00-5:00	419	905	281
AVERAGE	419.25	904.00	280.50

38,860	=average lbs. per hour finished product produced during testing
419.25	=average lbs. per hour of MDI resin used during testing
1.08%	= MDI resin used as % of finished product
904.00	=average lbs. per hour of phenolic resin (100% solids) used during testing
2.33%	=Phenolic resin used as % of finished product
280.50	=average lbs. per hour of wax (100% solids) used during testing
0.72%	=wax used as % of finished product

Press Test # 8:00 AM - 9:00 AM
2-22-96

Solids		Micro-Motions Pounds	100% Solids
100%	MDI Core -	420	420
57%	PF Surf. -	1597	910
58%	Wax Core -	192	292
58%	Wax Surf. -	312	

Tanks

Solids		Before	After	Pounds	100% Solids
100%	Core MDI -	213.5	212.375	676	676
2 ÷ 61%	Surf PF -	196	196		
2 ÷ 57%	Day Tank PF -	854	570	2932	834
2 ÷ 57%	Mix Tank PF -	8	2		
2 ÷ 58%	Wax -	78"	75.5	955	277

Factors per inch

MDI Tank - 600.466
PF Tank - 727.583
Wax Tank - 381.86

Factors per gallon

Day Tank - 10.11
Mix Tank - 10.11

Press Test # 9:00 AM - 10:00 AM

2-22-96

Micro-Motions

Solids		Pounds	100% Solids
100%	MDI Core -	421	421
57%	PF Surf. -	1591	907
58%	Wax Core -	193	296
58%	Wax Surf. -	317	

Tanks

Solids		Before	After	Pounds	100% Solids
100%	Core MDI -	212.375	211.625	450	45
2 ÷ 61.7%	Surf PF -	196	184.75	-8185	
2 ÷ 57%	Day Tank PF -	570	856	2675 +5510	76
2 ÷ 57%	Mix Tank PF -	2	257		
2 ÷ 58%	Wax -	75.5	72.75	1050	305

Factors per inch

MDI Tank - 600.466

PF Tank - 727.583

Wax Tank - 381.86

Factors per gallon

Day Tank - 10.11

Mix Tank - 10.11

Press Test #

10:00 AM - 11:00 AM

2-22-96

Micro-Motions

Solids		Pounds	100% Solids
100%	MDI Core -	421	421
57%	PF Surf. -	1593	908
58%	Wax Core -	191	290
58%	Wax Surf. -	308	

Tanks

Solids		Before	After	Pounds	100% Solids
100%	Core MDI -	211.625	211.25	225	225
2 ÷ 61%	Surf PF -	184.75	184.75		
2 ÷ 57%	Day Tank PF -	856	828	2831	807
2 ÷ 57%	Mix Tank PF -	257	5		
2 ÷ 58%	Wax -	72.75	70	1050	305

Factors per inch

MDI Tank - 600.466

PF Tank - 727.583

Wax Tank - 381.86

Factors per gallon

Day Tank - 10.11

Mix Tank - 10.11

Press Test #

11:00 AM - 12:00 PM
2-22-96

Micro-Motions

Solids		Pounds	100% Solids
100%	MDI Core -	422	422
57%	PF Surf. -	1593	908
58%	Wax Core -	194	294
58%	Wax Surf. -	313	

Tanks

Solids		Before	After	Pounds	100% Sol.
100% Core	MDI -	211.25	210.625	375	37
2 ÷ 61% Surf	PF -	184.75	184.75		
2 ÷ 57% Day Tank	PF -	828	548	2831	806
2 ÷ 57% Mix Tank	PF -	5	5		
2 ÷ 58% Wax	-	70	66.5	1337	388

Factors per inch

MDI Tank - 600.466
PF Tank - 727.583
Wax Tank - 381.86

Factors per gallon

Day Tank - 10.11
Mix Tank - 10.11

Press Test #

12:00 PM - 1:00 PM

2-22-96

Down 24 Minutes

Micro-Motions

Solids		Pounds	100% Solids
100%	MDI Core -	256	256
57%	PF Surf. -	954	544
58%	Wax Core -	118	177
58%	Wax Surf. -	188	

Tanks

Solids		Before	After	Pounds	100% Solids
100%	Core MDI -	210.625	210.25	225	225
2 ÷ 61%	Surf PF -	184.75	173.5	-8185	
2 ÷ 57%	Day Tank PF -	548	682	2776	791
2 ÷ 57%	Mix Tank PF -	5	406	+5409	
2 ÷ 58%	Wax -	66.5	64.5	764	221

Factors per inch

MDI Tank - 600.466

PF Tank - 727.583

Wax Tank - 381.86

Factors per gallon

Day Tank - 10.11

Mix Tank - 10.11

Press Test #

1:00 PM - 2:00 PM
2-22-96

Micro-Motions

Solids		Pounds	100% Solids
100%	MDI Core -	416	416
57%	PF Surf. -	1578	899
58%	Wax Core -	182	278
58%	Wax Surf. -	298	

Tanks

Solids		Before	After	Pounds	100% Solids
100%	Core MDI -	210.25	209.625	375	375
2 ÷ 61%	Surf PF -	173.5	173.5		
2 ÷ 57%	Day Tank PF -	682	892	1890	538
2 ÷ 57%	Mix Tank PF -	406	9		
2 ÷ 58%	Wax -	64.5	63	573	166

Factors per inch

MDI Tank - 600.466
PF Tank - 727.583
Wax Tank - 381.86

Factors per gallon

Day Tank - 10.11
Mix Tank - 10.11

Press Test #

2:00 PM - 3:00 PM
2-22-96

Micro-Motions

Solids		Pounds	100% Solids
100%	MDI Core -	421	421
57%	PF Surf. -	1590	906
58%	Wax Core -	186	281
58%	Wax Surf. -	299	

Tanks

Solids		Before	After	Pounds	100% Solids
100% Core	MDI -	209.625	208.938	413	413
2 ÷ 61% Surf	PF -	173.5	173.5		
2 ÷ 57% Day Tank	PF -	892	625	2720	775
2 ÷ 57% Mix Tank	PF -	9	7		
2 ÷ 58% Wax	-	63	60.5	955	277

Factors per inch

MDI Tank - 600.466
PF Tank - 727.583
Wax Tank - 381.86

Factors per gallon

Day Tank - 10.11
Mix Tank - 10.11

68

Press Test # 3:00 pm - 4:00 pm

2-22-96

Micro-Motions

Solids		Pounds	100% Solids
100%	MDI Core -	421	421
57%	PF Surf. -	1590	906
58%	Wax Core -	187	282
58%	Wax Surf. -	300	

Tanks

Solids		Before	After	Pounds	100% Solids
100%	Core MDI -	208.938	208.438	300	300
2 ÷ 61%	Surf PF -	173.5	162.188	-8230	
2 ÷ 57%	Day Tank PF -	625	478	3721	1060
2 ÷ 57%	Mix Tank PF -	7	700	+4509	
2 ÷ 58%	Wax -	60.5	58	955	276

Factors per inch

MDI Tank - 600.466

PF Tank - 727.583

Wax Tank - 381.86

Factors per gallon

Day Tank - 10.11

Mix Tank - 10.11

Press Test # 4:00pm - 5:00pm

2-22-96

Micro-Motions

Solids		Pounds	100% Solids
100%	MDI Core -	419	419
57%	PF Surf. -	1588	905
58%	Wax Core -	184	281
58%	Wax Surf. -	300	

Tanks

Solids		Before	After	Pounds	100% Solids
100%	Core MDI -	208.438	207.938	300	300
2 ÷ 61%	Surf PF -	162.188	162.188		
2 ÷ 57%	Day Tank PF -	478	898	2669	761
2 ÷ 57%	Mix Tank PF -	700	16		
2 ÷ 58%	Wax -	58	55.5	955	277

Factors per inch

MDI Tank - 600.466

PF Tank - 727.583

Wax Tank - 381.86

Factors per gallon

Day Tank - 10.11

Mix Tank - 10.11

LOUISIANA-PACIFIC CORPORATION

PRESS REPORT - LINE: (1) 2 DATE: 2-22-96

OPERATOR MACK SHIFT: AM CREW: 1

THICKNESS 15/32 PRESS LDS: 2 13/32 17 1/2

OVERALL TIMER: 7.05 DECOMPRESSION TIME: 18

PRESS TEMP: 215 TOTAL REJECTS:

LOG COUNT: 1562

LINE SPEED	THKNS.	FROM	TO
45	15/32	700	
45	1/2	7:15	
55	11	7:45	
53	11	5:55	

F.C.O.S. HYD. RADIATOR: ✓ TIME

PRESS BLOWN DOWN: ✓

SPINNER HEADS FLUSHED: ✓ TIME

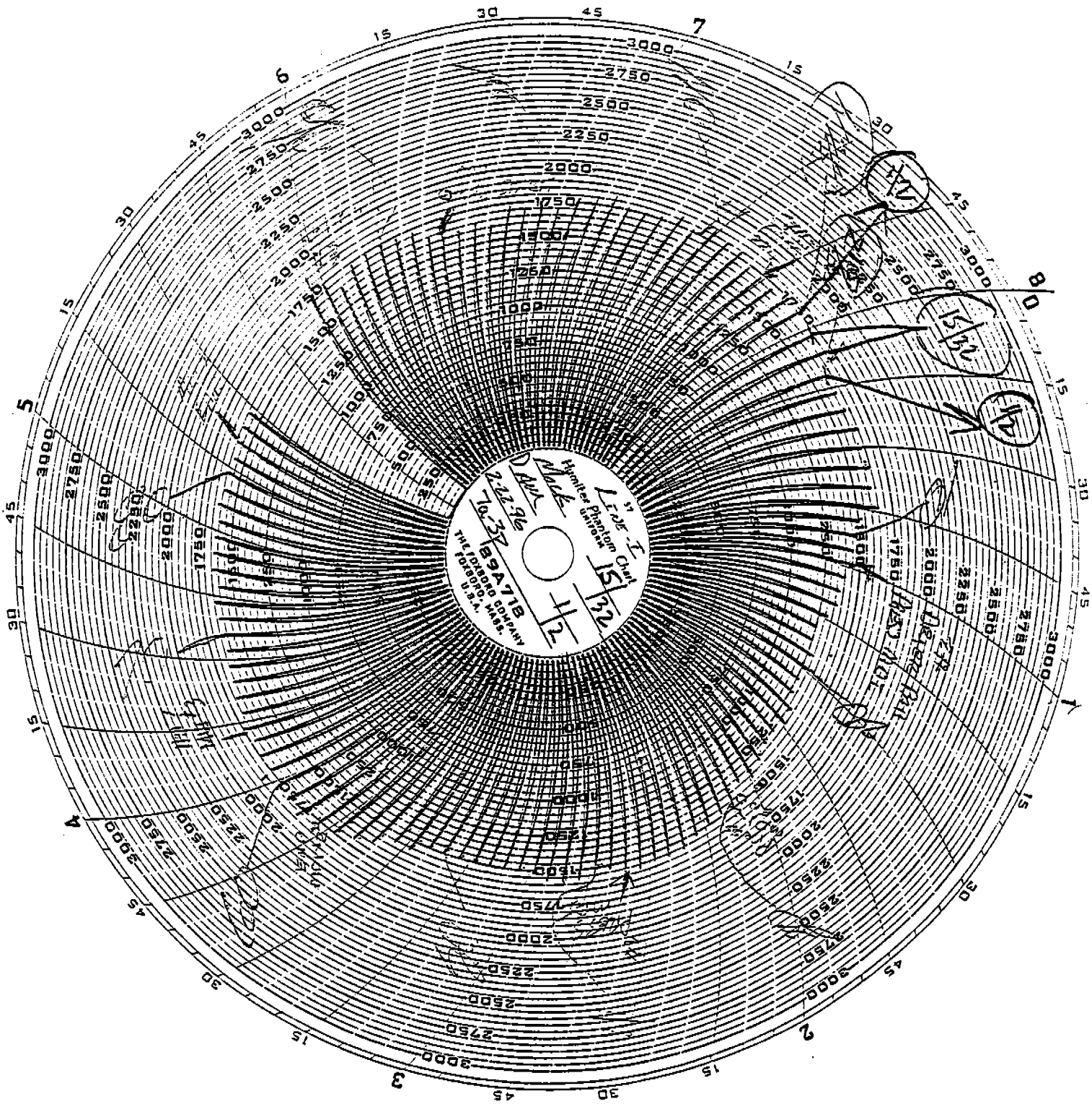
SURFACE BLENDER HOSED: ✓ TIME

FORMER HYD RADIATOR: ✓ TIME

DOWNTIME FROM	DOWNTIME TO	DOWNTIME (MINS) M	E	O	KEY	REASONS FOR DOWNTIME
12:31	12:55	24				Dozer to Build Bins

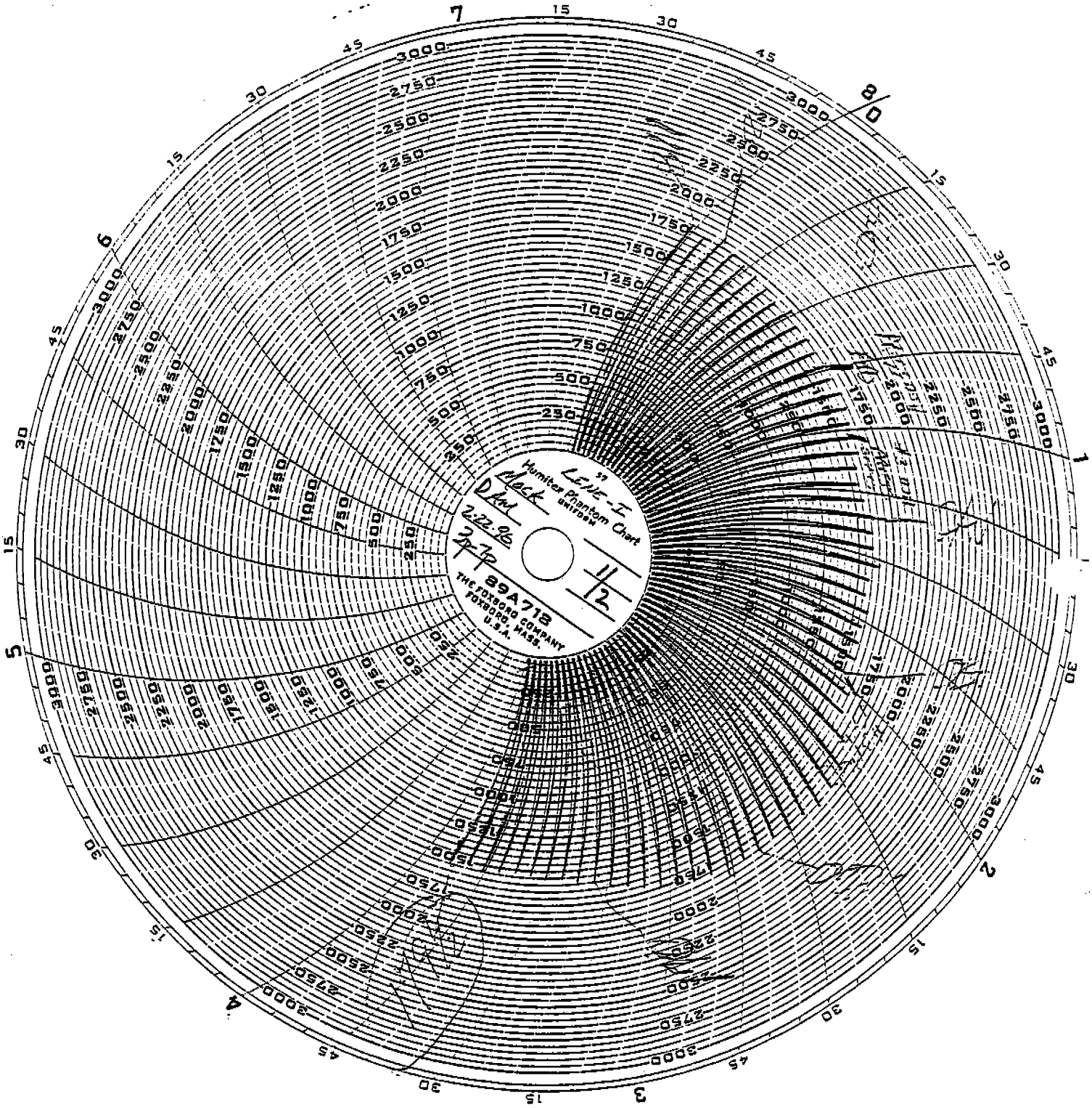
DOWNTIME CODE: M - MECHANICAL E - ELECTRICAL O - OPERATOR

PRESS CHART
2/22/96
0700-1500



72

LINE 2
PRESS CHART
2/22/96
1500 - 1900



73

2-1 Dryer RTO

RECORD EVERY 15 MIN. — HAYWARD AIR TESTING WORKSHEET

Time	RTO Chamber Bed Temp.					Inlet	Burners		Combust.	Exhaust	Press.	Gas
	#1	#2	#3	#4	#5	Press.	B#1	B#2	Temp.	Temp.	Drop	Usage
8:[illegible]	316	350	470	431	335	0.5	41.6	23.6	1521	249	27.8	0
[illegible]:15	317	351	463	439	329	0.8	33.0	18.3	1518	240	26.4	2
8:30	314	360	463	437	333	1.4	28.6	25.2	1520	250	26.5	4
8:45	318	350	468	436	332	0.7	28.8	20.9	1528	244	26.8	6
9:00	315	357	468	434	335	1.3	39.6	24.0	1529	244	26.8	8
9:15	314	361	464	440	332	0.8	40.2	38.6	1515	254	26.9	10
9:30	316	361	463	442	332	0.3	46.1	49.5	1516	256	26.7	13
9:45	317	356	463	445	328	1.2	35.5	17.4	1517	249	26.6	15
10:00	318	350	471	436	333	0.4	42.6	33.0	1518	247	27.2	18
10:15	318	354	465	444	328	0.6	30.3	15.1	1529	240	26.6	20
10:30	317	356	464	446	327	1.3	28.2	46.6	1519	248	26.8	22
10:45	317	354	472	435	334	0.4	36.0	22.9	1524	250	27.5	24
11:00	318	356	466	446	327	1.1	24.7	27.2	1521	243	26.7	26
11:15	315	363	469	441	332	1.6	49.8	31.9	1520	249	26.4	28
11:30	317	360	475	437	334	0.9	33.0	28.6	1531	249	27.2	31
11:45	316	364	470	444	331	1.2	38.2	32.9	1522	255	26.7	33
12:00	320	357	472	445	328	1.3	27.9	28.2	1525	243	26.4	34
12:15	320	357	478	439	332	0.8	35.8	30.9	1527	252	27.1	37
12:30	317	366	470	447	327	1.0	29.5	40.6	1528	259	26.5	39
12:45	318	360	480	438	332	0.4	49.8	26.7	1522	253	27.6	40
1:00	316	362	477	437	329	1.2	35.0	31.1	1529	244	27.0	43
1:15	315	367	474	442	327	1.2	38.5	41.7	1519	252	26.8	45
1:30	319	360	476	446	322	0.9	27.6	20.7	1534	244	27.0	47
1:45	319	359	482	440	326	0.9	27.4	10.5	1538	247	27.0	50
2:00	316	370	476	444	325	0.2	30.6	37.2	1525	259	26.6	52
2:15	320	361	479	443	324	1.2	34.6	18.9	1523	244	26.5	54
2:30	316	371	479	442	328	1.4	47.1	46.3	1519	250	26.6	56
2:45	317	369	489	440	329	1.9	52.8	36.2	1517	245	26.6	58
3:00	320	361	481	443	325	1.4	26.8	18.1	1524	248	27.1	61
3:15	318	370	477	446	324	0.9	36.3	27.7	1519	246	26.1	63
3:30	320	362	482	447	323	1.2	35.0	17.4	1526	244	26.6	65
3:45	320	361	485	439	325	0.7	30.1	17.6	1523	248	27.1	67
4:00	320	361	486	439	325	0.2	33.9	18.4	1522	249	27.2	69
4:15	319	366	480	445	321	1.1	28.2	29.5	1519	247	26.9	72
4:30	317	368	486	435	329	1.2	45.3	41.1	1518	246	26.9	73
4:45	316	371	481	440	326	1.7	40.5	30.8	1521	254	26.8	76
5:00	318	364	487	435	327	0.4	38.0	30.2	1527	252	27.6	78
5:10	320	361	486	437	325	0.3	33.9	20.1	1527	248	27.1	79

74

Line Dryer Rm
2/27/96

AYWARD LINE I FEBRUARY 20,21 1996
HERMAL OIL STACK - POM

ATA TIME	START=	15:45	END=	19:15	HOURS=	3.50
ATA TIME	START=	08:30	END=	16:30	HOURS=	8.00
					TOTAL=	11.5

OAf 'EIGHTS - LBS
verage weights determined by taking bundle weights divided by peices
er unit over the testing period.
1/2"
er/peice 55.08
er/ 8' x 16' 220.32

'LANT PRODUCTION RATE

11.50	=hours during testing
177	=pressloads
2124	=no. of 8'x16' boards produced (pressloads x 8 boards per load)
467,960	=lbs of finished product (boards produced x weight of finished board)
40,692	=lbs of finished product per hour (lbs of finshed product / hours)
20.35	=tons of finished product per hour (lbs of finshed product per hour / 2000 lb)

:UEL BURNING RATE ESTIMATED BY BARK INPUT

K1

13.89	=K1 fuel calibration in pounds per count
1,313	=K1 counts during testing hours
18,238	=K1 lbs of wet fuel burned during testing
11.50	=hours during testing
39.52%	=average moisture content of fuel
11,030	=total pounds of dry fuel burned during testing (wet pounds x (1- moisture content))
959.10	=lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
0.48	=tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
9,000	=estimated BTU content per pound of dry fuel,
8.63	=estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)

K2

.89	=K2 fuel calibration in pounds per count
1,859	=K2 counts during testing hours
25,822	=K2 lbs of wet fuel burned during testing
11.50	=hours during testing
39.52%	=average moisture content of fuel
15,616	=total pounds of dry fuel burned during testing (wet pounds x (1- moisture content))
1,357.94	=lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
0.68	=tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
9,000	=estimated BTU content per pound of dry fuel,
12.22	=estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)

FUEL BURNING RATE ESTIMATED TEMPERATURE DIFFERENTIAL

K1

447.3	=average incoming oil temperature on degrees f.
473.5	=average outgoinging oil temperature on degrees f.
60	=temperature differential at 100% capacity in degrees f
26.2	=actual temperature differential
19.4	=maximum mmbtu input at 100% capacity
8.47	=estimated mmbtu input per hour (actual temp. diff. / max temp. diff.) x max mmbtu input
9,000	=estimated BTU content per pound of dry fuel,
0.47	=estimated tons of dry fuel burned per hour during testing (btu input / btu content of dry fuel/2000)

K2

420.1	=average incoming oil temperature on degrees f.
472.1	=average outgoinging oil temperature on degrees f.
60	=temperature differential at 100% capacity in degrees f
51.9	=actual temperature differential
19.4	=maximum mmbtu input at 100% capacity
16.7907	=estimated mmbtu input per hour (actual temp. diff. / max temp. diff.) x max mmbtu input
9,000	=estimated BTU content per pound of dry fuel,
0.93	=estimated tons of dry fuel burned per hour during testing (btu input / btu content of dry fuel/2000)

76

LOUISIANA-PACIFIC CORPORATION

PRESS REPORT - LINE (1) 2 DATE: 2-20-96

OPERATOR Meyers SHIFT: Days CREW: C

THICKNESS 23/32H PRESS LDS: 3 23/32H, 1 81 1/2

OVERALL TIMER: 270 DECOMPRESSION TIME: -30

PRESS TEMP: 215°C TOTAL REJECTS: —

LOG COUNT: 1517

LINE SPEED	THKNS.	FROM	TO
35	23/32H	7:00	712
52	1/2	712	829
55	"	829	223
45	"	223	300
55	"	3:00	300

F.C.O.S. HYD. RADIATOR: 730 TIME

PRESS BLOWN DOWN: 700

SPINNER HEADS FLUSHED: — TIME

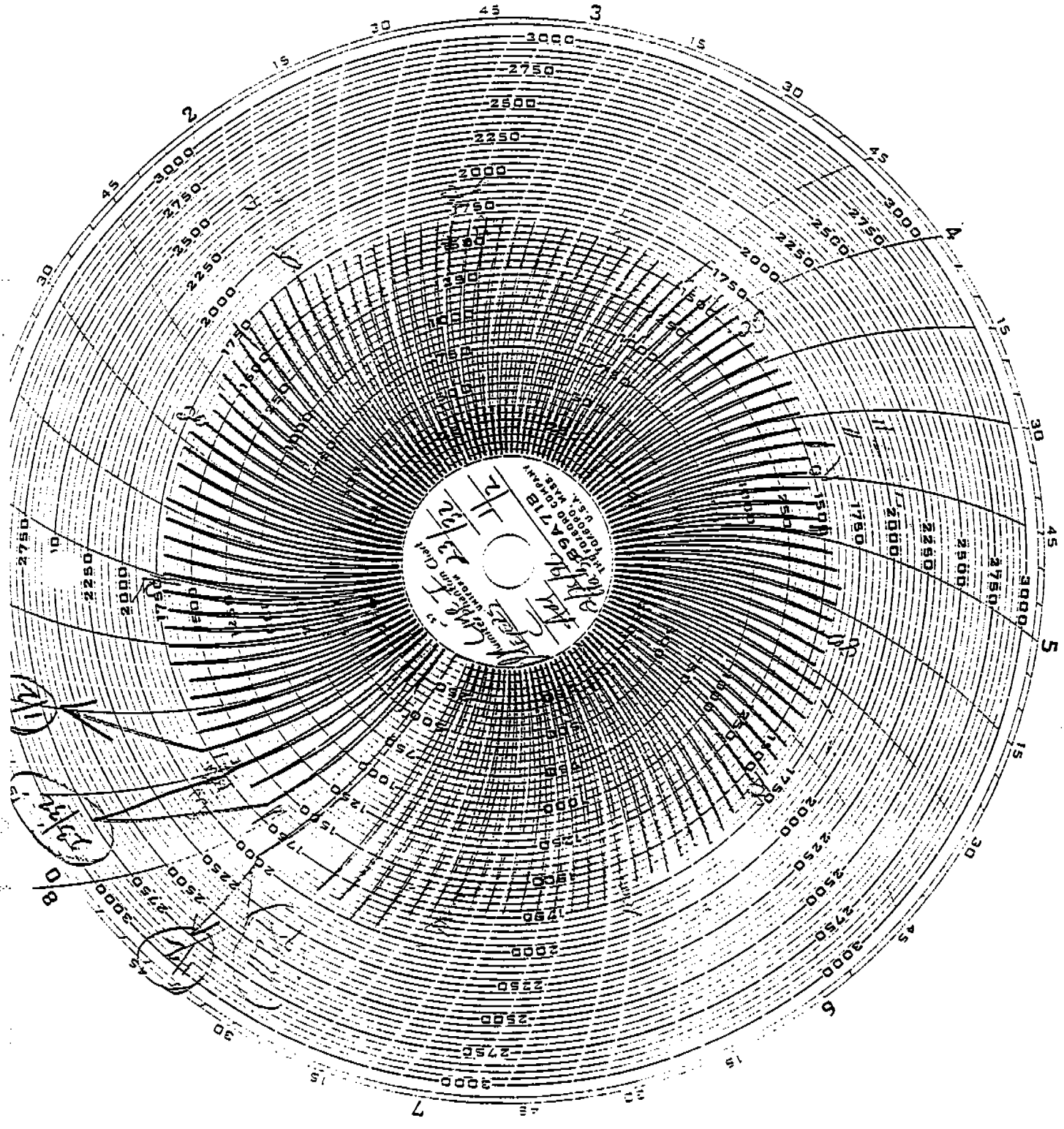
SURFACE BLENDER HOSED: — TIME

FORMER HYD RADIATOR: — TIME

DOWNTIME FROM	DOWNTIME TO	DOWNTIME (MINS) M	E	O	KEY	REASONS FOR DOWNTIME
245	253	8				Locked at leaking Regulator on the
						Unloader Boom & adjusted the tar
						for flight #1 of the Unloader C
						Also stayed down to build up Dr
						Bins for testing purposes.

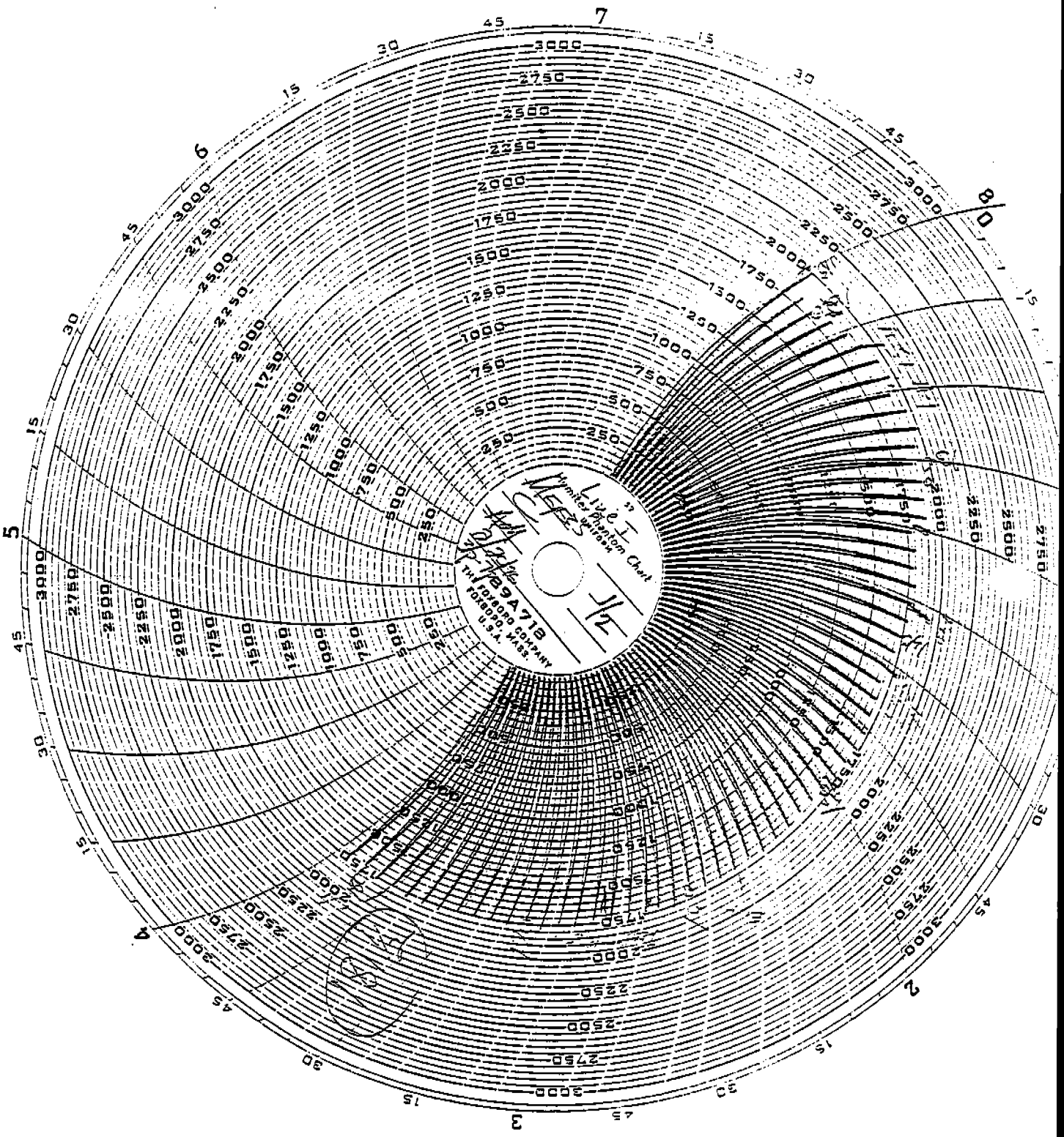
DOWNTIME CODE: M - MECHANICAL E - ELECTRICAL O - OPERATOR

LINE 1
PRESS CHART
2/20/96
0700 - 1500



78

LINE 1
PRESS CHA
15:00 - 19:



79

LI Dryer RTO 2-20-96

RECORD EVERY 15 MIN. HAYWARD AIR TESTING WORKSHEET

Time	RTO Chamber Bed Temp.					Inlet	Burners		Combust.	Exhaust	Press.	Gas
	#1	#2	#3	#4	#5	Press.	B#1	B#2	Temp.	Temp.	Drop	Usage
9:00	315	356	469	435	335	1.7	43.6	50.0	1515	254	26.1	0
9:15	319	351	468	442	329	1.5	25.0	25.8	1526	245	26.7	2
9:30	318	350	469	443	328	1.5	26.0	26.6	1531	247	26.8	4
9:45	317	348	473	441	329	1.1	50.8	38.8	1521	250	27.3	7
10:00	316	350	472	444	325	1.3	29.8	32.6	1514	241	26.7	9
10:15	315	351	473	446	324	1.2	27.8	31.7	1514	240	26.7	11
10:30	314	351	473	447	323	1.0	27.0	29.4	1514	239	26.2	14
10:45	314	350	476	444	325	1.2	24.0	31.8	1516	241	26.6	16
11:00	[illegible]	352	474	448	321	.6	36.1	32.3	1512	240	26.3	18
11:15	312	353	474	449	321	1.2	35.0	28.8	1513	242	26.6	20
11:30	312	354	476	449	320	.9	36.0	25.8	1513	241	26.3	23
11:45	311	355	475	451	320	1.3	34.3	27.7	1512	242	26.6	25
12:00	311	357	475	451	319	1.3	35.7	31.0	1513	246	26.7	27
12:15	310	356	475	451	320	1.5	36.1	22.7	1512	243	26.5	29
12:30	309	356	472	449	317	1.2	36.8	30.7	1512	240	26.8	32
12:45	308	357	473	448	317	1.1	25.1	29.6	1519	246	26.7	34
1:00	309	357	474	449	317	1.1	62.6	29.8	1512	245	26.8	37
1:15												
1:30	309	359	475	449	318	.9	36.5	34.9	1511	256	26.2	41
1:45	310	360	475	451	317	.9	37.2	26.8	1509	252	26.2	43
2:	309	360	476	450	317	1.0	36.7	20.6	1508	253	26.3	46
2:15	310	358	477	449	318	1.2	35.0	28.2	1514	246	26.9	48
2:30	310	360	476	449	318	.9	36.3	33.6	1509	257	26.2	50
2:45	310	361	477	449	319	1.2	34.4	24.9	1513	252	26.1	52
3:00	310	362	476	449	319	1.0	34.2	24.0	1509	251	26.2	55
3:15	311	361	476	449	319	1.1	33.9	28.3	1509	246	26.6	57
3:30	311	361	475	449	319	1.1	35.8	27.7	1509	252	26.3	59
3:45	312	357	476	447	318	1.2	34.0	27.6	1511	242	26.5	62
4:00	313	355	475	445	320	.7	35.0	28.0	1509	240	26.2	64
4:15	314	356	476	447	321	.5	38.5	31.3	1510	241	26.1	66
4:30	314	355	474	446	320	.9	35.3	30.7	1509	240	26.5	68
4:45	315	354	474	446	322	1.0	36.5	36.1	1512	240	26.2	71
5:00	316	353	476	444	324	1.5	37.7	27.3	1510	242	26.5	73
5:15	317	353	477	442	326	1.2	56.3	31.5	1506	250	27.2	75
5:30	317	352	475	442	326	1.2	43.7	25.5	1509	244	26.8	77
5:45	318	352	476	440	328	.8	50.3	32.1	1510	250	27.2	80
6:00	317	351	476	439	328	.6	46.5	33.0	1511	250	27.2	82
6:15	317	352	476	439	329	.5	51.2	34.6	1511	250	27.4	84
6:30	317	352	476	435	330	.5	50.6	30.0	1511	251	27.4	86
6:45	317	353	476	435	331	.7	53.7	31.9	1509	250	27.5	89
7:00	317	352	475	437	331	.6	50.9	34.7	1511	250	27.4	91

KCF

80

Unit I Dryer RTO
2/20/96

81

HAYWARD LINE I FEBRUARY 21, 1996
THERMAL OIL STACK - PHENOL
DATA TIME START= 09:30 END= 14:45 HOURS= 5.25

BOARD WEIGHTS - LBS
Vera eights determined by taking bundle weights divided by peices
er un.. over the testing period.
1/2"
er/peice 54.63
er/ 8' x 16' 218.51

PLANT PRODUCTION RATE

5.25 =hours during testing
83 =pressloads
996 =no. of 8'x16' boards produced (pressloads x 8 boards per load)
217,634 =lbs of finished product (boards produced x weight of finished board)
41,454 =lbs of finished product per hour (lbs of finshed product / hours)
20.73 =tons of finished product per hour (lbs of finshed product per hour / 2000 lb)

FUEL BURNING RATE ESTIMATED BY BARK INPUT

K1
13.89 =K1 fuel calibration in pounds per count
561 =K1 counts during testing hours
7,792 =K1 lbs of wet fuel burned during testing
5.25 =hours during testing
38.26% =average moisture content of fuel
4,811 =total pounds of dry fuel burned during testing (wet pounds x (1- moisture content))
916.37 =lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
0.46 =tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
9,000 =estimated BTU content per pound of dry fuel,
8.25 =estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)

K2
39 =K2 fuel calibration in pounds per count
650 =K2 counts during testing hours
11,807 =K2 lbs of wet fuel burned during testing
5.25 =hours during testing
38.26% =average moisture content of fuel
7,289 =total pounds of dry fuel burned during testing (wet pounds x (1- moisture content))
1,388.44 =lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
0.69 =tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
9,000 =estimated BTU content per pound of dry fuel,
12.50 =estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)

FUEL BURNING RATE ESTIMATED TEMPERATURE DIFFERENTIAL

K1
446.64 =average incoming oil temperature on degrees f.
471.31 =average outgoinging oil temperature on degrees f.
60 =temperature differential at 100% capacity in degrees f
24.7 =actual temperature differential
19.4 =maximum mmbtu input at 100% capacity
7.98 =estimated mmbtu input per hour (actual temp. diff. / max temp. diff.) x max mmbtu input
9,000 =estimated BTU content per pound of dry fuel,
0.44 =estimated tons of dry fuel burned per hour during testing (btu input / btu content of dry fuel/2000)

K2
419.85 =average incoming oil temperature on degrees f.
470.88 =average outgoinging oil temperature on degrees f.
60 =temperature differential at 100% capacity in degrees f
1.0 =actual temperature differential
19.4 =maximum mmbtu input at 100% capacity
16.50141 =estimated mmbtu input per hour (actual temp. diff. / max temp. diff.) x max mmbtu input
9,000 =estimated BTU content per pound of dry fuel,
0.92 =estimated tons of dry fuel burned per hour during testing (btu input / btu content of dry fuel/2000)

HAYWARD LINE I FEBRUARY 21, 1996
THERMAL OIL STACK - PM
DATA TIME START= 15:30 END= 20:15 HOURS= 4.75

BOARD WEIGHTS - LBS
average weights determined by taking bundle weights divided by peices
per unit over the testing period.
1/2"
per/peice 54.63
per/ 8' x 16' 218.52

PLANT PRODUCTION RATE

4.75 =hours during testing
73 =pressloads
876 =no. of 8'x16' boards produced (pressloads x 8 boards per load)
191,424 =lbs of finished product (boards produced x weight of finished board)
40,300 =lbs of finished product per hour (lbs of finshed product / hours)
20.15 =tons of finished product per hour (lbs of finshed product per hour / 2000 lb)

FUEL BURNING RATE ESTIMATED BY BARK INPUT

K1
13.89 =K1 fuel calibration in pounds per count
518 =K1 counts during testing hours
7,195 =K1 lbs of wet fuel burned during testing
4.75 =hours during testing
39.45% =average moisture content of fuel
4,357 =total pounds of dry fuel burned during testing (wet pounds x (1- moisture content))
917.18 =lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
0.46 =tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
9,000 =estimated BTU content per pound of dry fuel,
8.25 =estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)

K2
13.89 =K2 fuel calibration in pounds per count
691 =K2 counts during testing hours
9,598 =K2 lbs of wet fuel burned during testing
4.75 =hours during testing
39.45% =average moisture content of fuel
5,812 =total pounds of dry fuel burned during testing (wet pounds x (1- moisture content))
1,223.49 =lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
0.61 =tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
9,000 =estimated BTU content per pound of dry fuel,
11.01 =estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)

FUEL BURNING RATE ESTIMATED TEMPERATURE DIFFERENTIAL

K1
451.00 =average incoming oil temperature on degrees f.
474.80 =average outgoinging oil temperature on degrees f.
60 =temperature differential at 100% capacity in degrees f
23.8 =actual temperature differential
19.4 =maximum mmbtu input at 100% capacity
7.70 =estimated mmbtu input per hour (actual temp. diff. / max temp. diff.) x max mmbtu input
9,000 =estimated BTU content per pound of dry fuel,
0.43 =estimated tons of dry fuel burned per hour during testing (btu input / btu content of dry fuel/2000)

K2
423.80 =average incoming oil temperature on degrees f.
469.50 =average outgoinging oil temperature on degrees f.
60 =temperature differential at 100% capacity in degrees f
45.7 =actual temperature differential
19.4 =maximum mmbtu input at 100% capacity
14.77633 =estimated mmbtu input per hour (actual temp. diff. / max temp. diff.) x max mmbtu input
9,000 =estimated BTU content per pound of dry fuel,
0.82 =estimated tons of dry fuel burned per hour during testing (btu input / btu content of dry fuel/2000)

LOUISIANA-PACIFIC CORPORATION

PRESS REPORT - LINE (1) 2 DATE: 2/21/96

OPERATOR Rod SHIFT: AM CREW: 1

THICKNESS 7/16 PRESS LDS: 6 7/16 180 1/2

OVERALL TIMER: 180 DECOMPRESSION TIME: 15+2

PRESS TEMP: 215° TOTAL REJECTS:

LOG COUNT: 1470

LINE SPEED	THKNS.	FROM	TO
55	7/16	7:00	
55	1/2	7:20	
55	11	8:20	
45	11	1:20	
55	11	1:45	
45	11	4:30	
55	11	5:50	

F.C.O.S. HYD. RADIATOR: ✓ TIME

PRESS BLOWN DOWN: ✓

SPINNER HEADS FLUSHED: ✓ TIME

SURFACE BLENDER HOSED: ✓ TIME

FORMER HYD RADIATOR: ✓ TIME

DOWNTIME FROM	DOWNTIME TO	DOWNTIME (MINS) M	E	O	KEY	REASONS FOR DOWNTIME

DOWNTIME CODE: M - MECHANICAL O E - ELECTRICAL O - OPERATOR

LOUISIANA-PACIFIC CORPORATION

PRESS REPORT - LINE (1) 2 DATE: 7-21-96

OPERATOR VISSER SHIFT: PM CREW: B

THICKNESS 1/2 PRESS LDS: 30½ 55 19/32 SE 87 15/32

OVERALL TIMER: 173 DECOMPRESSION TIME: 18

PRESS TEMP: 215° TOTAL REJECTS:

LOG COUNT: 1528

LINE SPEED	THKNS.	FROM	TO
55	1/2	700	
56	19/32 SE	555	
52	15/32	100	
48	25/32	500	
45	15/32	640	

F.C.O.S. HYD. RADIATOR: — TIME

PRESS BLOWN DOWN: —

SPINNER HEADS FLUSHED: — TIME

SURFACE BLENDER HOSED: — TIME

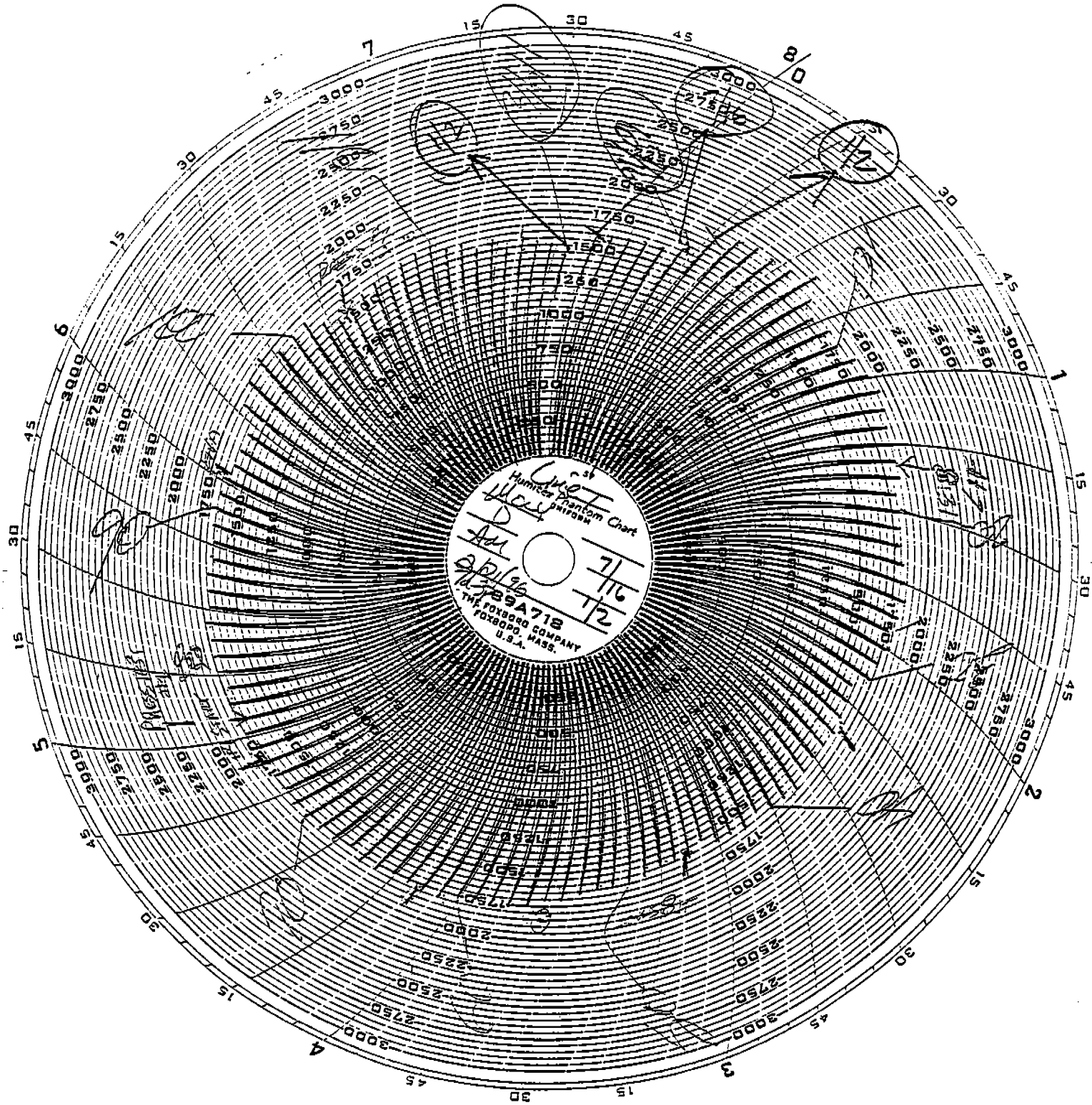
FORMER HYD RADIATOR: — TIME

DOWNTIME		DOWNTIME (MINS)			KEY	REASONS FOR DOWNTIME
FROM	TO	M	E	O		

DOWNTIME CODE: M - MECHANICAL E - ELECTRICAL O - OPERATOR

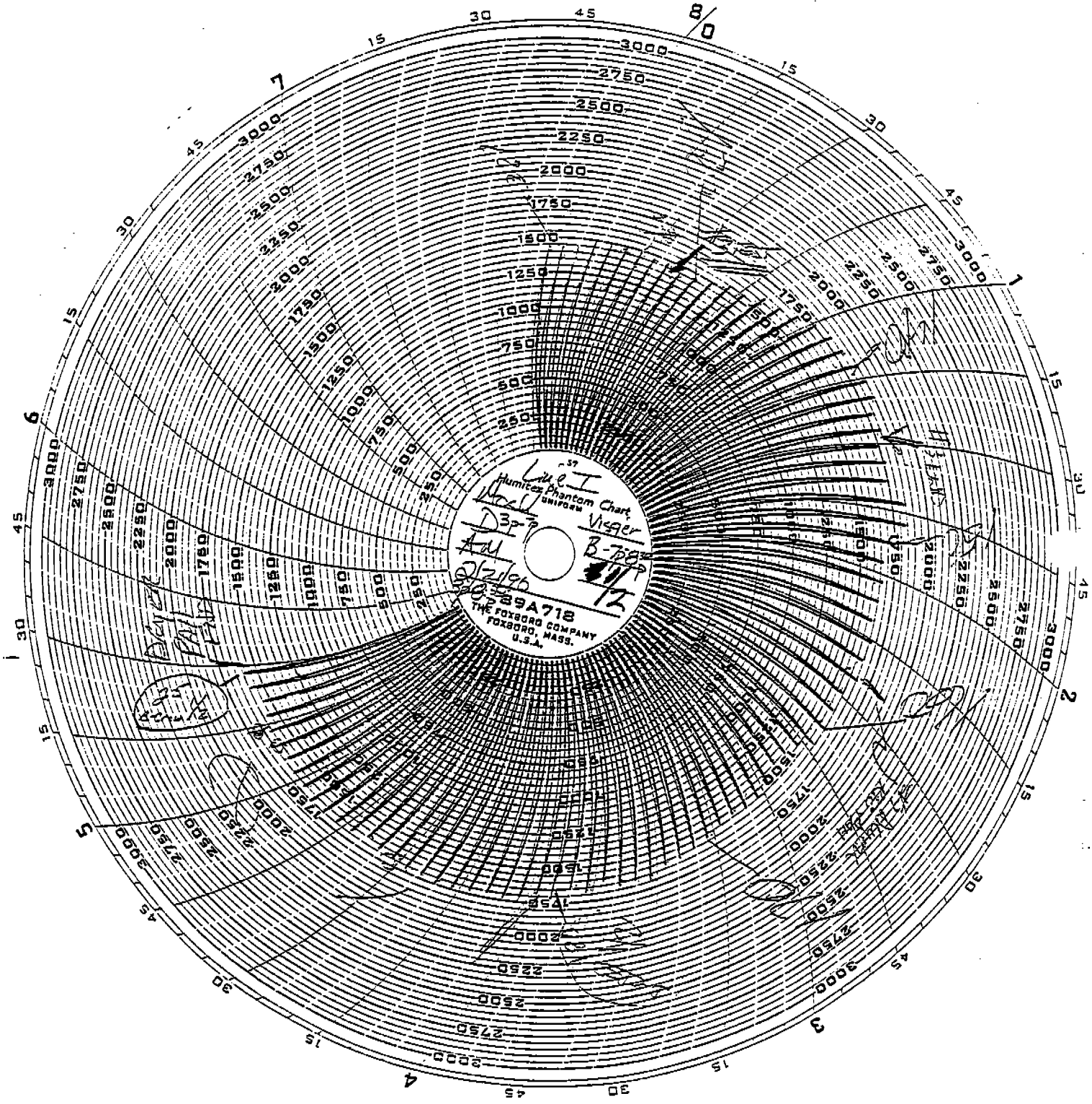
85

LINE 1 PRESS
CHART
2/21/96
0700-1500



36

LINE I
PRESS CHART
2/21/94
1500 - 2030



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LI Dryer RTO 2-21-96

RECORD EVERY 15 MIN. — HAYWARD AIR TESTING WORKSHEET

Time	RTO Chamber Bed Temp. #1	#2	#3	#4	#5	Inlet Press.	Burners B#1	B#2	Combust. Temp.	Exhaust Temp.	Press. Drop	Gas Usage
8:30	317	352	465	439	320	-.7	33.8	27.4	1513	238	26.5	0
8:45	316	357	462	442	321	1.3	34.0	22.8	1508	252	26.4	2
9:00	314	360	464	439	324	-.4	43.0	42.1	1502	256	26.4	4
9:15	314	360	467	437	326	1.4	40.6	50.5	1511	252	26.6	6
9:30	314	360	467	438	326	1.4	40.7	51.5	1511	249	26.7	8
9:45	314	361	467	439	326	1.7	40.6	45.2	1512	248	26.7	11
10:00	314	360	469	437	327	1.9	58.5	39.7	1515	249	26.7	13
10:15	315	359	471	436	327	1.7	39.7	32.8	1517	243	26.2	15
10:30	315	360	472	438	326	1.8	28.5	44.3	1522	243	26.4	18
10:45	316	356	474	436	327	1.0	35.5	27.4	1522	244	27.0	20
11:00	317	353	476	437	327	-.5	33.4	32.1	1525	249	27.4	22
11:15	317	353	477	438	326	-.5	31.1	24.7	1534	249	27.4	24
11:30	316	357	477	438	327	.7	34.8	31.5	1527	247	27.0	26
11:45	316	358	477	438	328	1.3	43.2	28.5	1515	246	26.9	29
12:00	318	355	478	438	327	.5	40.9	26.7	1520	250	27.1	31
12:15	317	357	478	438	328	.6	35.8	44.7	1524	248	27.3	33
12:30	318	356	479	439	328	.5	40.2	31.5	1523	251	27.3	35
12:45	315	360	475	437	328	1.7	30.3	38.3	1525	242	26.5	38
1:00	315	362	475	439	328	1.8	50.5	74.2	1515	245	26.4	40
1:15	318	358	479	436	330	.8	49.5	34.4	1517	247	27.1	42
1:30	316	363	474	441	329	1.8	42.9	33.3	1532	252	26.6	44
1:45	317	363	475	439	331	1.8	45.3	29.7	1519	245	26.4	46
2:00	317	361	476	437	331	1.6	42.5	35.3	1517	244	26.6	49
2:15	317	365	491	443	328	.4	44.0	38.3	1516	259	26.5	51
2:30	317	363	476	438	333	1.8	43.6	40.1	1516	247	26.5	53
2:45	317	364	472	441	331	1.3	58.0	47.5	1514	253	27.1	56
3:00	317	362	473	438	333	1.7	50.2	48.3	1515	245	26.5	58
3:15	317	364	472	439	333	1.8	46.0	45.0	1518	248	26.5	60
3:30	317	365	469	444	331	.5	46.3	42.1	1523	259	26.3	62
3:45	315	365	468	445	331	1.0	38.2	28.3	1525	260	26.4	64
4:00	318	365	468	445	332	.3	37.5	32.0	1520	258	26.2	66
4:15	320	361	467	448	329	1.0	33.2	31.9	1522	249	26.7	68
4:30	319	359	475	438	337	1.9	42.2	43.9	1519	252	26.8	70
4:45	319	363	467	447	330	1.1	50.8	22.4	1523	248	26.6	73
5:00	320	360	465	448	330	1.4	33.7	20.1	1521	245	26.6	75
5:15	321	360	468	449	331	1.3	35.4	30.2	1519	245	26.4	77
5:30	319	365	468	447	334	.9	41.9	35.4	1520	259	26.2	79
5:45	319	363	472	440	338	1.7	54.3	28.9	1521	245	26.2	81
6:00	315	361	465	446	332	.9	32.3	27.4	1516	248	26.7	84
6:15	315	356	466	443	330	.9	27.8	29.6	1522	240	26.4	86

kcF

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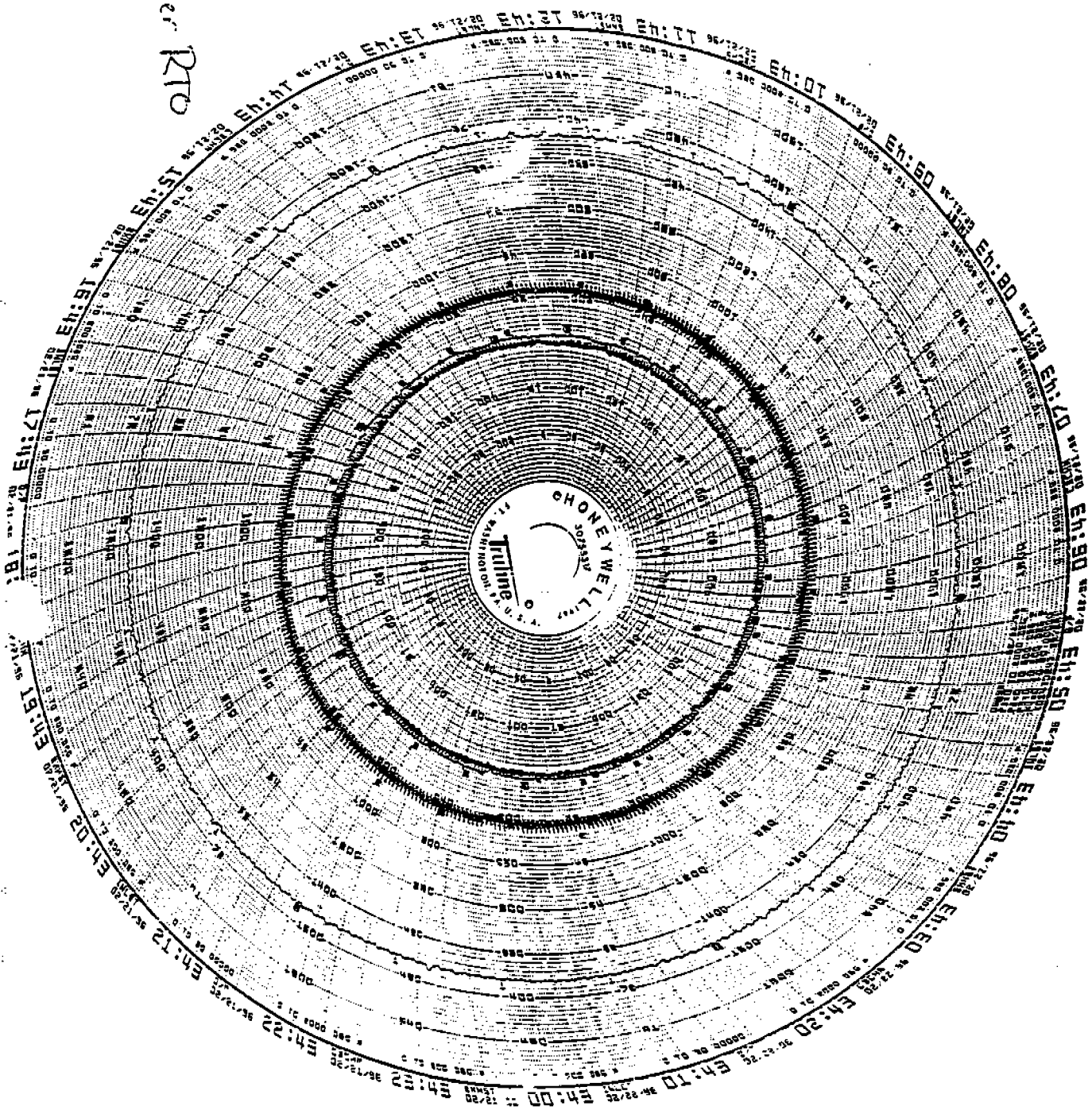
L I Dryer RTO 2-21-96

RECORD EVERY 15 MIN. HAYWARD AIR TESTING WORKSHEET

Time	RTO Chamber Bed Temp. #1	#2	#3	#4	#5	Inlet Press.	Burners B#1	B#2	Combust. Temp.	Exhaust Temp.	Press. Drop	Gas Usage
6:30	317	360	465	446	331	1.2	31.2	29.1	1516	254	26.3	88
6:45	320	352	472	439	335	.6	32.3	30.5	1520	244	26.9	90
7:00	318	360	465	446	332	1.0	31.7	30.8	1515	256	26.4	93
7:15	320	352	471	440	334	1.1	29.2	25.6	1522	244	27.0	95
7:30	319	358	465	447	332	1.2	31.3	27.2	1516	249	26.7	97
7:45	319	353	472	437	338	.7	37.4	45.1	1521	251	27.6	99
8:00	320	352	469	441	334	1.4	29.2	21.6	1523	242	27.0	102
8:15	318	354	466	444	331	.9	29.6	23.8	1531	240	26.8	104
8:30	316	356	470	435	339	1.0	51.2	29.0	1531	246	27.5	106

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Line I Dryer RTO
2/21/96



HAYWARD LINE I FEBRUARY 22, 1996
THERMAL OIL STACK NOX,CO,CO2,02,FORMALDEHYDE,BENZENE
DATA TIME START= 09:00 END= 14:15 HOURS= 5.25

BOARD WEIGHTS - LBS
average weights determined by taking bundle weights divided by peices
per unit over the testing period.
1/2"
per/peice 54.21
per/ 8' x 16' 216.85

PLANT PRODUCTION RATE

5.25 =hours during testing
82 =pressloads
984 =no. of 8'x16' boards produced (pressloads x 8 boards per load)
213,382 =lbs of finished product (boards produced x weight of finished board)
40,644 =lbs of finished product per hour (lbs of finshed product / hours)
20.32 =tons of finished product per hour (lbs of finshed product per hour / 2000 lb)

FUEL BURNING RATE ESTIMATED BY BARK INPUT

K1
13.89 =K1 fuel calibration in pounds per count
565 =K1 counts during testing hours
7,848 =K1 lbs of wet fuel burned during testing
5.25 =hours during testing
40.10% =average moisture content of fuel
4,701 =total pounds of dry fuel burned during testing (wet pounds x (1- moisture content))
895.40 =lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
0.45 =tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
9,000 =estimated BTU content per pound of dry fuel,
8.06 =estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)

K2
13.89 =K2 fuel calibration in pounds per count
808 =K2 counts during testing hours
11,223 =K2 lbs of wet fuel burned during testing
5.25 =hours during testing
40.10% =average moisture content of fuel
6,723 =total pounds of dry fuel burned during testing (wet pounds x (1- moisture content))
1,280.50 =lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
0.64 =tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
9,000 =estimated BTU content per pound of dry fuel,
11.52 =estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)

FUEL BURNING RATE ESTIMATED TEMPERATURE DIFFERENTIAL

K1
445.79 =average incoming oil temperature on degrees f.
473.21 =average outgoinging oil temperature on degrees f.
60 =temperature differential at 100% capacity in degrees f
27.4 =actual temperature differential
19.4 =maximum mmbtu input at 100% capacity
8.87 =estimated mmbtu input per hour (actual temp. diff. / max temp. diff.) x max mmbtu input
9,000 =estimated BTU content per pound of dry fuel,
0.49 =estimated tons of dry fuel burned per hour during testing (btu input / btu content of dry fuel/2000)

K2
420.06 =average incoming oil temperature on degrees f.
473.53 =average outgoinging oil temperature on degrees f.
60 =temperature differential at 100% capacity in degrees f
53.5 =actual temperature differential
19.4 =maximum mmbtu input at 100% capacity
17.29 =estimated mmbtu input per hour (actual temp. diff. / max temp. diff.) x max mmbtu input
9,000 =estimated BTU content per pound of dry fuel,
0.96 =estimated tons of dry fuel burned per hour during testing (btu input / btu content of dry fuel/2000)

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LOUISIANA-PACIFIC CORPORATION

PRESS REPORT - LINE (1) 2 DATE: 2-22-96

OPERATOR Mack SHIFT: Aon CREW: 1

THICKNESS 15/32 PRESS LDS: 2 13/32 17½

OVERALL TIMER: 2.05 DECOMPRESSION TIME: 18

PRESS TEMP: 215 TOTAL REJECTS: -

LOG COUNT: 1562

F.C.O.S. HYD. RADIATOR: ✓ TIME

PRESS BLOWN DOWN: ✓

SPINNER HEADS FLUSHED: ✓ TIME

SURFACE BLENDER HOSED: ✓ TIME

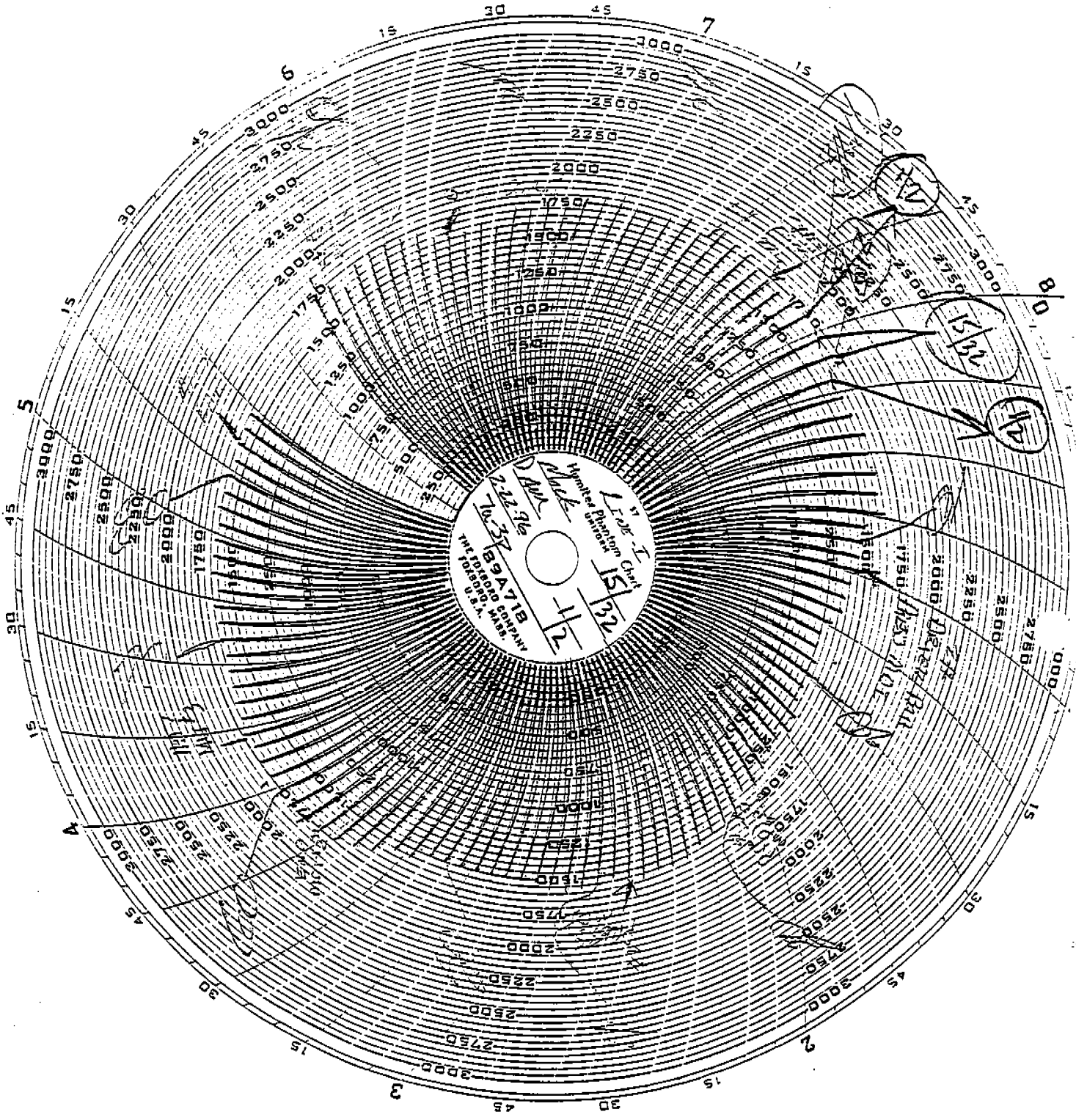
FORMER HYD RADIATOR: ✓ TIME

LINE SPEED	THKNS.	FROM	TO
45	15/32	700	
45	17	7:15	
55	11	7:45	
53	11	5:55	

DOWNTIME FROM	DOWNTIME TO	DOWNTIME (MINS) M	E	O	KEY	REASONS FOR DOWNTIME
12:31	12:55	24				Dryer to Build Bales

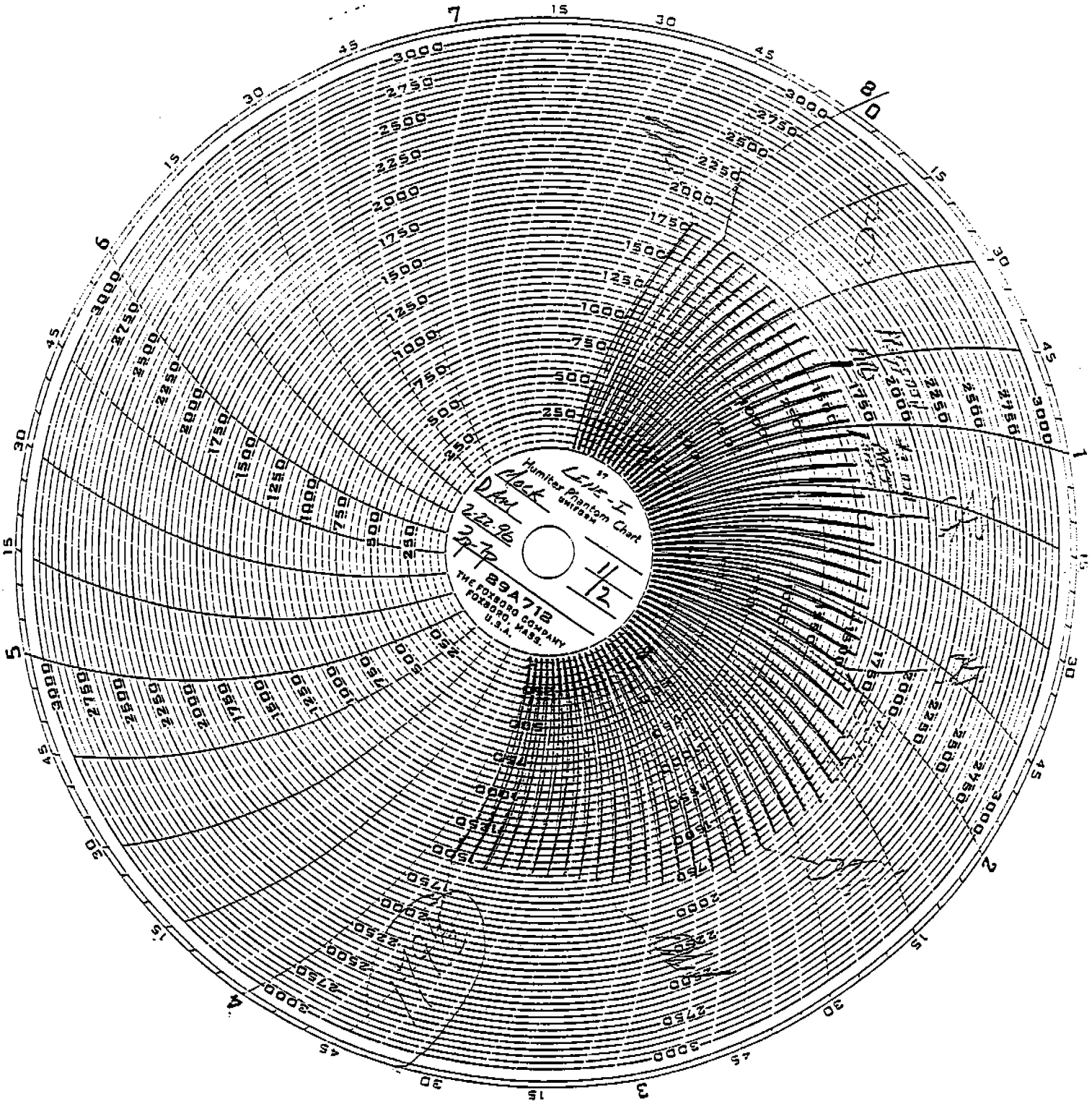
DOWNTIME CODE: M - MECHANICAL E - ELECTRICAL O - OPERATOR

PRESS CHART
2/22/96
0700-1500



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PRESS CHART
2/22/96
1500 - 1900



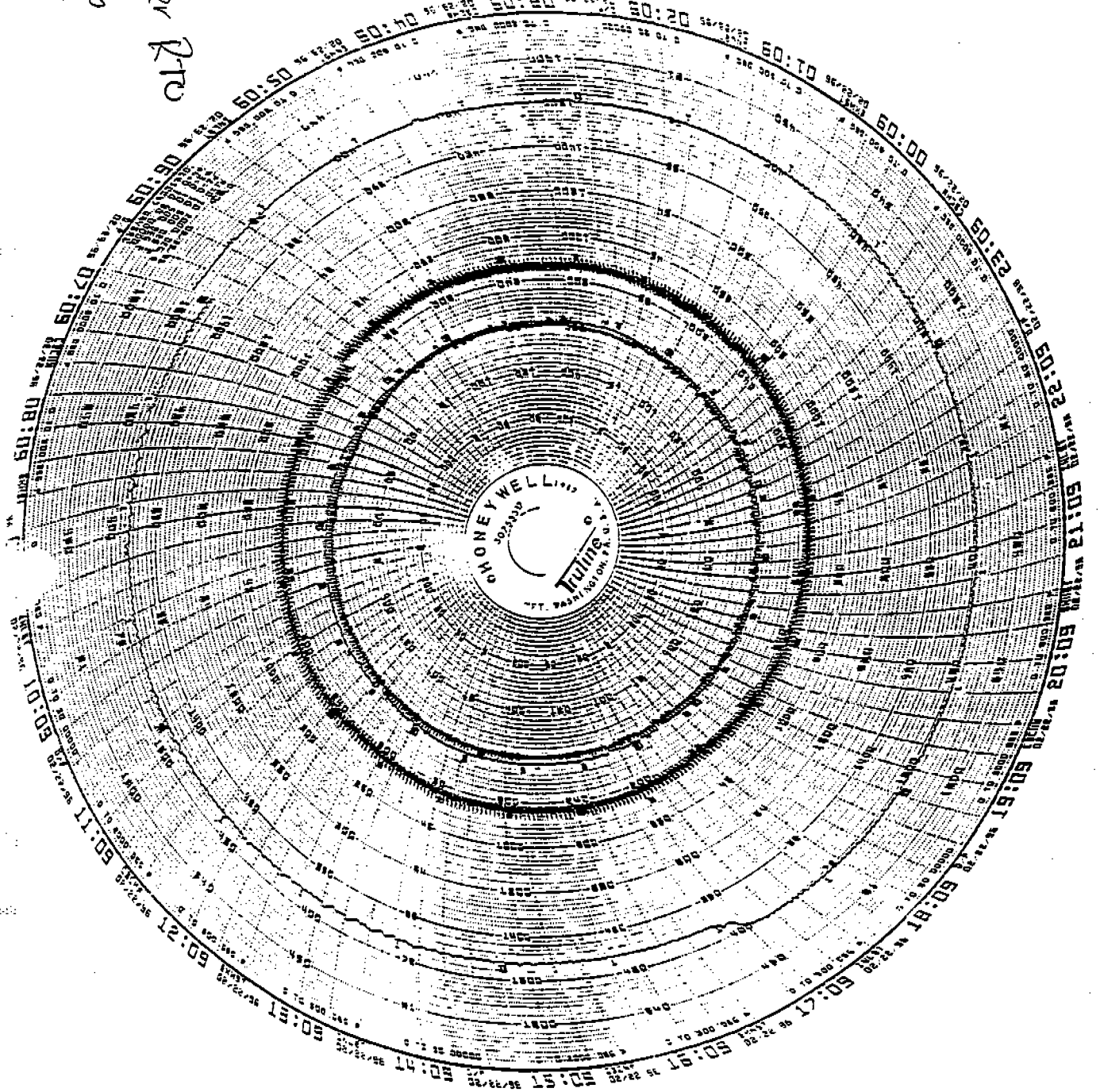
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RECORD EVERY 15 MIN. — HAYWARD AIR TESTING WORKSHEET

Time	RTO Chamber Bed Temp.					Inlet	Burners		Combust.	Exhaust	Press.	Gas
	#1	#2	#3	#4	#5	Press.	B#1	B#2	Temp.	Temp.	Drop	Usage
8:00 AM	316	350	470	431	335	0.5	41.6	23.6	1521	249	27.5	0
8:15	317	351	463	439	329	0.8	33.0	18.3	1518	240	26.4	2
8:30	314	360	463	437	333	1.4	28.1	25.2	1520	250	26.5	4
8:45	318	350	468	436	332	0.7	28.8	20.9	1528	244	26.8	6
9:00	315	357	468	434	335	1.3	39.6	24.0	1529	240	26.8	8
9:15	314	361	464	440	332	0.8	40.2	38.6	1515	254	26.9	10
9:30	316	361	463	442	332	0.3	46.1	49.5	1516	256	26.7	13
9:45	317	356	463	445	329	1.2	35.5	17.4	1517	249	26.6	15
10:00	318	350	471	436	333	0.4	42.6	33.0	1518	247	27.2	18
10:15	318	354	465	444	328	0.6	30.3	15.1	1529	240	26.6	20
10:30	317	356	464	446	327	1.3	28.2	46.6	1519	248	26.8	22
10:45	317	354	472	435	334	0.4	36.0	22.9	1524	250	27.5	24
11:00	318	356	466	446	327	1.1	24.7	27.2	1521	243	26.7	26
11:15	315	363	469	441	332	1.6	49.8	31.9	1520	249	26.4	28
11:30	317	360	475	437	334	0.9	33.0	28.6	1531	249	27.2	31
11:45	316	364	470	444	331	1.2	38.2	32.9	1522	255	26.7	33
Pm 12:00	320	357	472	445	328	1.3	27.9	28.2	1525	243	26.4	34
12:15	320	357	478	439	332	0.8	35.8	30.9	1527	252	27.1	37
12:30	317	366	470	447	327	1.0	29.5	40.6	1523	259	26.5	39
12:45	318	360	480	438	332	0.4	49.8	26.7	1522	253	27.6	40
1:00	316	362	477	437	329	1.2	35.0	31.1	1529	244	27.0	43
1:15	315	367	474	442	327	1.2	38.5	41.7	1519	252	26.8	45
1:30	319	360	476	446	322	0.9	27.6	20.7	1534	244	27.0	47
1:45	319	359	482	440	326	0.9	27.4	10.5	1538	247	27.0	50
2:00	316	370	476	444	325	0.2	30.6	37.2	1525	259	26.6	52
2:15	320	361	479	443	324	1.2	34.6	18.9	1523	244	26.5	54
2:30	316	371	479	442	328	1.4	47.1	46.3	1519	250	26.6	56
2:45	317	369	489	440	329	1.8	52.8	36.2	1517	245	26.6	58
3:00	320	361	481	443	325	1.4	26.8	18.1	1534	248	27.1	61
3:15	318	370	477	446	324	0.9	36.3	27.7	1519	246	26.6	63
3:30	320	362	492	447	323	1.2	35.0	17.4	1526	244	26.6	65
3:45	320	361	485	439	325	0.7	30.1	17.6	1523	249	27.1	67
4:00	320	361	486	439	325	0.2	33.9	18.4	1522	249	27.2	69
4:15	319	366	480	445	321	1.1	28.2	29.5	1519	247	26.9	72
4:30	317	368	496	435	329	1.2	45.3	41.1	1519	246	26.9	73
4:45	316	371	481	440	326	1.7	40.5	30.8	1521	256	26.8	76
5:00	318	364	487	435	327	0.4	38.0	30.2	1527	252	27.6	78
5:10	320	361	486	437	325	0.3	37.9	20.1	1527	248	27.1	79

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Line I Dryer RTO
2/22/96



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KONUS DATA READINGS EVERY 15 MINUTES

BY Pat M. DATE 2/29/96 PAGE 1 OF 2

PLANT Hayward L.P.

TIME	K1 OIL IN TEMP	K1 OIL OUT TEMP	K1 I.D. FAN W.C	K2 OIL IN TEMP	K2 OIL OUT TEMP	K2 I.D. FAN W.C	K3 OIL IN TEMP	K3 OIL OUT TEMP	K3 I.D. FAN W.C	K4 OIL IN TEMP	K4 OIL OUT TEMP	K4 I.D. FAN W.C	FUEL COUNT K1	FUEL COUNT K2	FUEL COUNT K3	FUEL COUNT K4	ONCE/HR BARK MOISTURE
9:00	240°	255°	-0.9	228°	254°	+1.0							363	398		9:00 AM	39.8
9:15	241°	260°	+1.0	230°	265°	+1.0							388	415		10:00 AM	40.6
9:30	244°	256°	-0.8	230°	266°	+0.8							393	455		11:00 AM	40.2
9:45	238°	250°	-0.9	224°	253°	+1.6							436	493		12:00 PM	39.3
10:00	235°	250°	-0.8	221°	256°	+1.4							479	542		1:00 PM	39.2
10:15	240°	250°	+1.8	225°	252°	+1.6							518	569		2:00 PM	38.8
10:30	233°	244°	-0.9	221°	256°	+1.4							566	628		3:00 PM	39.5
10:45	230°	241°	-0.9	215°	244°	+1.4							612	693		4:00 PM	40.4
11:00	230°	245°	+1.2	218°	251°	+1.4							663	748		5:00 PM	41.6
11:15	236°	257°	+1.2	222°	248°	+1.1							646	796		6:00 PM	41.1
11:30	237°	251°	+1.2	225°	263°	+1.1							694	842			
11:45	235°	246°	+1.4	222°	259°	+1.6							738	887			
12:00	237°	253°	+1.1	224°	253°	+1.6							784	929			
12:15	243°	255°	+1.2	230°	265°	-0.8							809	952			
12:30	240°	256°	+1.1	228°	254°	+1.1							848	987			
12:45	237°	251°	+1.1	223°	251°	-0.8							896	1028			
1:00	234°	250°	+1.2	220°	247°	-0.8							936	1078			
1:30	243°	262°	+1.2	229°	256°	+1.0							996	1170			
1:45	245°	260°	+1.2	232°	257°	+1.0							1012	1206			
2:00	243°	255°	+1.2	229°	253°	-0.8							1013	1230			
2:15	240°	249°	+1.2	226°	256°	-0.6							1058	1261			
2:30	239°	247°	-0.7	227°	251°	+0.4							1098	1302			
2:45	241°	250°	-0.5	226°	254°	+1.4							1133	1314			
3:00	244°	254°	-0.5	230°	255°	+1.2							1188	1360			
3:15	236°	245°	-0.6	221°	247°	+1.0							1230	1402			
3:30	232°	239°	-0.6	218°	246°	+1.2							1275	1451			
3:45	230°	240°	-0.5	217°	244°	+1.0							1316	1501			
4:00	226°	246°	-0.4	209°	250°	-0.8							1367	1560			
4:15	225°	249°	+0.6	209°	247°	+1.0							1411	1606			
4:30	227	250°	+0.5	209°	244°	+0.8							1444	1661			

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KONUS DATA READINGS EVERY 10 MINUTES BY Pat M. DATE 2/20/96 PAGE 2 of 2

PLANT Hayward LP

TIME	K1 OIL IN TEMP	K1 OIL OUT TEMP	K1 I.D. FAN "W.C	K2 OIL IN TEMP	K2 OIL OUT TEMP	K2 I.D. FAN "W.C	K3 OIL IN TEMP	K3 OIL OUT TEMP	K3 I.D. FAN "W.C	K4 OIL IN TEMP	K4 OIL OUT TEMP	K4 I.D. FAN "W.C	FUEL COUNT K1	FUEL COUNT K2	FUEL COUNT K3	FUEL COUNT K4	ONCE/HR BARK MOISTURE
4:45	230 c	250 c	-0.5	214 c	250 c	-0.8							1478	1719			
5:00	233 c	255 c	-0.5	216 c	257 c	-0.4							1506	1771			
5:15	225 c	245 c	-0.5	207 c	235 c	-0.2							1537	1823			
5:30	234 c	245 c	-0.6	215 c	251 c	-0.4							1567	1876			
5:45	234 c	252 c	-0.5	219 c	248 c	-0.6							1597	1909			
6:00	233 c	246 c	-0.6	218 c	243 c	-0.6							1627	1942			
6:15	234 c	244 c	-0.5	219 c	242 c	-1.0							1656	1975			
6:30	233 c	250 c	-0.6	222 c	251 c	-0.8							1687	2014			
6:45	235 c	257 c	-0.6	216 c	248 c	-0.4							1718	2057			
7:00	237 c	257 c	-0.5	224 c	250 c	-0.6							1747	2086			

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GD

KONUS DATA READINGS EVERY 10 MINUTES

BY Pat M. DATE 2/21/96 PAGE 1 OF 2

PLANT Hayward L.P.

TIME	K1 OIL IN TEMP	K1 OIL OUT TEMP	K1 I.D. FAN W.C	K2 OIL IN TEMP	K2 OIL OUT TEMP	K2 I.D. FAN W.C	K3 OIL IN TEMP	K3 OIL OUT TEMP	K3 I.D. FAN W.C	K4 OIL IN TEMP	K4 OIL OUT TEMP	K4 I.D. FAN W.C	FUEL COUNT K1	FUEL COUNT K2	FUEL COUNT K3	FUEL COUNT K4	ONCE/HR BARK MOISTURE
8:30	230	235	-0.5	214	232	-1.2							193	287			37.7%
8:45	232	237	-0.5	216	234	-1.0							219	323			38.4%
9:00	230	245	-0.5	219	246	-1.0							254	386			38.1%
9:15	230	245	-0.5	214	252	-0.2							279	415			36.4%
9:30	230	249	-0.5	217	242	-.08							311	454			39.5%
9:45	230	245	-0.4	211	243	-.08							339	488			38.9%
10:00	235	249	-0.6	219	250	-.02							372	530			39.3%
10:15	230	242	-0.4	217	238	-1.0							377	561			40.2%
10:30	228	245	-0.6	214	237	-1.1							425	603			38.7%
10:45	228	242	-0.6	216	244	-0.6							451	648			
11:00	230	250	-0.6	216	247	-0.6							485	706			
11:15	230	245	-0.6	211	237	-0.6							512	744			
11:30	233	247	-0.4	218	245	-0.5							541	782			
11:45	230	250	-0.4	210	244	-0.2							570	820			
12:00	232	244	-0.6	219	246	-0.8							597	851			
12:15	235	246	-0.4	220	240	-0.8							622	887			
12:30	226	240	-0.6	212	231	-1.6							643	927			
12:45	228	240	-0.5	214	239	-0.8							672	965			
1:00	234	250	-0.5	221	250	-0.2							699	1011			
1:15	244	247	-0.6	219	240	-1.6							695	1044			
1:30	230	235	-0.4	216	249	-0.4							728	1091			
1:45	227	236	-0.6	213	231	-1.2							755	1130			
2:00	226	236	-0.6	213	238	-0.4							784	1174			
2:15	235	247	-0.5	219	251	-0.6							813	1218			
2:30	228	241	-0.5	215	245	-0.6							842	1259			
2:45	234	246	-0.5	219	238	-0.6							872	1304			
3:00	231	240	-0.6	216	243	-0.6							901	1347			
3:15	230	251	-0.5	217	247	-0.4							932	1392			
3:30	235	248	-0.6	221	257	-0.3							962	1433			
3:45	232	239	-0.5	216	241	-1.0							991	1466			

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KONUS DATA READINGS EVERY 10 MINUTES

BY Pat M DATE 2/22/96 PAGE 1 OF ____

PLANT Hayward LP

TIME	K1 OIL IN TEMP	K1 OIL OUT TEMP	K1 I.D. FAN "W.C	K2 OIL IN TEMP	K2 OIL OUT TEMP	K2 I.D. FAN "W.C	K3 OIL IN TEMP	K3 OIL OUT TEMP	K3 I.D. FAN "W.C	K4 OIL IN TEMP	K4 OIL OUT TEMP	K4 I.D. FAN "W.C	FUEL COUNT K1	FUEL COUNT K2	FUEL COUNT K3	FUEL COUNT K4	ONCE/HR BARK MOISTURE
9:00	235	250	-0.5	221	255	-0.6							228	362			42.8%
9:15	226	240	-0.5	213	240	-1.0							261	409			41.7%
9:30	230	246	-0.4	217	238	-1.0							287	446			38.8%
9:45	236	247	-0.5	221	240	-0.8							317	486			39.4%
10:00	235	254	-0.5	217	250	-1.0							344	525			38.5%
10:15	223	241	-0.4	204	239	-0.6							380	570			39.9%
10:30	227	245	-0.5	217	248	-0.8							411	609			
10:45	234	250	-0.5	222	254	-0.6							436	647			
11:00	229	240	-0.5	215	250	-0.2							465	686			
11:15	228	244	-0.5	214	246	-0.2							495	726			
11:30	231	246	-0.4	217	243	-0.6							526	770			
11:45	228	245	-0.5	214	241	-0.6							554	809			
12:00	229	245	-0.4	214	251	-0.4							583	847			
12:15	226	244	-0.4	212	241	-0.6							609	885			
12:30	224	240	-0.5	207	233	-1.0							641	930			
12:45	238	249	-0.4	224	239	-1.2							645	971			
1:00	242	255	-0.5	225	253	-0.8							671	1006			
1:15	227	238	-0.5	214	244	-0.6							701	1046			
1:30	228	241	-0.5	212	239	-0.6							737	1098			
1:45	226	244	-0.5	214	244	-0.4							762	1128			
2:00	226	241	-0.4	211	238	-0							793	1170			

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101

KONUS DATA READINGS EVERY 10 MINUTES

BY Pat m. DATE 2/21/96 PAGE 2 of 2

PLANT Hayward L.P.

TIME	K1 OIL IN TEMP	K1 OIL OUT TEMP	K1 I.D. FAN "W.C	K2 OIL IN TEMP	K2 OIL OUT TEMP	K2 I.D. FAN "W.C	K3 OIL IN TEMP	K3 OIL OUT TEMP	K3 I.D. FAN "W.C	K4 OIL IN TEMP	K4 OIL OUT TEMP	K4 I.D. FAN "W.C	FUEL COUNT K1	FUEL COUNT K2	FUEL COUNT K3	FUEL COUNT K4	ONCE/HR BARK MOISTURE
4:00	231	244	-0.5	216	241	-0.8							1019	1495			
4:15	230	245	-0.6	216	242	-0.8							1049	1529			
4:30	227	240	-0.6	213	234	-1.4							1079	1561			
4:45	234	245	-0.6	219	240	-0.8							1107	1590			
5:00	234	249	-0.5	219	239	-0.7							1137	1639			
5:15	239	250	-0.5	224	248	-0.8							1165	1691			
5:30	236	247	-0.5	222	258	0							1192	1739			
5:45	235	254	-0.4	222	247	-0.8							1219	1763			
6:00	233	254	-0.4	216	229	-1.2							1247	1796			
6:15	232	254	-0.5	214	252	-0.6							1276	1830			
6:30	235	255	-0.5	219	244	-0.8							1315	1875			
6:45	235	245	-0.5	222	257	-0.1							1332	1895			
7:00	234	240	-0.6	214	235	-1.0							0	0			
7:15	233	240	-0.6	214	241	-0.8							35	49			
7:30	230	240	-0.6	216	249	-0.6							63	90			
7:45	230	240	-0.6	215	236	-0.6							98	136			
8:00	230	244	-0.5	215	242	-0.6							148	229			

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001

Konus EFB Readings

Plant Hayward L.P.

readings every 10 minutes

date 2/22/96

by Pat M

time	K1 and K2						K3 and K4					
	Bed Volt	Bed Current	Ion Volt	Ion Current	EFB Press.	Baghouse Press.	Bed Volt	Bed Current	Ion Volt	Ion Current	EFB Press.	Baghouse Press.
9:00	12.5	0.4	30	4	2.2	4						
9:15	13.0	0.4	28.5	4	2.0	4						
9:30	13.0	0.4	28.5	4	2.0	4						
9:45	13.0	0.4	28.5	4	2.2	4						
10:00	13.0	0.4	30	4	2.2	4						
10:15	13.0	0.4	30	4	2.2	4						
10:30	13.0	0.4	30	4	2.2	4						
10:45	12.5	0.4	28.5	4	2.2	4						
11:00	13.0	0.4	30	4	2.2	4						
11:15	13.0	0.4	30	4	2.4	4.5						
11:30	13.0	0.4	30	4	2.4	4						
11:45	13.0	0.4	30	4	2.4	4						
12:00	13.0	0.4	30	4	1.2	4						
12:15	13.0	0.4	30	4	1.2	4						
12:30	13.0	0.4	30	4	1.0	4						
1:45	13.0	0.4	28.5	4	0.8	4						
1:00	13.0	0.4	28	4	1.0	4						
1:15	13.0	0.4	30	4	1.0	4.5						
1:30	13.0	0.4	30	4	1.0	4.5						
1:45	13.0	0.4	30	4	0.8	4						
2:00	13.0	0.4	30	4	1.0	5						

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KONUS EFB REPORT DATE

SHIFT: (I) OR II
LINES 1 & 2

K-1 - K-2

	7	8	9	10	11	12	1	2	3	4	5	
Bed Voltage (KV)	7.5	7.5	7.5			10	10	11	11	1	5	K
Bed Amperage (MA)	.20	.20	.20			.20	.20	.21	.22	.27	.20	.32
Ionizer Voltage (KV)	22	22	22			25	25	25	26	28	28	30
Ionizer Amperage (MA)	1.8	1.8	1.8			2.0	2.0	2.2	2.4	2.8	3.0	3.6
EFB Pressure Drop (In.)	2.4	2.4	2.4			2.0	2.0	2.0	2.1	2.2	2.0	2.0
Inlet Temperature	467	455	458			453	459	455	447	463	479	476
Outlet Temperature	395	391	391			363	372	375	373	390	381	391
Rock Flow	OK	OK	OK			OK	OK	OK	OK	OK	OK	OK
Condition Code*	OK	OK	OK	6	8	OK	OK	OK	OK	OK	OK	OK

Rock Usage/Shift: _____

K-3 - K-4

	7	8	9	10	11	12	1	2	3	4	5	6
Bed Voltage (KV)	5.5	6	6	6	6	6	5	6	7	6	6	6
Bed Amperage (MA)	.21	.20	.20	.21	.24	.24	.23	.24	.24	.30	.26	.28
Ionizer Voltage (KV)	22	22	22	22	22	22	21	22	22	22	22	23
Ionizer Amperage (MA)	2.2	2.2	2.2	2.2	2.2	2.2	2.4	2.4	2.6	2.4	2.0	2.0
EFB Pressure Drop (In.)	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.0
Inlet Temperature	475	472	474	474	457	455	457	431	419	478	485	5.
Outlet Temperature	423	422	421	419	423	426	430	436	422	423	431	424
Rock Flow	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	
Condition Code*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	

Rock Usage/Shift: _____

Baghouse Pressure Drop: (in.)	7	8	9	10	11	12	1	2	3	4	5	6
L-I	4.0	4.0	4.0			4.0	4.0	4.0	4.0	4.0	4.0	4.2
L-II	3.8	3.7	3.8	4.0	3.9	4.0	4.0	4.0	3.9	4.0	4.0	3.8

Comments/Problems: Changed A Insulator in Line I

*Condition Codes
1) Start up/shutdown
2) Konus down
3) Moisture in bed
4) Adding rock
5) Power Outage
6) Checking EFB
7) Konus on oil
8) Maintenance

VOLUME PER SHIFT

LINE I	2
LINE II	2

1Z3/EFBFORMS/KNSRPT

SHIFT: I OR (II)
LINES 1 & 2

K-1 - K-2

	7	8	9	10	11	12	1	2	3	4	5	6
Bed Voltage (KV)	10	5	7	7	10	10	12	13	7	15	15	15
Bed Amperage (MA)	2.5	1.0	1.0	1.0	1.0	1.0	.04	.03	2.4	0	0	0
Ionizer Voltage (KV)	30	22	22	22	22	22	22	22	22	18	20	20
Ionizer Amperage (MA)	3.8	1.8	1.8	1.8	1.8	1.8	1.6	1.6	3.0	2.0	2.0	2.0
EFB Pressure Drop (In.)	2.0	.05	.05	.05	0	0	0	0	0	0	0	0
Inlet Temperature	451	449	447	457	457	460	444	445	440	456	459	469
Outlet Temperature	383	379	378	387	383	385	360	359	360	360	368	384
Rock Flow	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Condition Code*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

Rock Usage/Shift: _____

K-3 - K-4

	7	8	9	10	11	12	1	2	3	4	5	6
Bed Voltage (KV)	8	5	5	5	5	5	5	5	5	5	5	5
Bed Amperage (MA)	3.0	2.4	2.4	2.4	2.4	2.4	2.4	2.6	2.0	2.0	2.0	2.0
Ionizer Voltage (KV)	20	20	20	20	20	20	20	20	20	20	20	20
Ionizer Amperage (MA)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
EFB Pressure Drop (In.)	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04
Inlet Temperature	509	512	513	519	525	527	547	548	540	532	534	526
Outlet Temperature	419	424	425	424	422	425	417	419	416	415	414	410
Rock Flow	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Condition Code*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

Rock Usage/Shift: _____

Baghouse Pressure Drop: (in.)		7	8	9	10	11	12	1	2	3	4	5	6
	L-I	3.5	4.0	4.0	4.0	4.0	4.0	3.5	3.0	4.0	4.0	4.0	3.0
	L-II	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0

Comments/Problems: _____

*Condition Codes
1) Start up/shutdown
2) Konus down
3) Moisture in bed
4) Adding rock
5) Power Outage
6) Checking EFB
7) Konus on oil
8) Maintenance

VOLUME PER SHIFT

LINE I	1 1/2
LINE II	1 1/2

123\EFBFORMS/KNSRPT

Konus EFB Readings
Plant Hayward LP.
readings every 10 minutes

date 2/21/96
by Jason N.

time	K1 and K2						K3 and K4					
	Bed Volt	Bed Current	Ion Volt	Ion Current	EFB Press.	Baghouse Press.	Bed Volt	Bed Current	Ion Volt	Ion Current	EFB Press.	Baghouse Press.
9:30	13.5	0.2	20	1.2	.8	.4						
8:45	13.5	0.4	28	3.6	1	4						
9:00	13.5	0.2	30	4	1.4	.4						
9:15	13.0	0.2	30	4	1.6	.4						
9:30	13.0	0.2	29	4	1.9	.4						
9:45	13.0	0.2	29	4	1.9	.4						
10:00	13.0	0.2	30	4	2.2	4						
10:15	13.0	0.2	27	4	2.9	4						
10:30	13.0	0.2	30	4	3.4	4						
10:45	12.5	0.3	31	4	3.3	4						
11:00	13.0	0.3	30	4	2.9	4						
11:15	13.0	0.3	29	4	3	4						
11:30	13.0	0.3	29	4	2.8	4						
11:45	13.5	0.3	30	4	2.8	4						
12:00	13.0	0.3	30	4	3.4	4						
12:15	13.0	0.3	29	4	3.2	4						
12:30	12.5	0.3	28	4	2.8	4						
12:45	13.0	0.3	30	4	1.8	4						
1:00	12.0	0.3	30	4	1.4	4						
1:15	12.5	0.3	28	4	1.6	4						
1:30	12.5	0.3	30	4	1.6	4						
1:45	12.5	0.3	29	4	1.7	4						
2:00	12.5	0.3	29	4	1.5	4						
2:15	12.5	0.3	30	4	1.8	4						
2:30	12.5	0.3	29	4	1.4	4						
2:45	12.5	0.3	30	4	1.4	4.5						
3:00	12.5	0.3	29	4	1.4	4.5						
3:15	12.5	0.3	30	4	1.2	4						
3:30	12.5	0.3	29	4	1.4	4.2						
3:45	12.5	0.3	29	4	1.3	5						

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Konus EFB Readings
Plant Hayward L.P.
readings every 10 minutes

date 2/21/96
by Jason M.

time	K1 and K2 Bed Volt	K1 and K2 Bed Current	K1 and K2 Ion Volt	K1 and K2 Ion Current	K1 and K2 EFB Press.	K1 and K2 Baghouse Press.	K3 and K4 Bed Volt	K3 and K4 Bed Current	K3 and K4 Ion Volt	K3 and K4 Ion Current	K3 and K4 EFB Press.	K3 and K4 Baghouse Press.
4:00	12.5	0.6	28.5	.4	1.	4						
4:15	12.5	0.3	30.0	.4	1	4						
4:30	12.0	0.3	29.0	4	.9	4						
4:45	12.0	0.3	29.0	4	.4	4						
5:00	12.5	0.3	29.0	4	.6	4						
5:15	12.5	0.3	29.0	4	.6	4						
5:30	12.0	0.3	31.0	4	.6	4						
5:45	12.5	0.3	30	4	.6	4						
6:00	12.5	0.3	29	4	.4	4						
6:15	12.5	0.3	29	4	.6	4						
6:30	12.5	0.3	29	4	.4	4						
6:45	12.5	0.3	29	4	.4	4						
7:00	12.5	0.3	28	4	.2	4						
7:15	12.5	0.3	28	4	0	4						
7:30	12.5	0.3	28	4	0	4						
7:45	12.5	0.3	28.5	4	0	4						
8:00	12.5	0.3	29	3.8	0	4						

L-107

106

KONUS EFB REPORT DATE

SHIFT: (1) OR II
LINES 1 & 2

K-1 - K-2

	7	8	9	10	11	12	1	2	3	4	5	6
Bed Voltage (KV)	15.0	14.0	13.5	13.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.0
Bed Amperage (MA)	.2	.2	.4	.4	.6	.6	.6	.6	.6	.4	.6	.6
Ionizer Voltage (KV)	26	26	26	30	30	30	30	30	30	29	29	29
Ionizer Amperage (MA)	2.6	2.4	2.6	3.0	4.1	4.2	4.0	4.0	4.0	3.8	4.0	4.0
EFB Pressure Drop (In.)	0	.4	1.4	2.6	3.2	3.4	1.2	1.2	1.4	1.2	.6	.6
Inlet Temperature	459	475	444	480	484	487	472	481	492	491	478	497
Outlet Temperature	377	390	366	398	405	413	398	412	413	411	403	417
Rock Flow	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Condition Code*	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok

Rock Usage/Shift: _____

K-3 - K-4

	7	8	9	10	11	12	1	2	3	4	5	6
Bed Voltage (KV)	5.0	5.0	5.0	5.0	4.0	5.0	5.0	5.0	5.0	6.0	5.0	5.0
Bed Amperage (MA)	2.4	2.6	2.4	2.2	1.8	2.2	2.4	2.6	2.6	2.2	2.0	2.0
Ionizer Voltage (KV)	21	22	22	22	22	22	22	22	22	21	20	20
Ionizer Amperage (MA)	2.0	2.0	2.0	2.0	2.0	2.0	2.2	2.0	2.0	2.2	2.0	2.4
EFB Pressure Drop (In.)	.4	.4	.4	.4	.4	.4	.4	.4	.4	.4	.4	.4
Inlet Temperature	492	502	499	527	477	477	468	461	451	434	461	497
Outlet Temperature	422	423	419	404	414	419	427	330	432	431	427	427
Rock Flow	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Condition Code*	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok

Rock Usage/Shift: _____

Baghouse Pressure Drop: (in.)	7	8	9	10	11	12	1	2	3	4	5	6
L-I	4.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.5	4.8	4.0	4.0
L-II	4.2	4.8	4.6	4.8	4.0	4.2	3.8	4.0	4.2	4.4	3.8	4.0

Comments/Problems: _____

*Condition Codes
1) Start up/shutdown
2) Konus down
3) Moisture in bed
4) Adding rock
5) Power Outage
6) Checking EFB
7) Konus on oil
8) Maintenance

VOLUME PER SHIFT

LINE I	2
LINE II	2

I:\EFB\FORMS\KNSRPT

SHIFT: I OR II

LINES 1 & 2

K-1 - K-2

	7	8	9	10	11	12	1	2	3	4	5	6
Bed Voltage (KV)	12	12.5	13	12	12	12	12	12	12	12	12	12
Bed Amperage (MA)	0.8	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.4	0.4	0.4
Ionizer Voltage (KV)	28	28	29	29	29	29	29	29	29	29	29	29
Ionizer Amperage (MA)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.8	3.8	3.8	4.0
EFB Pressure Drop (In.)	0.2	.0	.0	.0	.0	.0	.0	.0	.0	0.2	0.4	1.6
Inlet Temperature	479	485	502	506	504	509	513	508	502	497	491	491
Outlet Temperature	401	406	417	418	420	421	414	407	403	405	407	410
Rock Flow	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Condition Code*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

Rock Usage/Shift: _____

K-3 - K-4

	7	8	9	10	11	12	1	2	3	4	5	6
Bed Voltage (KV)	5	5	5	5	5	5	5	5	5	5	5	5
Bed Amperage (MA)	2.2	2.2	2.2	2.2	2.4	2.4	2.2	2.2	2.2	2.2	2.2	2.0
Ionizer Voltage (KV)	20	20	20	20	20	20	20	20	20	20	20	20
Ionizer Amperage (MA)	2.0	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.4
EFB Pressure Drop (In.)	0.3	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Inlet Temperature	500	504	500	508	517	528	523	527	530	526	520	504
Outlet Temperature	423	426	426	428	425	424	426	422	421	423	425	421
Rock Flow	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Condition Code*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

Rock Usage/Shift: _____

Baghouse Pressure Drop: (in.)		7	8	9	10	11	12	1	2	3	4	5	6
	L-I	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	L-II	4.0	4.0	4.0	4.0	4.2	4.4	4.4	4.4	4.4	4.6	4.6	4.2

Comments/Problems: _____

*Condition Codes

1) Start up/shutdown
2) Konus down
3) Moisture in bed
4) Adding rock
5) Power Outage
6) Checking EFB
7) Konus on oil
8) Maintenance

VOLUME PER SHIFT

LINE I	2
LINE II	3

I:\EFBFORMS\KNSRPT

KONUS EFB REPORT DATE 2-22-96

SHIFT: (I) OR II
LINES 1 & 2

K-1 - K-2

	7	8	9	10	11	12	1	2	3	4	5	6
Bed Voltage (KV)	12.5	12.5	13.0	13.0	13.0	13.0	13.0	13.0	12.5	12.5	13.0	13.0
Bed Amperage (MA)	.4	.4	.4	.2	.4	.4	.4	.4	.4	.4	.4	.4
Ionizer Voltage (KV)	29	30	29	28	30	30	30	30	30	30	30	30
Ionizer Amperage (MA)	3.8	4	4.0	4.0	4.0	4.0	4.0	3.8	4.0	3.8	4.0	4.0
EFB Pressure Drop (In.)	2.6	2.2	2.0	2.4	2.2	.8	1.0	1.2	.8	.8	1.0	1.0
Inlet Temperature	492	488	487	492	495	513	514	514	509	505	507	502
Outlet Temperature	407	404	403	405	406	418	417	415	414	411	412	413
Rock Flow	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Condition Code*	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok

Rock Usage/Shift: _____

K-3 - K-4

	7	8	9	10	11	12	1	2	3	4	5	6
Bed Voltage (KV)	5.0	6.0	5.5	5.5	5.5	6.0	5.5	5.5	4.5	5.0	5.0	5.0
Bed Amperage (MA)	2.4	1.8	1.8	1.8	1.8	2.0	2.0	2.0	2.6	2.8	2.6	2.6
Ionizer Voltage (KV)	20	20	20	20	20	20	20	20	20	20	20	20
Ionizer Amperage (MA)	2.4	2.4	2.6	2.4	2.6	2.4	2.4	2.6	2.4	1.4	2.0	2.0
EFB Pressure Drop (In.)	.4	.4	.4	.4	.4	.4	.4	.4	.4	.4	.4	.4
Inlet Temperature	510	476	487	504	495	486	487	487	530	545	533	5..
Outlet Temperature	421	413	394	396	397	391	391	391	400	412	416	417
Rock Flow	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Condition Code*	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok

Rock Usage/Shift: _____

Baghouse Pressure Drop: (in.)		7	8	9	10	11	12	1	2	3	4	5	6
	L-I	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.5	4.0	4.0
	L-II	5.0	4.5	4.2	4.2	4.0	4.2	4.6	4.8	4.4	4.0	4.0	4.0

Comments/Problems: _____

*Condition Codes
1) Start up/shutdown
2) Dryers down
3) Moisture in bed
4) Adding rock
5) Power Outage
6) Checking EFB
7) Dryer in oil
8) Pre-heater failure

VOLUME PER SHIFT

LINE I	2
LINE II	2

KNSRPT

APPENDIX M

SAMPLING TRAIN CALIBRATION DATA

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job L.P. / Hayward Date 2-20-96

Operator EJ Module No. 10

Instructions:
Operate the control module at a flow rate equal to ΔH@ for 10 minutes before attaching the umbilical.

Record the following data:

Bar press 28.48 in.Hg θ = 1.0004 ΔH@ 1.95 in.WC.

Time (min)	Volume (CF)	Meter Temp (°F)	
		Inlet	Outlet
	(697.20)		
2.5	699.08	47	33
5.0	700.90	48	31
7.5	702.78	49	30
10	704.57	51	31
	V_m = 7.37	Avg(t_m) = 40	°F

Calculate Y_{cm} as follows:

$$Y_{cm} = \frac{1.786}{\theta\, V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cm} = \frac{1.786}{(1.0004)(7.37)}\left[\frac{(40) + 460}{(28.48)}\right]^{0.5} \quad 4.19$$

$$Y_{cm} = 1.01$$

If Y_{cm} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job L.P. Hayward Date 2-21-96

Operator EJ Module No. 10

Instructions:
Operate the control module at a flow rate equal to ΔH@ for 10 minutes before attaching the umbilical.

Record the following data:

Bar press 29.24 in.Hg θ = 1.0004 ΔH@ 1.95 in.WC.

Time (min)	Volume (CF)	Meter Temp (°F)	
		Inlet	Outlet
	(980.50)		
2.5	982.34	15	10
5.0	984.15	16	11
7.5	985.96	38	12
10	987.80	38	12
	V_m = 7.30	Avg(t_m) = 18.25	°F

Calculate Y_{cm} as follows:

$$Y_{cm} = \frac{1.786}{\theta\, V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cm} = \frac{1.786}{(7.30)(1.0004)}\left[\frac{(18.25) + 460}{(29.24)}\right]^{0.5} \quad \frac{4.04}{.347}$$

$$Y_{cm} = .988$$

If Y_{cm} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job L.P. Hayward Date 2-22-96

Operator ES Module No. 10

Instructions:
Operate the control module at a flow rate equal to ΔH@ for 10 minutes before attaching the umbilical.

Record the following data:

Bar press 29.01 in.Hg θ = 1.0004 ΔH@ 1.95 in.WC.

Time (min)	Volume (CF)	Meter Temp (°F)	
		Inlet	Outlet
	(273.20)		
2.5	275.07	23	14
5.0	276.89	26	14
7.5	278.74	28	14
10	280.57	32	15
	V_m = 7.37	Avg(t_m) = 20.75	°F

Calculate Y_m as follows:

$$Y_m = \frac{1.786}{\theta\, V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_m = \frac{1.786}{(1.0004)(7.37)}\left[\frac{(20.75) + 460}{(29.01)}\right]^{0.5} \quad 4.07$$

$$Y_m = \underline{\quad .985 \quad}$$

If Y_m is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job LP-Hayward, WI Date 2/19/96

Operator S.K Module No. 17

Instructions:
Operate the control module at a flow rate equal to ΔH@ for 10 minutes before attaching the umbilical.

Record the following data:

Bar press 28.18 in.Hg θ = .9985 ΔH@ 1.74 in.WC.

Time (min)	Volume (CF)	Meter Temp (°F)	
		Inlet	Outlet
	(213.400)		
2.5	215.294	50	47
5.0	217.190	55	49
7.5	219.110	58	50
10	221.033	61	51
	V_m = 7.633	Avg(t_m) = 52.6	°F

Calculate Y_{cm} as follows:

$$Y_{cm} = \frac{1.786}{\theta\, V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cm} = \frac{1.786}{(.9985)(7.633)}\left[\frac{(52.6) + 460}{(28.18)}\right]^{0.5}$$

$$Y_{cm} = .9994$$

If Y_{cm} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

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INTERPOLL LABORATORIES, INC.
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EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job L.P. / Hayward, WI Date 2-20-96

Operator M. Kaebler Module No. 18

Instructions:
Operate the control module at a flow rate equal to ΔH@ for 10 minutes before attaching the umbilical.

Record the following data:

Bar press 28.75 in.Hg θ = 1.0051 ΔH@ 1.91 in.WC.

Time (min)	Volume (CF)	Meter Temp (°F)	
		Inlet	Outlet
	(257.50)		
2.5	259.36	46	43
5.0	261.23	47	43
7.5	263.09	49	43
10	264.95	52	43
	V_m = 7.45	Avg(t_m) = 45.75	°F

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{\theta\, V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(1.0051)(7.45)}\left[\frac{(45.75) + 460}{(28.75)}\right]^{0.5}$$

$$Y_{cn} = 1.000$$

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job L.F. / Hayward, WI Date 2-22-96

Operator M. Kaehler Module No. 1B

Instructions:
Operate the control module at a flow rate equal to ΔH@ for 10 minutes before attaching the umbilical.

Record the following data:

Bar press 28.91 in.Hg θ = 1.0051 ΔH@ 1.91 in.WC.

Time (min)	Volume (CF)	Meter Temp (°F)	
		Inlet	Outlet
	(421.30)		
2.5	424.22	62	61
5.0	426.10	61	63
7.5	428.05	65	62
10	429.95	66	62
	V_m = 7.65	Avg(t_m) = 62.75	°F

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{\theta\, V_m} \left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(1.0051)\,(7.65)} \left[\frac{(62.75) + 460}{(28.91)}\right]^{0.5}$$

Y_{cn} = .998

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

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Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: February 28, 1996

Meter Box No.: 5 (Rockwell Dry Test Meter Serial No. 949230)

Date of Last Calibration: July 4, 1995
Calibration Technician: S. Fjelsta
Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
January 11, 1996	6-7164	357.10	574.29	217.19	217.19
February 16, 1996	6-7287	583.30	708.99	125.69	342.88
February 21, 1996	6-7318	709.40	1016.57	307.17	650.05

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: February 28, 1996

Meter Box No. : 6 (Rockwell Dry Test Meter Serial No. 964548)

Date of Last Calibration: January 11, 1996
Calibration Technician: S. Fjelsta
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
February 22, 1996	6-7318	437.32	595.20	157.88	157.88

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: February 28, 1996

Meter Box No. : 10 (Rockwell Dry Test Meter Serial No. 1334112)

Date of Last Calibration: December 5, 1995
Calibration Technician: D. Van Hoever
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
December 14, 1995	5-6998	26.35	152.02	125.67	125.67
December 20, 1995	5-7027	170.70	308.60	137.90	263.57
January 09, 1996	6-7145	319.40	461.20	141.80	405.37
January 11, 1996	6-7164	473.50	692.71	219.21	624.58
February 20, 1996	6-7318	704.80	1517.09	812.29	1436.87

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: February 28, 1996

Meter Box No. : 17 (Rockwell Dry Test Meter Serial No. 1334113)

Date of Last Calibration: January 18, 1996
Calibration Technician: S. Kelker
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
February 13, 1996	6-7285	114.25	210.80	96.55	96.55
February 20, 1996	6-7318	222.00	436.66	214.66	311.21

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: February 28, 1996

Meter Box No. : 18 (Rockwell Dry Test Meter Serial No. 1334117)

Date of Last Calibration: January 22, 1996
Calibration Technician: S. Kelker
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
February 21, 1996	6-7318	266.50	695.66	429.16	429.16

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: February 28, 1996

Meter Box Number: 1-S (Rockwell Dry Test Meter Serial No. 64710)

Date of Last Calibration: January 11, 1996
Calibration Technician: S. Fjelsta
Wet Test Meter Number: American Meter AL-17 (0.05 CF/REV)

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
February 22, 1996	6-7318	861.736	868.220	6.484	6.484

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: February 28, 1996

Meter Box No. : 6-S (Rockwell Dry Test Meter Serial No. 649078)

Date of Last Calibration: January 11, 1996
Calibration Technician: S. Fjelsta
Wet Test Meter No.: American Meter AL-17 (0.05 CF/REV)

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
February 13, 1996	6-7285	463.200	465.830	2.630	2.630
February 20, 1996	6-7318	466.403	473.379	6.976	9.606

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: February 28, 1996

Meter Box No. : CEM Trailer (Rockwell Dry Test Meter Serial No. 964554)

Date of Last Calibration: February 8, 1996
Calibration Technician: S. Kelker
Wet Test Meter No.: American Meter AL-17

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
February 21, 1996	6-7318	939.410	946.262	6.852	6.852

* Total volume through meter since last calibration.

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Meter Calibration Sheet EPA/Method 5

Date 1-4-95
Bar. Press. 29.12 IN.HG
Wet Test Meter No. AL-20

Control Module No. 5
Serial No. DTM 949230
Technician SF

ΔH (IN.WC)		Gas Volume Wet Test Meter	* Cal. Index	* Diff. Wet Test Meter ΔP_w	Gas Volume Dry Test Meter (ft^3)		Gas Temperatures			Time	Meter Coeff.	Orifice Const.	C_f
							Wet Test	Dry Test					
Nominal	Actual	(ft^3)	(%)	(IN.WC.)	V_{di}	V_{df}	t_w (°F)	t_{di} (°F)	t_{do} (°F)	θ (Min/Sec)	Y	ΔH@	
0.5	0.5	2	99.85	0.01	317.568	319.608	66.5	81	66	5/00	.9867911	1.773	
1.2	1.2	3	99.91	0.025	321.479	324.527	66.5	85	67	4/51	.9980224	1.769	
2.0	2.0	3	99.93	0.055	325.726	328.769	66.5	87	68	3/49	1.00057	1.819	
3.3	3.3	5	100.00	0.09	329.697	334.757	66.5	91	70	5/01	1.00640	1.855	
4.7	4.7	5	100.02	0.12	335.670	340.731	66.5	95	71	4/14	1.00685	1.872	
		1	2	3	4	5	6	7	8	9	10	Avg	
												0.9997	1.82

Positive leak check performed by SF
Meter was in tolerance
Approved by

Meter was not in tolerance
Meter was not in tolerance
Date 1/9/96

☐: readjusted linkage
☐: changed dry test meter

*Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

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M-15

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Meter Calibration Sheet EPA/Method 5

Date: 1-11-96
Bar. Press.: 25.97 IN.HG
Wet Test Meter No.: AL-20

Control Module No.: 6
Serial No. DTM: 964568
Technician: SF

ΔH (IN.WC)		Gas Volume Wet Test Meter	* Cal. Index φ	* Diff. Wet Test Meter ΔP_w	Gas Volume Dry Test Meter (ft^3)		Gas Temperatures			Time θ	Meter Coeff.	Orifice Const.	C_f
							Wet Test I_w (°F)	Dry Test					
Nominal	Actual	(ft^3)	(%)	(IN.WC.)	V_{dr}	V_w		I_{di} (°F)	I_{do} (°F)	(Min/Sec)	Y	ΔH@	
0.5	0.5	2	99.85	0.01	969.132	971.196	69.5	81	70	5/08	1.0015	1.830	
1.2	1.2	3	99.91	0.025	971.451	974.465	69.5	86	71	5/02	1.0083	1.864	
2.0	2.0	3	99.93	0.055	965.629	968.626	69.5	80	69	3/56	1.0046	1.910	
3.3	3.3	5	100.00	0.09	974.975	980.022	69.5	91	72	5/09	1.0047	1.931	
4.7	4.7	5	100.02	0.12	980.635	985.673	69.5	95	73	4/2	1.0079	1.939	
		2	3	4	5	6	7	8	9	10	(min) Avg	1.0054	1.89	

Positive leak check performed by: SF
☒ Meter was in tolerance
Approved by:

Meter was not in tolerance ☐: readjusted linkage
Meter was not in tolerance ☐: changed dry test meter
Date: 1/17/96

*Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

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M-16

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Meter Calibration Sheet EPA/Method 5

Date: Dec 5 1995
Bar. Press.: 28.81 IN.HG
Wet Test Meter No.: AL-20

Control Module No.: 10
Serial No. DTM: 1334112
Technician: D. Van Hoeven

ΔH (IN WC) Nominal	ΔH (IN WC) Actual	Gas Volume Wet Test Meter (ft^3)	* Cal. Index ϕ (%)	* Diff. Wet Test Meter ΔP_w (IN.WC.)	Gas Volume Dry Test Meter (ft^3) V_{wi}	Gas Volume Dry Test Meter (ft^3) V_{di}	Gas Temperatures Wet Test t_w (°F)	Gas Temperatures Dry Test t_{di} (°F)	Gas Temperatures Dry Test t_{do} (°F)	Time θ (Min/Sec)	Meter Coeff. Y	Orifice Const. ΔH@	C_p
0.5	.5	X 1.5	99.85	0.01	11.01	12.55	65.4	85	73	3:50	.9932	1.84	
1.2	1.2	X 2.5	99.91	0.025	1008.21	1010.76	65.3	87	73	4:18	1.0038	2.00	
2.0	2.0	3.5	99.93	0.055	992.48	996.06	65.3	82	72	4:37	.9935	1.97	
3.3	3.3	5	100.00	0.09	997.58	1002.65	65.2	86	72	5:09	1.0034	1.97	
4.7	4.7	X 4.5	100.02	0.12	1003.16	1007.71	65.0	90	73	3:54	1.0079	1.98	
		4	5	6	7	8	9	10		Avg	1.0004	1.95	

Positive leak check performed by
Meter was in tolerance
Approved by

Meter was not in tolerance ☐: readjusted linkage
Meter was not in tolerance ☐: changed dry test meter
Date 12/14/95

*Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

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M-17

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Meter Calibration Sheet EPA/Method 5

Date 1/18/96
Bar. Press. 24.72 IN.HG
Wet Test Meter No. AL-20

Control Module No. 17
Serial No. DTM 1334113
Technician SK

ΔH (IN.WC)		Gas Volume Wet Test Meter	* Cal. Index	* Diff. Wet Test Meter ΔP_w	Gas Volume Dry Test Meter (ft^3)		Gas Temperatures			Time	Meter Coeff.	Orifice Const.	C_p
							Wet Test	Dry Test					
Nominal	Actual	(ft^3)	(%)	(IN.WC.)	V_{di}	V_{df}	t_w (°F)	t_{di} (°F)	t_{df} (°F)	θ (Min/Sec)	Y	ΔH@	
0.5	0.5	2	99.85	0.01	101.347	103.427	65	91	77	4/48	.9935	1.65	
1.2	1.2	3	99.91	0.025	80.817	83.900	65	87	72	4/50	.9959	1.7596	
2.0	2.0	3	99.93	0.055	71.650	74.688	65	90	70	3/45	1.00033	1.779	
3.3	3.3	5	100.00	0.09	85.940	92.090	65	92	74	5/50	1.0037	1.748	
4.7	4.7	6	100.02	0.12	95.182	100.316	65	99	75	4/08	1.0025	1.7856	
1	2	3	4	5	6	7	8	9	10	Avg	.9985	1.74	

Positive leak check performed by SK
Meter was in tolerance
Approved by

Meter was not in tolerance ☐: readjusted linkage
Meter was not in tolerance ☐: changed dry test meter
Date 2/6/96

*Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

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M-18

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Meter Calibration Sheet EPA/Method 5

Date 1/22/96
Bar. Press. 29.19 IN.HG
Wet Test Meter No. AL-20

Control Module No. 18
Serial No. DTM 1334117
Technician SK

ΔH (IN WC)		Gas Volume Wet Test Meter	Cal. Index φ	Diff. Wet Test Meter ΔP_w	Gas Volume Dry Test Meter (ft^3)		Gas Temperatures			Time θ	Meter Coeff.	Orifice Const.	C_f
							Wet Test t_w (°F)	Dry Test					
Nominal	Actual	(ft^3)	(%)	(IN.WC.)	V_{di}	V_{df}		t_{di} (°F)	t_{do} (°F)	(Min/Sec)	Y	ΔH@	
0.5	05	2	99.85	0.01	235.948	237.984	58.2	78	65	5/00	1.0035	1.724	
1.2	1.2	3	99.91	0.025	240.010	243.090	58.8	77	65	4/59	1.0027	1.826	
2.0	2.0	3	99.93	0.055	229.839	232.878	58.5	79	63	3/53	1.0050	1.845	
3.3	3.3	5	100.00	0.09	245.114	250.196	59	84	66	5/00	1.0056	1.804	
4.7	4.7	5	100.02	0.12	252.210	257.282	59	88	67	4/13	1.0088	1.818	
		4	5	6	7	8	9	10		Avg	1.0051	1.80	

Positive leak check performed by SK
Meter was in tolerance
Approved by

Meter was not in tolerance ☐: readjusted linkage
Meter was not in tolerance ☐: changed dry test meter
Date 2/2/96

*Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

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M-19

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Minimodule Calibration Sheet/Flow Rate Range 0-0.13 CFM/(0-4 LPM)

Date 1-11-96
Bar. Press. 28.18 IN.HG
Wet Test Meter No. AL-17 (.05 CF/FEV)
Meter Box No. # 15
Serial No. DTM 64710
Technician SF

Rota-meter Reading (cc/Min)	ΔP_d (IN.WC)	Gas Volume Wet Test Meter (ft^3)	** Cal Index ϕ (%)	Diff. Wet Test Meter ΔP_w (IN.WC)	Gas Volume Dry Test Meter (ft^3) V_{di}	Gas Volume Dry Test Meter (ft^3) V_{df}	Gas Temperature Wet Test t_w (°F)	Gas Temperature Dry Test t_{di} (°F)	Gas Temperature Dry Test	Time θ (Min/Sec)	Meter Coeff. Y	Rota-meter Coeff. Z
1000	.001	0.2	99.55	0.04	851.725	851.937	69.5	100			0.9967	
1000	.001	0.2	99.55	0.04	851.959	852.168	69.5	100			1.0062	
1000	.001	0.2	99.55	0.04	852.199	852.411	69.5	99			0.9949	
1	2	3	4	5	6	7	8	9		10/11 Avg.	0.9993	

Meter was in tolerance ☒
Meter was not in tolerance ☐: readjusted linkage
Meter was not in tolerance ☐: changed dry test meters
Approved by [signature] Date 1/17/96

Gas Meter Bimetallic Therm. Calibration/Verification *
☐ ≥ ± 5°F (Out of control)
☒ ≤ ± 5°F (In control)
☐ Recalibrated _/_/_
☒ No action required

*Verified against mercury in glass thermometer or calibrated platinum resistance thermometer.

*Based on AL-17 wet test meter calibration in Aug. 1989 against Bell Prover (NBS Traceable) - Carl Poe Co.

M-20

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Minimodule Calibration Sheet/Flow Rate Range 0-0.13 CFM/(0-4 LPM)

Date 1-11-96
Bar. Press. 28.48 IN.HG
Wet Test Meter No. AL-17 (.05 CF/REV)

Meter Box No. 163
Serial No. DTM 64078
Technician SF

Rota-meter Reading (cc/Min)	ΔP_{id} (IN.WC)	Gas Volume Wet Test Meter (ft^3)	** Cal Index ϕ (%)	Diff. Wet Test Meter ΔP_w (IN.WC)	Gas Volume Dry Test Meter (ft^3) V_{di}	V_{df}	Gas Temperature Wet Test t_w (°F)	Dry Test t_{di} (°F)	Dry Test	Time θ (Min/Sec)	Meter Coeff. Y	Rota-meter Coeff. Z
1000	.001	0.2	99.55	0.04	433.953	434.152	69.5	72			1.0087	
1000	.001	0.2	99.55	0.04	434.417	434.618	67.5	77			1.0081	
1000	.001	0.2	99.55	0.04	434.637	434.842	65.5	80			0.9939	
1	2	3	4	5	6	7	8	9		10/11 Avg.	1.0036	

Meter was in tolerance ☒
Meter was not in tolerance ☐: readjusted linkage
Meter was not in tolerance ☐: changed dry test meters
Approved by _____ Date 1/17/96

Gas Meter Bimetallic Therm. Calibration/Verification *
☐ ≥ ± 5°F (Out of control)
☒ ≤ ± 5°F (In control)

☐ Recalibrated _/_/_
☒ No action required

*Verified against mercury in glass thermometer or calibrated platinum resistance thermometer.

*Based on AL-17 wet test meter calibration in Aug. 1989 against Bell Prover (NBS Traceable) - Carl Poe Co.

M-21

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Minimodule Calibration Sheet/Flow Rate Range 0-0.13 CFM/(0-4 LPM)

Date 2/8/96
Bar. Press. 28.73 IN.HG
Wet Test Meter No. AL-17 (.05 CF/FEV)

Meter Box No. DR 1
Serial No. DTM 964554
Technician Steve Kelker

Rotameter Reading (cc/Min)	ΔP_{dl} (IN.WC)	Gas Volume Wet Test Meter (ft^3)	** Cal Index ϕ (%)	Diff. Wet Test Meter ΔP_w (IN.WC)	Gas Volume Dry Test Meter (ft^3) V_{dl}	V_{dl}	Gas Temperature Wet Test t_w (°F)	Dry Test t_{dl} (°F)	Time θ (Min/Sec)	Meter Coeff. Y	Rotameter Coeff. Z
1000	.001	.5	99.55	0.04	929.700	930.198	69.4	68	—	1.0003	
1000	.001	.5	99.55	0.04	930.198	930.698	69.4	68	—	0.9963	
1000	.001	.5	99.55	0.04	930.698	931.198	69.4	68	—	0.9963	
1	2	3	4	5	6	7	8	9	10(1) Avg.	0.9976	

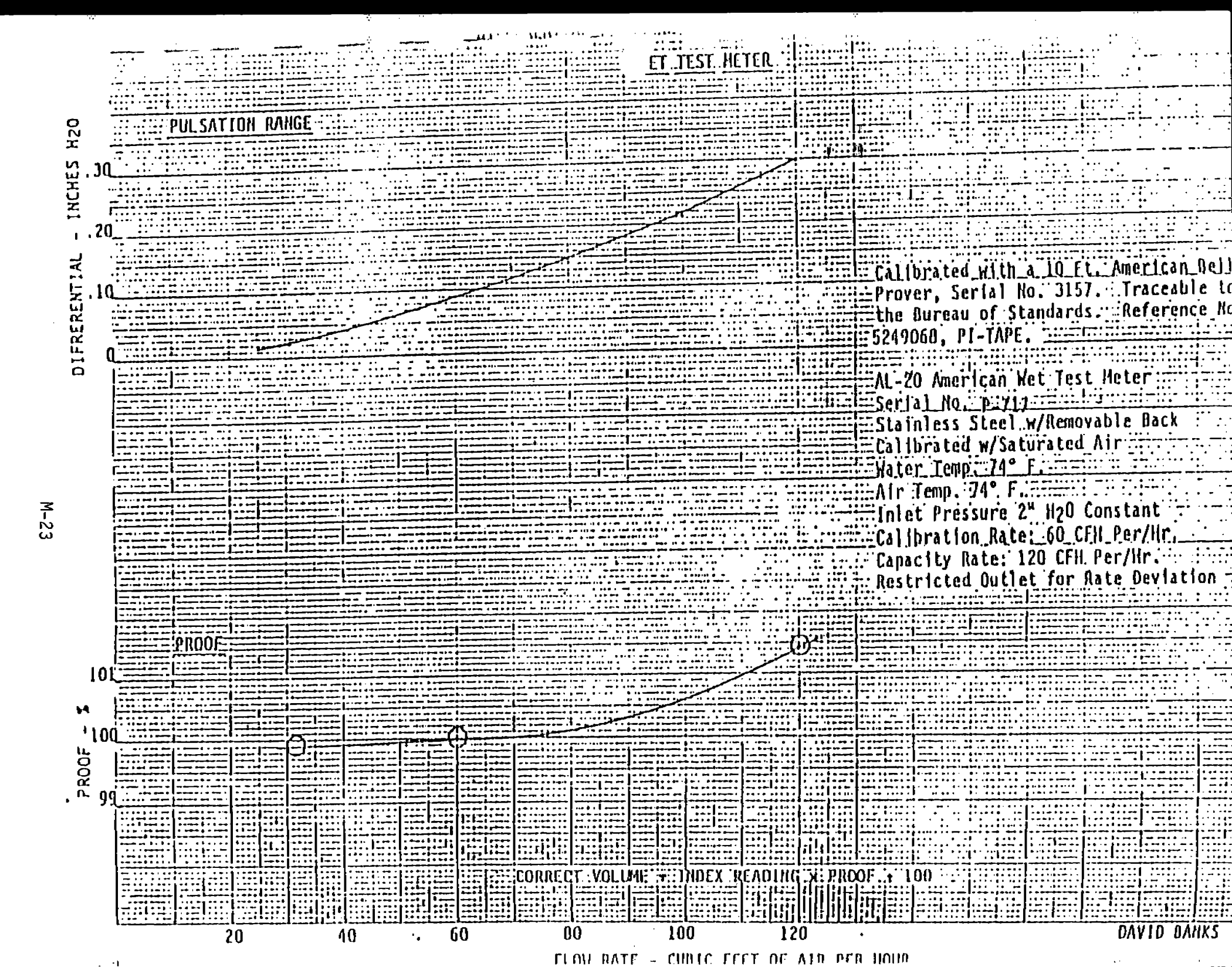
Meter was in tolerance [X]
Meter was not in tolerance ☐: readjusted linkage
Meter was ~~not~~ in tolerance ☐: changed dry test meters
Approved by _____ Date 2/8/96

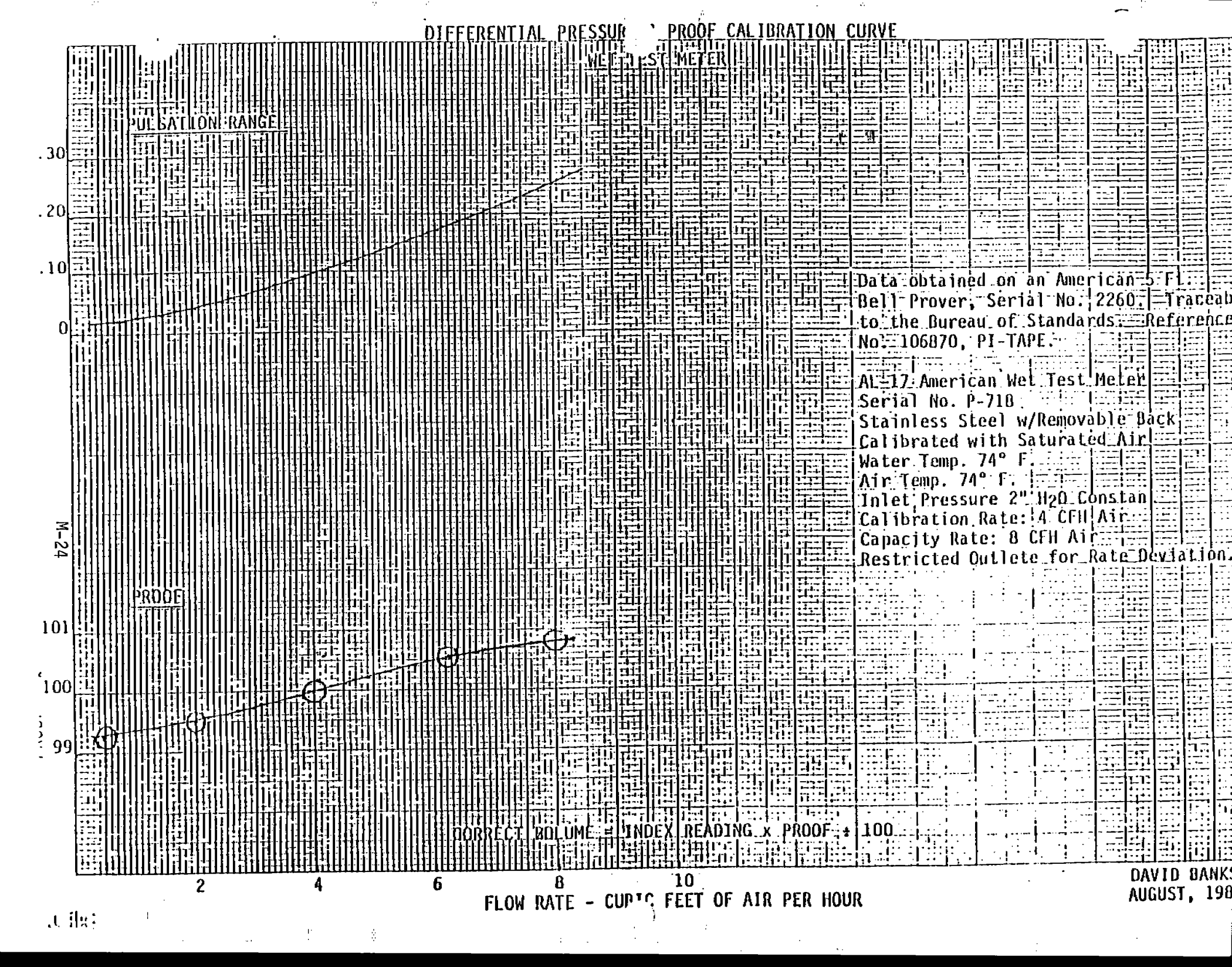
Gas Meter Bimetallic Therm. Calibration/Verification *
☐ ≥ ± 5°F (Out of control)
☐ ≤ ± 5°F (In control)
☐ Recalibrated _/_/_
☐ No action required

*Verified against mercury in glass thermometer or calibrated platinum resistance thermometer.

*Based on AL-17 wet test meter calibration in Aug. 1989 against Bell Prover (NBS Traceable) - Carl Poe Co.

M-22


ET TEST METER
PULSATION RANGE
DIFRENTIAL - INCHES H20
.30
.20
.10
0
PROOF
101
100
99
PROOF - %
Calibrated with a 10 Ft. American Bell
Prover, Serial No. 3157. Traceable to
the Bureau of Standards. Reference No
5249060, PI-TAPE.
AL-20 American Wet Test Meter
Serial No. P-711
Stainless Steel w/Removable Back
Calibrated w/Saturated Air
Water Temp. 74° F.
Air Temp. 74° F.
Inlet Pressure 2" H20 Constant
Calibration Rate: 60 CFH Per/Hr.
Capacity Rate: 120 CFH Per/Hr.
Restricted Outlet for Rate Deviation
CORRECT VOLUME = INDEX READING X PROOF ÷ 100
20
40
60
00
100
120
DAVID BANKS
FLOW RATE - CUBIC FEET OF AIR PER HOUR


DIFFERENTIAL PRESSUR ' PROOF CALIBRATION CURVE
WET TEST METER
PULSATION RANGE
.30
.20
.10
0
M-24
PROOF
101
100
99
Data obtained on an American 5 Ft.
Bell Prover, Serial No. 2260. Traceab
to the Bureau of Standards. Reference
No. 106870, PI-TAPE.
AL-17 American Wet Test Meter
Serial No. P-718
Stainless Steel w/Removable Back
Calibrated with Saturated Air
Water Temp. 74° F.
Air Temp. 74° F.
Inlet Pressure 2" H2O Constan
Calibration Rate: 4 CFH Air
Capacity Rate: 8 CFH Air
Restricted Outlete for Rate Deviation.
CORRECT VOLUME = INDEX READING x PROOF ÷ 100
2
4
6
8
10
FLOW RATE - CUBIC FEET OF AIR PER HOUR
DAVID BANKS
AUGUST, 198

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 02-20-96
Technician: Ed Juers

Nozzle Number 3-4

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.247
2	.246
3	.249
Average:	.247

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 02-20-96 Nozzle Number 7-8
Technician: Duane Van Hoever

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.453
2	.452
3	.455
Average:	.453

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 02-20-96 Nozzle Number 8-8

Technician: Duane Van Hoever

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.434
2	.434
3	.435
Average:	.434

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 02-21-96 Nozzle Number 2-4

Technician: Mark Kaehler

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.249
2	.251
3	.251
Average:	.250

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 02-21-96
Technician: Ed Juers

Nozzle Number GLASS

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.275
2	.276
3	.275
Average:	.275

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 02-22-96 Nozzle Number GLASS

Technician: Duane Van Hoever

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.434
2	.434
3	.434
Average:	.434

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 02-22-96 Nozzle Number GLASS-3

Technician: Mark Kaehler

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.187
2	.187
3	.187
Average:	.187

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Temperature Measurement Device Calibration Sheet

Unit Under Test:
Vendor: Omega
Model: HH 81
Range: 0 - 2000 °F
Date of Calibration: 12-26-95
Method of Calibration:
Serial Number: 73J x 1495
Thermocouple Type: K
Technician: Mark Koehler
PDT No. 31

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☐ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100°F) ± 1 degree (for negative temperatures add ± 2 degrees). The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation	
			Δt (°F)	(%)
0		-3	3	.65
100		97	3	.54
200		200	0	0
300		298	2	.76
400		397	3	.35
500		497	3	.31
600		599	1	.09
700		698	2	.17
800		800	0	0
900		899	1	.07
1000		999	1	.07
1100		1899	1	.06
1200		1199	1	.06
1300		1298	2	.11
1400		1400	0	0
1500		1498	2	.10
1600		1600	0	0
1700		1699	1	.05
1800		1800	0	0
1900		1897	3	.13
2000		1998	2	.08
2100		2095	5	.20
		Averages:	1.64	.15

OF = off scale response by unit under test (°F)
% dev = 100 Δt/(460 + t)
☒ Unit in tolerance
☐ Unit was not in tolerance: recalibrated - See new calibration sheet.

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Temperature Measurement Device Calibration Sheet

Unit Under Test:
Vendor: Omega
Model: HH81
Range: 0 - 2100 °F
Date of Calibration: 2/6/96
Method of Calibration:

Serial Number: 73X1493
Thermocouple Type: K
Technician: SK
PDT No.: 32

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☒ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100°F) ± 1 degree (for negative temperatures add ± 2 degrees). The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation	
			Δt (°F)	(%)
0	0	-3	3	.652
100	100	97	3	.536
200	200	199	1	.152
300	300	298	2	.263
400	400	397	3	.349
500	500	497	3	.313
600	600	599	1	.094
700	700	698	2	.172
800	800	800	0	0
900	900	899	1	.074
1000	1000	999	1	.068
1100	1100	1098	2	.128
1200	1200	1199	1	.060
1300	1300	1298	2	.114
1400	1400	1401	1	.054
1500	1500	1498	2	.102
1600	1600	1602	2	.097
1700	1700	1699	1	.046
1800	1800	1801	1	.044
1900	1900	1899	1	.042
2000	2000	2000	0	0
2100	2100	2097	3	.039
		Averages:	1.6	.154

OF = off scale response by unit under test (°F)

% dev = 100 Δt/(460 + t)

☒ Unit in tolerance

☐ Unit was not in tolerance: recalibrated - See new calibration sheet.

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Temperature Measurement Device Calibration Sheet

Unit Under Test:
Vendor: OMEGA
Model: HH51
Range: 0 - 2000 °F
Date of Calibration: 1-10-96
Method of Calibration:
Serial Number: 747X0343
Thermocouple Type: K
Technician: [signature]
PDT No. 34

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☒ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100°F) ± 1 degree (for negative temperatures add ± 2 degrees). The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation	
			Δt (°F)	(%)
0	0	-3	3	.65
100	100	97	3	.53
200	200	199	1	.15
300	300	298	2	.26
400	400	397	3	.39
500	500	498	2	.20
600	600	600	0	0
700	700	699	1	.08
800	800	802	2	.16
900	900	900	0	0
1000	1000	1001	1	.07
1100	1100	1099	1	.06
1200	1200	1201	1	.06
1300	1300	1300	0	0
1400	1400	1403	3	.16
1500	1500	1501	1	.05
1600	1600	1604	4	.19
1700	1700	1701	1	.05
1800	1800	1804	4	.17
1900	1900	1901	1	.04
2000	2000	2003	3	.12
2100	2100	2100	0	0
		Averages:	1.68	.154

OF = off scale response by unit under test (°F)
% dev = 100 Δt/(460 + t)

☒ Unit in tolerance
☐ Unit was not in tolerance: recalibrated - See new calibration sheet.

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Temperature Measurement Device Calibration Sheet

Unit Under Test:
Vendor: OMEGA
Model: HH81
Range: -160°C to 1372°C
Date of Calibration: 2-6-96
Serial Number: 741X1327
Thermocouple Type: K
Technician: EJ
PDT No.: 42

Method of Calibration:

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☒ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100°F) ± 1 degree (for negative temperatures add ± 2 degrees). The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation	
			Δt (°F)	(%)
0	0	-3	3	.65
100	100	97	3	.53
200	200	199	1	.15
300	300	297	3	.39
400	400	397	3	.35
500	500	497	3	.31
600	600	599	1	.09
700	700	698	2	.17
800	800	800	0	0
900	900	899	1	.07
1000	1000	1000	0	0
1100	1100	1098	2	.13
1200	1200	1200	0	0
1300	1300	1298	2	.11
1400	1400	1401	1	.05
1500	1500	1499	1	.05
1600	1600	1602	2	.09
1700	1700	1701	1	.05
1800	1800	1802	2	.09
1900	1900	1901	1	.04
2000	2000	2000	0	0
2100	2100	2099	1	.04
		Averages:	1.5	.153

Off = off scale response by unit under test (°F)

☒ Unit in tolerance

% dev = 100 Δt/(460 + t)

☐ Unit was not in tolerance: recalibrated - See new calibration sheet.

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Temperature Measurement Device Calibration Sheet

Unit Under Test:
Vendor: Omega
Model: HH81J
Range: 0-2000 °F
Date of Calibration: 2-16-96
Method of Calibration:
Serial Number: 745X1539
Thermocouple Type: K
Technician: LH
PDT No.: 43

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☒ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100°F) ± 1 degree (for negative temperatures add ± 2 degrees). The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation	
			at (°F)	(%)
0	0	-3	3	.650
100	100	98	2	.357
200	200	200	0	0
300	300	299	1	-133
400	400	398	2	.233
500	500	499	1	.104
600	600	600	0	0
700	700	699	1	.086
800	800	801	1	.079
900	900	899	1	.074
1000	1000	1000	0	0
1100	1100	1098	2	.128
1200	1200	1200	0	0
1300	1300	1298	2	.113
1400	1400	1401	1	.054
1500	1500	1499	1	.051
1600	1600	1602	2	.097
1700	1700	1700	0	0
1800	1800	1802	2	.088
1900	1900	1900	0	0
2000	2000	2000	0	0
2100	2100	2097	3	.117
		Averages:	1.137	.107

OF = off scale response by unit under test (°F)
% dev = 100 Δt/(460 + t)
☒ Unit in tolerance
☐ Unit was not in tolerance: recalibrated - See new calibration sheet.

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Temperature Measurement Device Calibration Sheet

Unit Under Test:
ndor: Omega
Model: HH 81
Range: 0-2000 °F
Date of Calibration: 12-26-95
Method of Calibration:

Serial Number: 745X 1540
Thermocouple Type: K
Technician: Mark Koehler
PDT No.: 45

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☐ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100°F) ± 1 degree (for negative temperatures add ± 2 degrees). The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation	
			Δt (°F)	(%)
0		-2	2	.113
100		98	2	.136
200		200	0	0
300		298	2	.26
400		398	2	.123
500		499	1	.10
600		600	0	0
700		699	1	.09
800		801	1	.08
900		900	0	0
1000		1001	1	.07
1100		1099	1	.06
1200		1201	1	.06
1300		1299	1	.06
1400		1402	2	.11
1500		1499	1	.05
1600		1602	2	.10
1700		1701	1	.05
1800		1802	2	.09
1900		1901	1	.04
2000		2001	1	.04
2100		2099	1	.04
		Averages:	1.18	.11

OF = off scale response by unit under test (°F)

% dev = 100 Δt/(460 + t)

☑ Unit in tolerance

☐ Unit was not in tolerance: recalibrated - See new calibration sheet.

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INTERPOLL LABORATORIES, INC.
(612) 786-6020

Temperature Measurement Device Calibration Sheet

Unit Under Test:
Vendor: OMEGA
Model: HH81
Range: -160 to +1,372 °C
Date of Calibration: 2-6-96
Method of Calibration:
Serial Number: 75SX1176
Thermocouple Type: K
Technician: EJ
PDT No.: 47

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☒ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100°F) ± 1 degree (for negative temperatures add ± 2 degrees). The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation	
			Δt (°F)	(%)
0	0	-3	3	.65
100	100	98	2	.36
200	200	200	0	0
300	300	298	2	.26
400	400	398	2	.24
500	500	499	1	.10
600	600	600	0	0
700	700	699	1	.09
800	800	801	1	.08
900	900	901	1	.07
1000	1000	1001	1	.07
1100	1100	1099	1	.06
1200	1200	1201	1	.06
1300	1300	1299	1	.06
1400	1400	1402	2	.11
1500	1500	1500	0	0
1600	1600	1602	2	.09
1700	1700	1701	1	.05
1800	1800	1803	3	.13
1900	1900	1901	1	.04
2000	2000	2001	1	.04
2100	2100	2099	1	.04
		Averages:	1.27	.12

OF = off scale response by unit under test (°F)
% dev = 100 Δt/(460 + t)
☒ Unit in tolerance
☐ Unit was not in tolerance: recalibrated - See new calibration sheet.

011995-G:\STACK\WP\FORMS\S-433

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. 22-8

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .460 IN.

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0

6. B_1 < 5° 0
7. B_2 < 5° 0

8. Z <.125" .0
9. W <.0625" .01

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .760 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☒ Meets all EPA design criteria thus C_p = 0.84
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel.
C_p = _____

Date of Inspection:

4-8-94

Inspected by:

CFR Title 40 Part 60 Appenidix A Method 2

S-348

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No 23-5

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .460 IN.

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0

6. B_1 < 5° 0
7. B_2 < 5° 0

8. Z <.125" .02
9. W <.0625" .01

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .760 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☒ Meets all EPA design criteria thus C_p = 0.84
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel.
C_p = _____

Date of Inspection:

2-8-94

Inspected by:

CFR Title 40 Part 60 Appenidix A Method 2

S-348

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. 23-6

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .460 IN.

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0

6. B_1 < 5° 0
7. B_2 < 5° 0

8. Z <.125" .02
9. W <.0625" .025

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☒ Meets all EPA design criteria thus C_p = 0.84
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel.
C_p = _____

Date of Inspection:

4-8-94

Inspected by:

CFR Title 40 Part 60 Appenidix A Method 2

S-348

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. 27-6

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .460 IN.

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0

6. B_1 < 5° 0
7. B_2 < 5° 0

8. Z <.125" .01
9. W <.0625" .02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☒ Meets all EPA design criteria thus C_p = 0.84
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel.
C_p = _____

Date of Inspection: 4-7-94

Inspected by: [signature]

CFR Title 40 Part 60 Appenidix A Method 2

S-348

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. 29-8

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .460 IN.

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0

6. B_1 < 5° 0
7. B_2 < 5° 0

8. Z <.125" .01
9. W <.0625" .02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☐ Meets all EPA design criteria thus C_p = 0.84
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel.
C_p = _____

Date of Inspection: 1-7-94

Inspected by: [signature]

CFR Title 40 Part 60 Appenidix A Method 2

S-348

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. MM-6

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .460 IN.

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0

6. B_1 < 5° 0
7. B_2 < 5° 0

8. Z <.125" .03
9. W <.0625" .025

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☒ Meets all EPA design criteria thus C_p = 0.84
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel.
C_p = _____

Date of Inspection:

4-8-94

Inspected by:

CFR Title 40 Part 60 Appenidix A Method 2

S-348

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. MM5-S

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .460 IN.

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0

6. B_1 < 5° 2
7. B_2 < 5° 2

8. Z <.125" .02
9. W <.0625" .02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☒ Meets all EPA design criteria thus C_p = 0.84
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel.
C_p = _____

Date of Inspection:

4-7-93

Inspected by:

CFR Title 40 Part 60 Appenidix A Method 2

S-348

4-7-93 G:\STACK\WP\FORMS\S-348

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date: 2-9-96
Technician: E. Jurs
Mercury Column Barometer No.: 1
Aneroid Barometer No.: 10724004

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjusted Mercury Barometer Read	Initial Aneroid Barometer Read	Difference (P_{ba} - P_{bm})
28.99	82	.136	28.85	28.85	0

Has this barometer shown any consistent problems with calibration? Yes/No. If yes, explain. NO

Has problem been alleviated? Yes/No. How?

Note: Aneroid barometers will be calibrated periodically against a mercury column barometer. The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20 - 30 minutes before calibrating. Aneroid barometer will be calibrated to the adjusted mercury barometer readings.

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 12-26-95
Technician Mark Gaebler
Mercury Column Barometer No. Lab 1
Aneroid Barometer No. 21029004

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjusted Mercury Barometer Read	Initial Aneroid Barometer Read	Difference (P_{ba} - P_{bm})
29.090	80	.131	28.949	28.95	.001

Has this barometer shown any consistent problems with calibration? Yes/No. If yes, explain. _____

Has problem been alleviated? Yes/No. How? _____

Note: Aneroid barometers will be calibrated periodically against a mercury column barometer. The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20 - 30 minutes before calibrating. Aneroid barometer will be calibrated to the adjusted mercury barometer readings.

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INTERPOLL LABORATORIES
(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 1-10-96

Technician E Trowbridge

Mercury Column Barometer No. ULTIMETER MODEL 12

Aneroid Barometer No. SN -01002005

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjsted Mercury Barometer Read	Initial Aneriod Barometer Read	Difference ($P_{ba}-P_{bm}$)
29.164	72	.116	29.05	29.05	-0-

Has this barometer shown any consistent problems with calibration? Yes/No. If yes, explain. No

Has problem been alleviated? Yes/No. How?

*Note

Aneroid barometers will be calibrated periodically against a mercury column barometer. The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20-30 minutes before calibrating. Aneriod barometer will be calibrated to the adjusted mercury barometer readings.

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 12/8/95
Technician D. VAN HOEVER
Mercury Column Barometer No. LAB
Aneroid Barometer No. DUAL'S

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjusted Mercury Barometer Read	Initial Aneroid Barometer Read	Difference (P_{ba} - P_{bm})
29.14	82	.142	28.998	28.94	.058

Has this barometer shown any consistent problems with calibration? Yes/(No) If yes, explain. _____

Has problem been alleviated? Yes/No. How? _____

Note: Aneroid barometers will be calibrated periodically against a mercury column barometer. The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20 - 30 minutes before calibrating. Aneroid barometer will be calibrated to the adjusted mercury barometer readings.

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FILE COPY

Interpoll Laboratories, Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014-1819

TEL: (612) 786-6020
FAX: (612) 786-7854

RESULTS OF THE MARCH 21, 1996 AIR EMISSION COMPLIANCE TEST OF THE LINE 1 THERMAL OIL HEATER AT THE LOUISIANA PACIFIC PLANT IN HAYWARD, WISCONSIN

Submitted to:

LOUISIANA-PACIFIC CORPORATION
Route 8, Box 8263
Hayward, Wisconsin 54843

Attention:

Keith Seelig

Approved by:



Daniel Despen
Manager
Stationary Source Testing Department

Report Number 6-7451E
April 24, 1996
SL/sll

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3 **AIR EMISSION RESULTS** 6

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APPENDICES:

A - Preliminary Volumetric Flow Rate Determination

B - Location of Test Ports

C - Field Data Sheets

D - Interpoll Laboratories Analytical Data

E - Operational Data

F - Procedures

G - Calculation Equations

H - Sampling Train Calibration Data

ABBREVIATIONS

ACFM	actual cubic feet per minute
cc (ml)	cubic centimeter (milliliter)
DSCFM	dry standard cubic foot of dry gas per minute
DSML	dry standard milliliter
DEG-F (°F)	degrees Fahrenheit
DIA.	diameter
FP	finished product for plant
FT/SEC	feet per second
g	gram
GPM	gallons per minute
GR/ACF	grains per actual cubic foot
GR/DSCF	grains per dry standard cubic foot
g/dscm	grams per dry standard cubic meter
HP	horsepower
HRS	hours
IN.	inches
IN.HG.	inches of mercury
IN.WC.	inches of water
LB	pound
LB/DSCF	pounds per dry standard cubic foot
LB/HR	pounds per hour
LB/10^6BTU	pounds per million British Thermal Units heat input
LB/MMBTU	pounds per million British Thermal Units heat input
LTPD	long tons per day
MW	megawatt
mg/Nm^3	milligrams per dry standard cubic meter
ug/Nm^3	micrograms per dry standard cubic meter
microns (um)	micrometer
MIN.	minutes
ng	nanograms
ohm-cm	ohm-centimeter
PM	particulate matter
PPH	pounds per hour
PPM	parts per million
ppmC	parts per million carbon
ppm,d	parts per million, dry
ppm,w	parts per million, wet
ppt	parts per trillion
PSI	pounds per square inch
SQ.FT.	square feet
TPD	tons per day
ug	micrograms
v/v	percent by volume
w/w	percent by weight
<	≤ (when following a number)

Standard conditions are defined as 68°F (20°C) and 29.92 IN. of mercury pressure.

g:\stack\wp\misc\abbrev.frm

1 INTRODUCTION

On March 21, 1996 Interpoll Laboratories personnel conducted a particulate emission compliance test of the Line 1 Thermal Oil Heater at the Louisiana Pacific Plant in Hayward, Wisconsin. On-site testing was performed by Jamie Bainville and Jim Lorenz. Coordination between testing activities and plant operation was provided by Keith Selig of Louisiana Pacific Corporation. The tests were not witnessed by a member of the Wisconsin Department of Natural Resources.

Particulate determinations were performed in accordance with EPA Methods 2 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1995). A preliminary volumetric flow rate determination was performed to select the appropriate nozzle diameter required for isokinetic sample withdrawal. An Interpoll Labs sampling train which meets or exceeds specifications in the above-cited reference was used to extract particulate samples by means of a heated glass-lined probe. Wet catch samples were collecctd in the back half of the Method 5 sampling train and analyzed as per Wisconsin DNR Protcol.

An integrated flue gas sample was extracted simultaneously with the particulate sampling train using a specially designed gas sampling system. Integrated flue gas samples were collected in 44-liter Tedlar bags housed in a protective aluminum container. After sampling was complete, the bags were sealed and returned to the laboratory for Orsat analysis. Prior to sampling, the Tedlar bags are leak-checked at 15 IN.HG. vacuum with an in-line rotameter. Bags with any detectable in-leakage are discarded.

Testing was conducted from two test ports oriented at 90° on the stack. These test ports are located approximately 4.8 diameters downstream and 2.3 diameters upstream of the nearest flow disturbance. A 20-point traverse was used to collect representative particulate samples. Each traverse point was sampled 3 minutes to give a total sampling time of 60 minutes per run.

The important results of the test are summarized in Section 2. Detailed results are presented in Section 3. Field data and all other supporting information are presented in the appendices.

2 SUMMARY AND DISCUSSION

The results of the air emission compliance tests are summarized in Table 1. An overview of the results is presented in the table below:

Parameter		Measured
Particulate		
(Dry + Wet Catch)		
.....	(GR/DSCF)	0.0147
.....	(LB/10^6BTU)	0.056
(Dry Catch Only)		
.....	(GR/DSCF)	0.010
.....	(LB/10^6BTU)	0.040

The wet catch portion of the first sampling run was accidentally spilled during recovery, therefore, this run was voided by the Interpoll Laboratories field engineer. An additional test run was performed immediately following the third test run. No other difficulties were encountered in the field or in the laboratory evaluation of the samples. On the basis of these facts and a complete review of the data and results, it is our opinion that the results reported herein are accurate and closely reflect the actual values which existed at the time the test was performed.

Table 1a Summary of the Results of the March 21, 1996 Particulate Emission Test of the Line 1 Thermal Oil Heater Stack at the Louisiana Pacific Plant in Hayward, Wisconsin.

ITEM		Run 1	Run 2	Run 3
Date of test		03-21-96	03-21-96	03-21-96
Time runs were done	(HRS)	1038/1145	1210/1312	1340/1445
Steam flow	(KLB/HR)			
Volumetric flow				
actual	(ACFM)	17922	19125	19072
standard	(DSCFM)	10922	11762	11338
Gas temperature	(DEG-F)	306	310	308
Moisture content	(%V/V)	9.62	8.21	11.53
Gas composition	(%V/V,dry)			
carbon dioxide		7.10	6.50	5.30
oxygen		12.80	13.40	14.80
nitrogen		80.10	80.10	79.90
Isokinetic variation	(%)	97.0	97.5	100.2
Particulate concentration				
actual	(GR/ACF)	.007330	.0113	.00811
standard	(GR/DSCF)	.0120	.0184	.0136
Part. emission rate	(LB/HR)	1.13	1.86	1.33
Emission factor	(LB/MMBTU)	0.041	0.067	0.061

.0141
1.94

Note: Dry + Organic/Inorganic Wet Catch

Table 1b Summary of the Results of the March 21, 1996 Particulate Emission Test of the Line 1 Thermal Oil Heater Stack at the Louisiana Pacific Plant in Hayward, Wisconsin.

ITEM		Run 1	Run 2	Run 3
Date of test		03-21-96	03-21-96	03-21-96
Time runs were done	(HRS)	1038/1145	1210/1312	1340/1445
Steam flow	(KLB/HR)			
Volumetric flow				
actual	(ACFM)	17922	19125	19072
standard	(DSCFM)	10922	11762	11338
Gas temperature	(DEG-F)	306	310	308
Moisture content	(%V/V)	9.62	8.21	11.53
Gas composition	(%V/V,dry)			
carbon dioxide		7.10	6.50	5.30
oxygen		12.80	13.40	14.80
nitrogen		80.10	80.10	79.90
Isokinetic variation	(%)	97.0	97.5	100.2
Particulate concentration				
actual	(GR/ACF)	.006409	.006016	.00655
standard	(GR/DSCF)	.0105	.009786	.0110
Part. emission rate	(LB/HR)	0.985	0.987	1.07
Emission factor	(LB/MMBTU)	0.035	0.036	0.049

Note: Dry Catch Only

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3 RESULTS

The results of all field and laboratory evaluations are presented in this section. Gas composition (Orsat and moisture) are presented first followed by the computer printout of the particulate results. Preliminary measurements including test port locations are given in the appendices.

The results have been calculated on a personal computer using programs written in Extended BASIC specifically for source testing calculations. EPA-published equations have been used as the basis of the calculation techniques in these programs. The particulate emission rate has been calculated using the product of the concentration times flow method.

3.1 Orsat & Moisture Analyses

Test No. 18
Line 1 Thermal Oil Heater Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	03-21-96	03-21-96	03-21-96
Dry basis (orsat)			
carbon dioxide.....	7.10	6.50	5.30
oxygen.....	12.80	13.40	14.80
nitrogen.....	80.10	80.10	79.90
Wet basis (orsat)			
carbon dioxide.....	6.42	5.97	4.69
oxygen.....	11.57	12.30	13.09
nitrogen.....	72.39	73.53	70.69
water vapor.....	9.62	8.21	11.53
Dry molecular weight.....	29.65	29.58	29.44
Wet molecular weight.....	28.53	28.63	28.12
Specific gravity.....	0.985	0.989	0.971
Water mass flow.....(LB/HR)	3261	2950	4145
FO	1.141	1.154	1.151

3.2 Results of Particulate Determinations

Test No. 18
Line 1 Thermal Oil Heater Stack

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	03-21-96	03-21-96	03-21-96
Time run start/end.....(HRS)	1038/1145	1210/1312	1340/1445
Static pressure.....(IN.WC)	-0.12	-0.12	0.00
Cross sectional area (SQ.FT)	14.75	14.75	14.75
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	88.0	79.0	118.0
desiccant.....(GRAMS)	11.0	11.0	12.0
total.....(GRAMS)	99.0	90.0	130.0
Total particulate material..			
.....collected(grams)	0.0342	0.0566	0.0416
Gas meter coefficient.....	1.0023	1.0023	1.0023
Barometric pressure..(IN.HG)	29.26	29.26	29.26
Avg. orif.pres.drop..(IN.WC)	1.75	2.08	2.04
Avg. gas meter temp..(DEF-F)	58.0	65.5	67.6
Volume through gas meter....			
at meter conditions...(CF)	43.72	47.96	47.72
standard conditions.(DSCF)	43.86	47.46	47.03
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.432	.432	.432
Avg.stack gas temp ..(DEG-F)	306	310	308
Volumetric flow rate.....			
actual.....(ACFM)	17922	19125	19072
dry standard.....(DSCFM)	10922	11762	11338
Isokinetic variation.....(%)	97.0	97.5	100.2
Particulate concentration...			
actual.....(GR/ACF)	0.00733	0.01131	0.00811
dry standard.....(GR/DSCF)	0.01203	0.01840	0.01365
Particle mass rate...(LB/HR)	1.126	1.855	1.33 1.48
F-factor .....(DSCF/MMBTU)	9140	9140	9140
Emission factor...(LB/MMBTU)	0.041	0.067	0.061 .0563

4 RESULTS OF FUEL ANALYSIS

INTERPOLL LABORATORIES, INC.
Fuel Laboratory
(612) 786-6020

Date:	3/28/96
Client:	LOUISIANA-PACIFIC, HAYWARD
Laboratory Log Number:	7451-64-9999
Sample Collected:	3/21/96
Sample Received:	3/22/96
Source:	LINE 1 KONUS
Sample Identification:	TEST 18, WOOD

Proximate and Ultimate Analysis WT %

Proximate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			43.45
Ash		3.16	1.79
Volatile Matter	81.07	78.51	44.40
Fixed Carbon (calculation)	18.93	18.33	10.37
Sulfur	0.02	0.02	0.01
Heating Value, BTU/LB.	8434	8168	4619

Ultimate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			43.45
Ash		3.16	1.79
Carbon	51.54	49.91	28.23
Hydrogen	4.99	4.84	2.74
Nitrogen	0.06	0.06	0.03
Oxygen (calculated)	43.39	42.02	23.76
Sulfur	0.02	0.02	0.01

Respectfully submitted,

David J. Schneider

David J. Schneider, Manager
Chemistry Department

9141

APPENDIX A

PRELIMINARY VOLUMETRIC FLOW RATE DETERMINATION

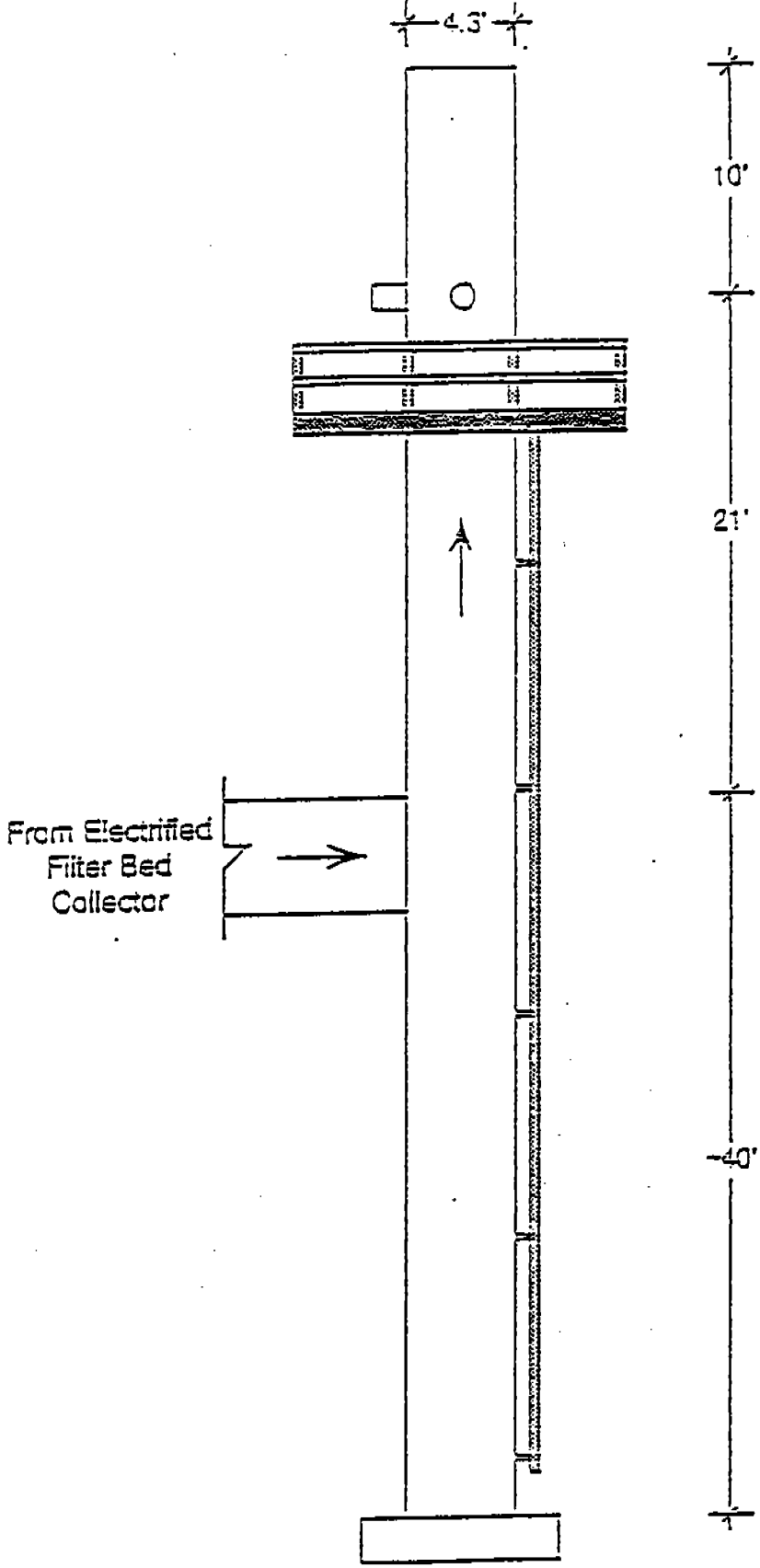
Test No. 18
Line 1 Thermal Oil Heater Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	03-21-96
Time of Determination.....(HRS)	800
Barometric pressure.....(IN.HG)	29.26
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	20
Shape of duct.....	Round
Stack diameter.....(IN)	52
Duct area.....(SQ.FT)	14.75
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.115
Avg. gas temp.....(DEG-F)	288
Moisture content.....(% V/V)	10.78
Avg. linear velocity.....(FT/SEC)	19.8
Gas density.....(LB/ACF)	.05088
Molecular weight.....(LB/LBMOLE)	29.65
Mass flow of gas.....(LB/HR)	53358
Volumetric flow rate.....	
actual.....(ACFM)	17478
dry standard.....(DSCFM)	10761

APPENDIX B

LOCATION OF TEST PORTS



HAYWARD, WI
DRAWING 10
LINE 1
THERMAL OIL HEATER
STACK
ELEVATION

APPENDIX C

FIELD DATA SHEETS

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: LP HAWARD
Source: LINE 1 THERMO OIL HEATER STACK
Test: 1B Run Date: 3-21-96
Stack Dimen.: ⌀ 52 IN.
Dry Bulb: °F Wet bulb: °F
Manometer: ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 29.26 IN.HG
Static Pressure: -.115 IN.WC
Operators: S. BAINVILLE, J. Lorenz
Pitot No.: V235 C_p: .84

Drawing of Test Site

Cross-section View	Elevation View

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas
		Port Length: 6.5 IN.		Time Start: 800	HRS
A 1		1.35	7.85	.06	
2		4.26	10.76	.07	
3		7.59	14.09	.075	
4		11.75	18.25	.09	
5		17.79	24.25	.095	
6		34.22	40.71	.105	
7		40.24	46.74	.11	
8		44.4	50.90	.1	
9		47.74	54.24	.105	
10		50.64	57.14	.08	
B 1				.07	
2				.09	
3				.1	
4				.11	
5				.11	
6				.09	
7				.07	
8				.065	
9				.06	
10				.055	
Temp. Meas. Device & S/N:				Time End:	HRS

R or nothing = reg. manometer; S = expanded; E = electronic

460.4
454.3

032594-G:\STACK\WP\FORMS\S-392.1

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job CP/HAYWARD
Source THE No.1 KOMUS STACK
Method 5 Filter holder: 4" GLASS

Date 3-21-96 Test 18 Run 1
No. of traverse points 20
Filter type: GLASS FIBER

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: .00 cfm at 6 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used: 7989

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: S. BATEMAN

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	594	496	98
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1425	1418	7
Total			105

Integrated Gas Sampling Data:

Bag Pump No. 27B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 850
Sampling rate: 400

Box No. 28 Bag No. 1
Size: 44 L
cc/min at 400 IN.HG
(HRS) Time end: 955 (HRS)
cc/min Operator: JB

S/N of O_2 Analyzer used to monitor train outlet: —

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INTERPOLL LABORATORIES, INC.
(612) 5-6020

EPA Method 5 Field Data Sheet

Job: EP/HAYWARD
Source: LINE NO. 1 KOHLS STACK
Date: 3-21-96 Test 18 Run 1

Operators: JB/JL
Meter Box No. 13 ΔH@ 1.82 in.WC
Gasmeter Coeff. 1.0023

Nozzle No. 5-7
Nozzle Dia. .432 in.
Bar. Press. 29.26 in.Hg

Pitot No. 23V-5
C_p .840
H_2O 10 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	(9:50)	458.33			9.78	2	280	234	229	39	41	32	
1	3	459.89	.045	.86	1.43	2	280				45	34	
2	6	461.61	.050	1.03	3.71	3	283	241	235	37	49	34	
3	9	463.50	.055	1.48	5.45	3	285				50	36	
4	12	465.25	.055	1.13	7.56	4	287	237	245	39	52	37	
5	15	467.33	.080	1.65	9.91	5	289				55	39	
6	18	469.20	.100	2.06	2.39	5	290	236	260	40	57	38	
7	21	472.20	.110	2.27	4.76	5	291				56	38	
8	24	474.62	.100	2.07	6.98	4	291	243	271	38	55	41	
9	27	476.84	.090	1.74	9.01	4	280				58	40	
10	30	479.00	.080	1.50	0.97	3	286	247	272	41	57	43	
1	33	480.92	.075	1.41	2.86	3	286				60	44	
2	36	482.86	.070	1.31	4.94	4	290	245	270	40	60	44	
3	39	484.97	.085	1.59	7.25	5	293				61	45	
4	42	487.28	.105	1.95	9.51	4	295	243	271	41	60	45	
5	45	489.40	.100	1.86	1.52	4	297				61	46	
6	48	491.35	.080	1.48	3.55	4	293	246	274	41	60	46	
7	51	493.35	.060	1.49	5.50	4	299				59	46	
8	54	495.33	.075	1.39	7.32	3	297	244	271	42	59	46	
9	57	497.30	.065	1.20	9.21	4	296				59	47	
10	60	499.13	.07	1.30									
	(955)												
	0 - 60	V_m - 40.8		ΔH - 1.54							Avg. - 57.3		

C3

W-1

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP / HAYWARD
Source LINE NO.1 KOCHS STACK
Method 5 Filter holder: 4" glass

Date 3-21-96 Test 18 Run 2
No. of traverse points 20
Filter type: glass fiber

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: .00 cfm at 6 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used: 7997

Recovery solvent(s)
☑ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: R.R. / J.B. / J.L.

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	564	476	88
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1524	1517	11
Total			99

Integrated Gas Sampling Data:

Bag Pump No. 27B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1038
Sampling rate: 400

Box No. 28 Bag No. 2
Size: 44 L
cc/min at 22 IN.HG
(HRS) Time end: 1145 (HRS)
cc/min Operator: J.B.

S/N of O_2 Analyzer used to monitor train outlet: —

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TERRA LABORATORIES, Inc.
(612) [illegible]-6020

EPA Method 5 Field Data Sheet

Job LP/HAYWARD
Source UNIT NO. 1 KOCH STACK
Date 3-21-96 Test 18 Run 2

Operators J.B. / J.L
Meter Box No. 13 ΔH@ 1.82 in.WC
Gasmeter Coeff. 1.0023

Nozzle No. S-7
Nozzle Dia. .432 in.
Bar. Press. 29.26 in.Hg

Pitot No. 23V-5'
C_p .840
H_2O 12 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	1038	(499.67)			1.71	4	301	232	245	39	50	47	
B 1	3	501.80	.075	1.50	4.02	5	302				57	47	
2	6	504.05	.100	1.97	6.28	5	304	239	257	40	59	47	
3	9	506.35	.095	1.86	8.67	5	305				60	47	
4	12	508.63	.105	2.06	1.11	5	309	236	254	39	62	49	
5	15	511.08	.110	2.17	3.51	5	308				63	49	
6	18	513.40	.050	1.98	5.57	5	310	232	260	38	64	50	
7	21	515.70	.080	1.58	7.69	5	309				64	50	
8	24	517.80	.080	1.59	9.72	4	308	233	270	39	64	50	
9	27	519.80	.075	1.49	1.54	3	305				64	50	
10	30	521.59	.060	1.20	3.20	3	307	232	272	40	62	51	
A 1	33	523.18	.050	.99	4.95	3	299				63	51	
2	36	524.93	.055	1.10	6.77	3	303	228	269	39	64	52	
3	39	526.71	.060	1.20	8.88	4	306				64	52	
4	42	528.83	.080	1.60	1.17	5	306	231	270	39	65	52	
5	45	531.17	.095	1.90	3.52	5	305				65	52	
6	48	533.48	.100	2.00	6.19	6	309	234	270	38	65	52	
7	51	536.12	.130	2.56	8.65	6	307				65	53	
8	54	538.80	.11	2.19	1.12	6	305	232	268	40	67	54	
9	57	541.08	.11	2.19	3.42	5	303				67	55	
10	60	543.39	.095	1.91									
	(1145)												
	60 θ =	V_m = 43.72		1.75 ΔH =							Avg. = 58.0		

C-5

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP/HAYWARD
Date 3-21-96 Test 18 Run 3
Source LIME Kiln Kilns STACK
No. of traverse points 20
Method 5 Filter holder: 4" glass
Filter type: glass fibre

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☑
Post test: .00 cfm at 5 IN. HG (vac) ☑

Particulate Catch Data:

No. of filters used: 7986

Recovery solvent(s)

☑acetone
☐other(s)

No. of probe wash bottles: 1
Sample recovered by: R.R. / J.B. / J.L.

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	565	486	79
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1436	1425	11
Total			90

Integrated Gas Sampling Data:

Bag Pump No. 273
Box No. 28 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar
Size: 44 L
Pretest leak check: 0
cc/min at 22 IN.HG
Time start: 1210
(HRS) Time end: 1315 (HRS)
Sampling rate: 400
cc/min Operator: JJB

S/N of O_2 Analyzer used to monitor train outlet: —

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INTERPOL LABORATORIES, INC.
(612) 476-6020

EPA Method 5 Field Data Sheet

Job LP/HAYWARD
Source LINE 4 & 5 KOMUS STACK
Date 3-21-96 Test 18 Run 3

Operators JB./R.P.
Meter Box No. 13 ΔH@ 1.82 in.WC
Gasmeter Coeff. 1.0023

Nozzle No. 5-7
Nozzle Dia. .432 in.
Bar. Press. 29.26 in.Hg

Pitot No. 23V-5
C_p .840
H_2O 12 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	(12:10)	(543.63)									63	58	
A 1	3	545.67	.065	1.35	5.56	B	305						
2	6	547.66	.07	1.45	7.57	4	308	220	245	39	68	57	
3	9	549.81	.08	1.67	9.73	4	307				69	58	
4	12	551.96	.08	1.67	1.89	4	309	231	252	39	70	58	
5	15	554.25	.100	2.08	4.30	5	310				70	58	
6	18	556.97	.130	2.70	7.05	6	310	235	257	40	69	58	
7	21	559.75	.128	2.66	9.77	6	311				69	58	
8	24	562.37	.122	2.53	2.43	6	312	236	264	39	71	59	
9	27	564.85	.105	2.18	4.90	5	312				71	59	
10	30	567.26	.094	1.98	7.26	5	304	234	263	41	72	61	
B 1	33	569.71	.097	2.05	9.65	5	304				68	61	
2	36	572.32	.114	2.38	2.23	5	309	234	258	40	70	61	
3	39	574.93	.120	2.51	4.88	6	309				72	62	
4	42	577.58	.125	2.60	7.59	6	314	239	268	40	72	62	
5	45	580.22	.115	2.39	0.18	6	315				73	62	
6	48	582.86	.120	2.50	2.83	6	314	234	270	41	73	63	
7	51	585.42	.106	2.20	5.32	5	317				74	63	
8	54	587.60	.088	1.83	7.60	4	317	234	271	41	74	63	
9	57	589.50	.060	1.26	9.48	3	313				73	63	
10	60	591.54	.075	1.58	1.59	3	309	237	269	40	74	64	
	(1312)												
	θ = 60	V_m = 47.96		ΔH = 2.08							Avg. = 65.5		

C-7

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Interpoll Laboratories EPA Method 5/17 Sample Log Sheet

Job LP MAYWOOD
Source LIFT KNOCK STACK
Method 5 Filter holder: GLASS

Date 3-21-96 Test 18 Run 4
No. of traverse points 20
Filter type: GLASS

Sample Train Leak Check:
Pretest: ≤ 0.02 cfm at 15 IN.HG (vac) ☒
Post test: 0 cfm at 7 IN. HG (vac) ☒

Particulate Catch Data:
No. of filters used: 7987

Recovery solvent(s)
☒ Acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: S. BARBULE / KR/SL

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1	618	500	118
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1540	1528	12
Total			+130 SAB 3/28/96

Integrated Gas Sampling Data:

Bag Pump No. 27B
Bag Material: 5-layer Aluminized Tedlar
Pretest leak check: 0
Time start: 1340
Sampling rate: 400

Box No. 28 Bag No. 3
Size: 44 L
cc/min at 22 IN.HG
(HRS) Time end: 1445 (HRS)
cc/min Operator: SD

S/N of O_2 Analyzer used to monitor train outlet: —

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...ERP... LAB. ATC..., INC.
(612) ... 6020

EPA Method 5 Field Data Sheet

Job LAPMAYWOOD
Source LF-C No 1 CONCUSTACK
Date 3-21-96 Test 1B Run 4

[redacted] SBATAVILLE S.L
[redacted] ΔH@ 1.82 in.WC
[redacted] 1.0023

Nozzle No. S-7
Nozzle Dia. .432 in.
Bar. Press. 29.26 in.Hg

Pitot No. 230-S1
C_p .840
H_2O 10 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head	Orifice [redacted] (in.WC)	Des. Vac. (cfm)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
[redacted]	(1340)	(592.00)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
B 1	3	594.50	.105	2.21	4.48	5	304	233	245	37	62	60	
2	6	596.80	.090	1.87	6.77	4	306				64	60	
3	9	599.40	.100	2.20	9.31	5	307	235	250	37	65	60	
4	12	601.57	.120	2.48	1.94	5	308				67	59	
5	15	604.50	.120	2.49	4.57	4	310	234	247	39	69	60	
6	18	607.10	.120	2.49	7.21	5	312				70	60	
7	21	609.70	.110	2.29	9.75	5	312	246	256	38	71	60	
8	24	612.00	.095	1.98	2.10	5	311				71	61	
9	27	614.36	.090	1.88	4.40	4	310	249	259	39	72	61	
10	30	616.48	.075	1.57	6.51	4	308				72	61	
A 1	33	618.30	.055	1.15	8.31	3	308	256	259	38	70	62	
2	36	620.30	.075	1.59	0.43	4	299	~~252~~	~~256~~		72	62	
3	39	622.45	.075	1.54	2.55	4	301	250	261	39	73	63	
4	42	624.90	.100	2.10	4.98	5	308				74	63	
5	45	627.41	.100	2.10	7.41	5	310	245	269	40	74	63	
6	48	629.83	.110	2.31	9.96	6	311				74	63	
7	51	632.40	.110	2.30	2.51	6	312	240	271	40	74	64	
8	54	635.00	.105	2.20	5.00	6	313				74	63	
9	57	637.46	.100	2.10	7.44	6	310	243	269	41	74	64	
10	60	639.72	.09	1.91	9.76	5	304				74	64	
	(1445)												
[redacted]	0 - 60	V_m - 47.72	[redacted]	2.04 ΔH -	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	Avg. - 67.6		[redacted]

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APPENDIX D

INTERPOLL LABORATORIES ANALYTICAL RESULTS

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 3 Data Reporting Sheet - Orsat Analysis

Job: 4P/HAYWARD
Team Leader: TB
ate Submitted:
Test No.: 18
Date of Analysis:

Source: Unit 1 Kodiak
Test Site: Stack
Date of Test: 3-21-96
No. of Runs Completed: 3
Technician: ET

Test/ Run	Sample Log No. and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
18-1	7451-61	1	0	7.1	14.9	7.1	12.8	
		2	0	7.1	19.9	7.1	12.8	
	☒B☐F	Avg				7.1	12.8	
18-2	62	1	0	6.5	19.9	6.5	13.4	
		2	0	6.5	19.9	6.5	13.4	
	☒B☐F	Avg				6.5	13.4	
18-3	63	1	0	5.3	20.1	5.3	14.8	
		2	0	5.3	20.1	5.3	14.8	
	☒B☐F	Avg				5.3	14.8	
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						

☒ Ambient Air QA Check
☒ Orsat Analyzer System Leak Check
☒ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F = Flask (250 cc all glass)

B = Tedlar Bag (5 layer)

EPA Method 3 Guidelines

Fuel Type	FO Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Impinger Catch Data Reporting Sheet

Protocol: ☐Minnesota ☒Wisconsin ☐Iowa ☐EPA Method 202 ☐Other

Job: LP / Hayward
Date Submitted: 3-22-96
Date of Analysis: 3-27-96
Source/Site: Line No. 1 Konus / Stack
Test No.: 18
Technician: B.O.

	Solvent Phase	Aqueous Phase
Test: 18 Run: 1	Dish No: 58	Dish No: 703
Log No: 7451-57I	Dish + Sample Wt: 40.7126 g	Dish + Sample Wt: 46.8705 g
Color & Appearance:	Dish Tare Wt: 40.7126 g	Dish Tare Wt: 46.8704 g
	Fraction Wt: 0.0000 g	Fraction Wt: 0.0001 g
Comments:	Smpl Vol: 200 ml, Alqt: 200 ml, Factor: 1.000	Smpl Vol: 200 ml, Alqt: 100 ml, Factor: 2.000
	Sample Wt: 0.0000 g	Sample Wt: 0.0002 g
Test: 18 Run: 2	Dish No: 62	Dish No: 714
Log No: -58I	Dish + Sample Wt: 50.8913 g	Dish + Sample Wt: 48.6346 g
Color & Appearance:	Dish Tare Wt: 50.8883 g	Dish Tare Wt: 48.6341 g
	Fraction Wt: 0.0030 g	Fraction Wt: 0.0005 g
Comments:	Smpl Vol: 290 ml, Alqt: 290 ml, Factor 1.000	Smpl Vol: 290 ml, Alqt: 100 ml, Factor 2.900
	Sample Wt: 0.0030 g	Sample Wt: 0.0015 g
Test: 18 Run: 3	Dish No: 65	Dish No: 718
Log No: -59I	Dish + Sample Wt: 44.6607 g	Dish + Sample Wt: 41.3981 g
Color & Appearance:	Dish Tare Wt: 44.6570 g	Dish Tare Wt: 41.3909 g
	Fraction Wt: 0.0037 g	Fraction Wt: 0.0072 g
Comments:	Smpl Vol: 320 ml, Alqt: 320 ml, Factor 1.000	Smpl Vol: 320 ml, Alqt: 100 ml, Factor 3.200
	Sample Wt: 0.0037 g	Sample Wt: 0.0230 g
Test: 18 Run: 4	Dish No: 68	Dish No: 728
Log No: -60I	Dish + Sample Wt: 43.1614 g	Dish + Sample Wt: 42.9810 g
Color & Appearance:	Dish Tare Wt: 43.1548 g	Dish Tare Wt: 42.9805 g
	Fraction Wt: 0.0066 g	Fraction Wt: 0.0005 g
Comments:	Smpl Vol: 310 ml, Alqt: 310 ml, Factor 1.000	Smpl Vol: 310 ml, Alqt: 100 ml, Factor 3.100
	Sample Wt: 0.0066 g	Sample Wt: 0.0016 g

Note: Factor = Sample Volume/Aliquot Volume

Blank Solvent Wt. 0.0000 g

	RUN 1	RUN 2	RUN 3	RUN 4
Results of Solvent Phase g	0.0000	0.0030	0.0037	0.0066
Results of Aqueous Phase g	0.0000	0.0013	0.0228	0.0014

D-2

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Solvent Rinse Data Reporting Sheet

☒ EPA Method 5 Probe Wash ☐ EPA Method 29 Probe Wash ☐ EPA Method 202 Cup & Tube Wash

Job: LP HAYWARD
Date Submitted:
Date of Analysis: 4-4-96
Source/Site: LINE 1 KONUS STACK
Test No.: 18
Technician: SCB

Transport Leakage ☐ None ☒ _____ ml
Solvent: _____

Test: 18	Run: 0	Dish No: 23	
Log No: 7451-56P		Dish + Sample Wt: 46.0848	g
Volume of Solvent	120 ml	Dish Tare Wt: 46.0847	g
*Solvent Residue	ug/ml	Sample Wt: .0001	g
Test: 18	Run: 1	Dish No: 882	
Vol. of Solvent	130 ml	Dish + Sample Wt: 38.1192	g
Log Number -57P		Dish Tare Wt: 38.0970	g
Comments		Sample Wt: .0212	g
Test: 18	Run: 2	Dish No: 849	
Vol. of Solvent	150 ml	Dish + Sample Wt: 46.5371	g
Log Number -58P		Dish Tare Wt: 46.5298	g
Comments		Sample Wt: .0073	g
Test: 18	Run: 3	Dish No: 93	
Vol. of Solvent	160 ml	Dish + Sample Wt: 53.9928	g
Log Number -59P		Dish Tare Wt: 53.9832	g
Comments		Sample Wt: .0096	g

*Solvent Residue _____ ug/ml = [(Sample Wt. _____ g) (10^6)]/Vol. of Sol. _____ ml

EPA-M5 Acetone Residue Blank Spec. ≤ 7.8 ug/ml

√SLV

	RUN 0	RUN 1	RUN 2	RUN 3
Results of Solvent Rinse g	.0001	.0211 D-3	.0072	.0095

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Solvent Rinse Data Reporting Sheet

☒ EPA Method 5 Probe Wash ☐ EPA Method 29 Probe Wash ☐ EPA Method 202 Cup & Tube Wash

Job: LP/Hayward
Date Submitted:
Date of Analysis: 4-4-96
Source/Site: LINE 1 KONUS STACK
Test No.: 18
Technician: SCB

Transport Leakage☐ None☒ _____ ml Solvent: _____

Test: 18	Run: 4	Dish No: 622	
Log No: 7451-607		Dish + Sample Wt: 48.8508	g
Volume of Solvent	165 ml	Dish Tare Wt: 48.8492	g
*Solvent Residue	ug/ml	Sample Wt: .0016	g
Test:	Run:	Dish No:	
Vol. of Solvent	ml	Dish + Sample Wt:	g
Log Number		Dish Tare Wt:	g
Comments		Sample Wt:	g
Test:	Run:	Dish No:	
Vol. of Solvent	ml	Dish + Sample Wt:	g
Log Number		Dish Tare Wt:	g
Comments		Sample Wt:	g
Test:	Run:	Dish No:	
Vol. of Solvent		Dish + Sample Wt:	g
Log Number		Dish Tare Wt:	g
Comments		Sample Wt:	g

*Solvent Residue_____ug/ml = [(Sample Wt._____g) (10^6)]/Vol. of Sol. _____ml

EPA-M5 Acetone Residue Blank Spec. ≤ 7.8 ug/ml

✓SV	RUN 4	RUN	RUN	RUN
Results of Solvent Rinse g	0.0015	D-4		

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Filter Gravimetrics Reporting Sheet

Fiter Type: ☒ EPA Method 5 ☐ EPA Method 29 ☐ EPA Method 202 ☐ Other_____

Job: LP/HAYWARD
Date Submitted:
Date of Analysis: 4-8-6

Source/Site: LINE 1 KONUS STACK
Test No.: 18
Technician: SCB

Test: 1D	Run: 0	Filter No: 2588	
Field Blank:		Filter Type: 4" G.F.	
Log No: 7451-56F		Filter + Sample Wt: .9561	g
Color: WHITE		Filter Tare Wt: .8561	g
		Sample Wt: .0000	g
Test: 1D	Run: 1	Filter No: 7989	
Log No: -57F		Filter Type: 4" G.F.	
Color: LIGHT TAN		Filter + Sample Wt: .8694	g
		Filter Tare Wt: .8463	g
		Sample Wt: .0231	g
Test: 18	Run: 2	Filter No: 7977	
Log No: -58F		Filter Type: 4" G.F.	
Color: LIGHT TAN		Filter + Sample Wt: .9824	g
		Filter Tare Wt: .9597	g
		Sample Wt: .0227	g
Test: 18	Run: 3	Filter No: 7986	
Log No: -59F		Filter Type: 4" G.F.	
Color: LIGHT TAN		Filter + Sample Wt: .9771	g
		Filter Tare Wt: .8565	g
		Sample Wt: .0206	g

√gw

	RUN 0	RUN 1	RUN 2	RUN 3
Results of Filter Analysis g	.0000	.0231	.0227	.0206

	RUN	RUN	RUN	RUN
Total Mass g				

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Filter Gravimetrics Reporting Sheet

Fiter Type: ☒ EPA Method 5 ☐ EPA Method 29 ☐ EPA Method 202 ☐ Other_____

Job: LP / Hayward
Date Submitted:
Date of Analysis: 4-3-90

Source/Site: Zone No. 1 Ronus Stack
Test No.: 18
Technician: SLT

Test: 18 Run: 4	Filter No: 7987
Field Blank:	Filter Type: 4" G.F.
Log No: 7951-60F	Filter + Sample Wt: .8761 g
Color: Grey	Filter Tare Wt: .8440 g
	Sample Wt: .0321 g
Test: Run:	Filter No:
Log No:	Filter Type:
Color:	Filter + Sample Wt: g
	Filter Tare Wt: g
	Sample Wt: g
Test: Run:	Filter No:
Log No:	Filter Type:
Color:	Filter + Sample Wt: g
	Filter Tare Wt: g
	Sample Wt: g
Test: Run:	Filter No:
Log No:	Filter Type:
Color:	Filter + Sample Wt: g
	Filter Tare Wt: g
	Sample Wt: g

VgV

	RUN 4	RUN	RUN	RUN
Results of Filter Analysis g	.0321			

	RUN	RUN	RUN	RUN
Total Mass g				

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job LP/HAYWARD Source LINE No. 1 KOMLS Site STACK Log No. 7451
Field Engineer J. BAZNVILLE Date of Test 3-21-96 Test No. 18 No. of Runs 4

No. Items	Sample Type		Analysis		Sequence No.	Comments
	Probe Wash: ☒ Acetone ☐ $MeCl_2$	☐ DI Water ☐ _____	☒ EPA M-5 ☐ EPA M-29	☐ EPA M-201A ☒ _____		
	Filter: ☒ 4" Glass ☐ SS Thimble	☐ Pallflex ☐ 2.5" Glass	☐ EPA M-5 ☐ EPA M-29 ☐ EPA M-201A	☐ EPA M-17		
	Impingers: ☒ DI Water ☐ 3% H_2O_2 ☐ 1N NaOH ☐ 2,4-DNPH	☐ H_2SO_4 ☐ HNO_3/H_2O_2 ☐ $KMnO_4/H_2SO_4$ ☒ ACETONE RINSE	☐ MN Protocol ☒ WI Protocol ☐ EPA M-202 ☐ EPA M6,8 ☐ Acid Gases	☐ IA Protocol ☐ Formaldehyde ☐ EPA M-29 ☐ EPA M-26 ☐ _____		
	Integrated Gas: ☒ Tedlar Bag	☐ _____	☐ EPA M-3 ☐ _____	☐ EPA M-10		
—	**Oxides of Nitrogen:**		☐ EPA M-7A ☐ _____			
	Fuel Lab: ☒ Fuel Sample	☐ Aggregate	☐ Per S-0163			
—	**Particle Sizing:**		☐ X-Ray Sdgraph ☐ _____	☐ Cascade Imp		
—	**Miscellaneous:**	☐ _____	☐ _____			

Fuel Type:
Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite
Wood: ☒ Wood Waste ☐ Dust ☐ Bark
Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6
Misc: ☐ Natural Gas ☐ RDF ☐ _____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
James Baznville INTERPOLL LABS	Interpoll	3/22/96 1115

APPENDIX E

OPERATIONAL DATA

HAYWARD LINE 1 THERMAL OIL (REVISED)

CONTENTS PAGE

TEST SCHEDULES 1
LINE 2 THERMAL OIL , DRYER & PRESS DATA SUMMARY 2

LINE 1 THERMAL OIL HEATER MARCH 21, 1996 PM

PRODUCTION/SUMMARY 3
PRESS REPORT 4
PRESS CHARTS 5
KONUS DATA SHEETS 6-8
PRESS RTO CHART 9
BOARD WEIGHTS/THICKNESSES 10

HAYWARD TESTING MARCH 21st, 1996
Test schedule

Line 1 Thermal Oil Stack

	POLLUTAN	RUN #1	RUN #2	RUN #3
3-21	PM	850-955	1038-1145	1210-1312

HAYWARD LINE 1 TESTING MARCH 21, 1996
Line 1 process data summary

LINE 1 THERMAL OIL HEATER MARCH 21, 1996 - PM

18.73 =Production rate in Tons per hour
0.58 =K3 estimated Tons per hour of fuel burned based on fuel measurement
10.41 =K3 estimated mmBTU per hour input based on fuel measurement
0.88 =K4 estimated Tons per hour of fuel burned based on fuel measurement
15.77 =K4 estimated mmBTU per hour input based on fuel measurement
1.45 =Total tons of dry bark per hour input
26.18 =Total mmBTU per hour input

2

HAYWARD LINE 1 MARCH 21, 1996
THERMAL OIL STACK - PM

DATA TIME	START=	08:45	END=	08:55	HOURS=	0.17
	START=	09:10	END=	13:15	HOURS=	4.08
					TOTAL=	4.25

BOARD WEIGHTS - LBS
average weights determined by taking bundle weights divided by peices per unit over the testing period.

7/16"
per/peice 48.77
per/ 8' x 16' 195.07

PLANT PRODUCTION RATE

4.25 =hours during testing
68 =pressloads
816 =no. of 8'x16' boards produced (pressloads x 8 boards per load)
159,179 =lbs of finished product (boards produced x weight of finished board)
37,454 =lbs of finished product per hour (lbs of finshed product / hours)
18.73 =tons of finished product per hour (lbs of finshed product per hour / 2000 lb)

FUEL BURNING RATE ESTIMATED BY BARK INPUT

K1
13.89 =K1 fuel calibration in pounds per count
589 =K1 counts during testing hours
8,181 =K1 lbs of wet fuel burned during testing
4.25 =hours during testing
39.90% =average moisture content of fuel
4,917 =total pounds of dry fuel burned during testing (wet pounds x (1- moisture content))
1,156.92 =lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
0.58 =tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
9,000 =estimated BTU content per pound of dry fuel,
10.41 =estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)

K2
13.89 =K2 fuel calibration in pounds per count
892 =K2 counts during testing hours
12,390 =K2 lbs of wet fuel burned during testing
4.25 =hours during testing
39.90% =average moisture content of fuel
7,446 =total pounds of dry fuel burned during testing (wet pounds x (1- moisture content))
1,752.07 =lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
0.88 =tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
9,000 =estimated BTU content per pound of dry fuel,
15.77 =estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)

FUEL BURNING RATE ESTIMATED TEMPERATURE DIFFERENTIAL

K1
454.40 =average incoming oil temperature on degrees f.
481.30 =average outgoinging oil temperature on degrees f.
60 =temperature differential at 100% capacity in degrees f
26.9 =actual temperature differential
19.4 =maximum mmbtu input at 100% capacity
8.70 =estimated mmbtu input per hour (actual temp. diff. / max temp. diff.) x max mmbtu input
9,000 =estimated BTU content per pound of dry fuel,
0.48 =estimated tons of dry fuel burned per hour during testing (btu input / btu content of dry fuel/2000)

K2
428.30 =average incoming oil temperature on degrees f.
471.40 =average outgoinging oil temperature on degrees f.
60 =temperature differential at 100% capacity in degrees f
43.1 =actual temperature differential
19.4 =maximum mmbtu input at 100% capacity
13.94 =estimated mmbtu input per hour (actual temp. diff. / max temp. diff.) x max mmbtu input
9,000 =estimated BTU content per pound of dry fuel,
0.77 =estimated tons of dry fuel burned per hour during testing (btu input / btu content of dry fuel/2000)

PRESS REPORT - LINE (1) 2 DATE: 2.17.06.

OPERATOR MEYERS SHIFT: 4TH CREW: C

THICKNESS 7/16 PRESS LDS: 196 7/16

OVERALL TIMER: 157 DECOMPRESSION TIME: 14-1

PRESS TEMP: 215 TOTAL REJECTS: —

LOG COUNT: 1435

LINE SPEED	THKNS.	FROM	TO
55	7/16	700	923
58	7/16	923	210
59	7/16	2110	700

S-89
C 23

F.C.O.S. HYD. RADIATOR: 10:00 TIME

PRESS BLOWN DOWN: 9:30

SPINNER HEADS FLUSHED: — TIME

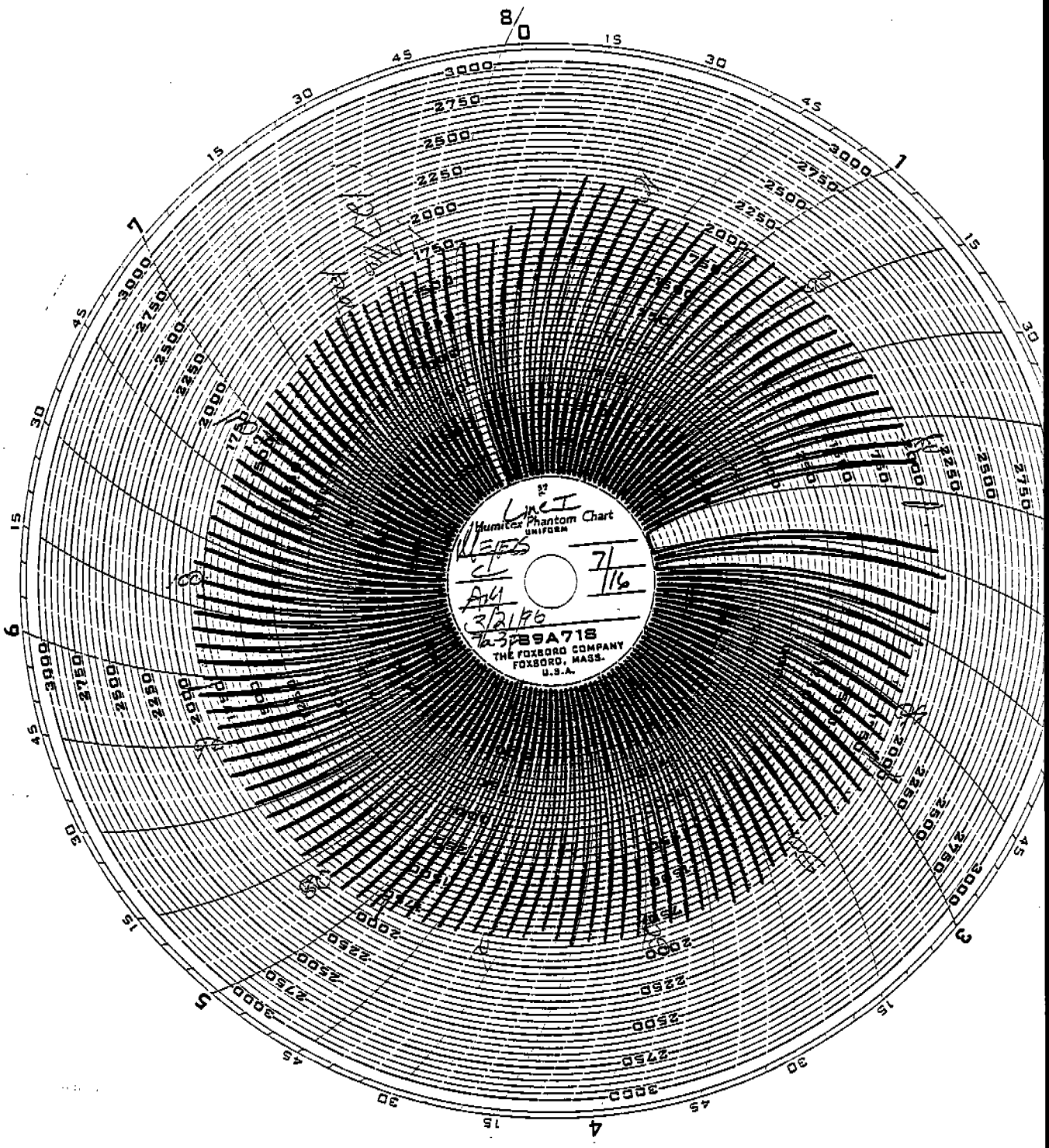
SURFACE BLENDER HOSED: — TIME

FORMER HYD RADIATOR: — TIME
L S C

DOWNTIME FROM	DOWNTIME TO	DOWNTIME (MINS) M	E	O	KEY	REASONS FOR DOWNTIME
—	—	—				Replaced torn screen.
900	918		18			Fuse blown for Loader Boom Brake
						Kept tripping out Loader Boom

DOWNTIME CODE: M - MECHANICAL E - ELECTRICAL (18) O - OPERATOR

LINE I
PRESS CHART
3/21/96
0700 - 1500



KONUS DATA READINGS EVERY 10 MINUTES / BY Pat m DATE 3-21-96 PAGE 1 OF 1

PLANT Hayward L.P

TIME	K1 OIL IN TEMP	K1 OIL OUT TEMP	K1 I.D. FAN W.C	K2 OIL IN TEMP	K2 OIL OUT TEMP	K2 I.D. FAN W.C	K3 OIL IN TEMP	K3 OIL OUT TEMP	K3 I.D. FAN W.C	K4 OIL IN TEMP	K4 OIL OUT TEMP	K4 I.D. FAN W.C	FUEL COUNT K1	FUEL COUNT K2	FUEL COUNT K3	FUEL COUNT K4	ONCE/HR BARK MOISTURE
8:30	234	253	-0.4	219	233	-3							333	412			40.1
8:45	233	251	-0.4	219	241	-2.6							560	472			39.6
9:00	235	254	-0.3	221	247	-2.2							418	514			39.8
9:15	239	256	-0.4	219	253	-2.0							457	561			40.5
9:30	239	258	-0.4	225	250	-2.4							490	605			39.3
9:45	232	250	-0.4	219	245	-2.2							528	661			40.2
10:00	232	244	-0.4	219	244	-2.4							556	702			40.3
10:15	232	246	-0.4	219	240	-2.4							593	757			39.6
10:30	232	244	-0.4	216	238	-2.4							629	816			
10:45	233	256	-0.4	220	242	-2.2							672	873			
11:00	236	256	-0.4	223	249	-2.4							717	929			
11:15	240	257	-0.4	227	248	-2.4							770	997			
11:30	235	254	-0.4	220	239	-2.6							819	1059			
11:45	236	253	-0.4	221	244	-2.4							864	1106			
12:00	237	256	-0.4	224	251	-2.2							911	1145			
12:15	235	247	-0.4	221	246	-2.2							953	1184			
12:30	232	241	-0.4	217	237	-2.4							1004	1221			
12:45	233	241	-0.5	218	242	-2.4							1050	1278			
1:00	234	240	-0.5	218	241	-2.4							1105	1325			
1:15	231	241	-0.5	216	237	-2.6							1149	1364			
1:30	234	252	-0.4	220	243	-2.4							1201	1422			
1:45	234	254	-0.4	220	244	-2.4							1251	1475			
2:00	238	256	-0.4	225	246	-2.2							1291	1524			
2:15	235	255	-0.5	225	249	-2.2							1335	1586			
2:30	241	256	-0.4	229	251	-2.2							1374	1631			
2:45	234	250	-0.5	221	250	-1.6							1416	1685			
3:00	234	253	-0.4	220	248	-2.2							1458	1729			

E-7

6

Konus EFB Readings

Plant Hayward L.P.

date 3-21-96

by Pat M

readings every 10 minutes

time	K1 and K2						K3 and K4					
	Bed Volt	Bed Current	Ion Volt	Ion Current	EFB Press.	Baghouse Press.	Bed Volt	Bed Current	Ion Volt	Ion Current	EFB Press.	Baghouse Press.
8:30	11.5	1.4	30	3.8	0.8	3.5						
8:45	4.5	1.4	28	3.8	1.6	2.5						
9:00	12.0	1.6	28	3.6	2.0	2.0						
9:15	12.0	1.4	28	3.4	2.2	2.5						
9:30	12.0	1.4	28	3.6	2.2	2.5						
9:45	12.0	1.6	28	3.6	2.4	2.0						
10:00	12.0	1.6	29	3.6	2.6	2.0						
10:15	12.0	1.6	28	3.6	2.6	2.0						
10:30	12.0	1.6	28	3.8	2.6	2.0						
10:45	11.5	1.6	28	3.8	2.0	2.5						
11:00	11.5	1.8	27	4.0	1.8	2.0						
11:15	11.5	2.0	27	4.0	1.8	2.5						
11:30	11.5	2.0	27	3.6	1.8	2.0						
11:45	10.0	1.8	27	4.0	2.0	2.5						
12:00	11.5	2.0	28	3.4	2.2	2.5						
12:15	11.5	2.0	27	3.4	2.0	2.5						
12:30	11.5	1.8	27	3.6	2.4	2.0						
12:45	11.5	1.8	27	3.6	2.6	2.0						
1:00	9.0	1.6	27	3.8	2.4	2.5						
1:15	11.5	1.6	27	3.8	2.2	2.5						
1:30	11.5	1.8	28	3.6	2.0	2.5						
1:45	9.5	2.2	29	3.8	2.0	2.5						
2:00	11.5	2.0	29	3.8	2.0	2.0						
2:15	11.6	2.0	28	3.6	2.2	2.5						
2:30	11.0	2.0	29	3.6	2.0	2.0						
2:45	11.0	2.2	28	3.8	2.0	2.5						
3:00	11.0	2.0	28	3.8	2.0	2.5						

SHIFT: (1) OR II
LINES 1 & 2

K-1 - K-2

	7	8	9	10	11	12	1	2	3	4	5	6
Bed Voltage (KV)	13	12.5	12	12	11.5	11.5	11.5	11.5	10	11	11	11
Bed Amperage (MA)	.08	.10	.14	.15	.17	.20	.14	.18	.20	.21	.22	.22
Ionizer Voltage (KV)	27	28	28	27	29	29	28	29	28	28	28	26
Ionizer Amperage (MA)	3.0	3.2	3.6	3.8	3.9	3.4	3.6	3.8	4.0	3.6	3.0	3.4
EFB Pressure Drop (In.)	0	1.7	1.7	2.2	2.6	2.2	2.4	2.1	2.0	1.8	1.6	1.6
Inlet Temperature	378	395	404	411	416	418	403	411	418	419	420	419
Outlet Temperature	290	299	303	312	320	323	323	323	327	327	330	329
Rock Flow	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Condition Code*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

Rock Usage/Shift: _____

K-3 - K-4

	7	8	9	10	11	12	1	2	3	4	5	6
Bed Voltage (KV)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	7	7	7	7	7
Bed Amperage (MA)	.20	.20	.20	.18	.18	.18	.20	.20	.18	.18	.18	.17
Ionizer Voltage (KV)	21	21	21	21	20	20	21	21	21	21	21	21
Ionizer Amperage (MA)	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.2	2.0	2.0	2.1	2.2
EFB Pressure Drop (In.)	.04	.04	.05	.04	.04	.04	.05	.04	.04	.04	.04	.04
Inlet Temperature	499	475	484	449	439	439	443	435	449	453	448	480
Outlet Temperature	395	398	396	397	403	403	407	403	404	405	407	408
Rock Flow	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Condition Code*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

Rock Usage/Shift: _____

Baghouse Pressure Drop: (in.)		7	8	9	10	11	12	1	2	3	4	5	6
	L-I	2.4	2.3	2.5	2.4	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1
	L-II	4.8	4.8	4.8	4.7	4.7	4.7	4.4	4.4	4.6	4.4	4.4	4.6

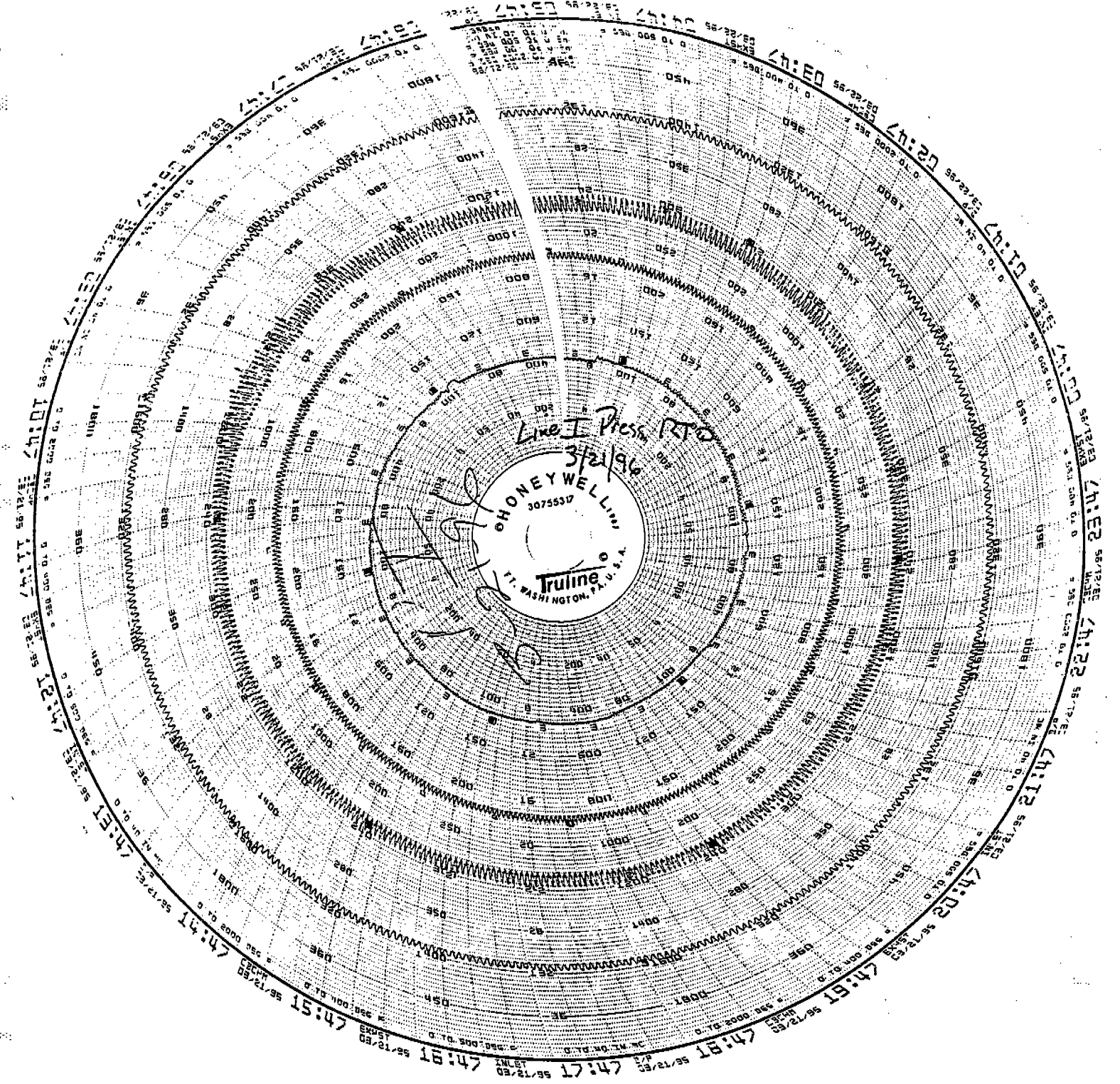
Comments/Problems: _____

*Condition Codes
1) Start up/shutdown
2) Konus down
3) Moisture in bed
4) Adding rock
5) Power Outage
6) Checking EFB
7) Konus on oil
8) Maintenance

VOLUME PER SHIFT

LINE I	1½
LINE II	1½

C:\EFB\FORMS\KNSRPT


Line I Press RTD
3/21/96
HONEYWELL
30755317
Truline
WASHINGTON, PA. U.S.A.

DATE: 3-21-96 - 1
SHIFT/CREW: ~~A~~ ~~B~~ C
OPERATOR: ARNOLD

3/21 1-3
26 1147/8

UNIT/ THICKNESS	WEIGHT	HEIGHT	UNIT/ THICKNESS	WEIGHT	HEIGHT
7/16	#4206	39 3/4	7/16	#4433	39 3/4
2	Called	39 3/4	57		39 5/8
3		40	58		39 5/8
4	#4208	39 5/8	59		39 5/8
5		40	60	#4376	39 5/8
6		40	61		39 5/8
7	Called	40	62		39 5/8
8	#4411	40 1/4	63		39 5/8
9		39 7/8	64	#4436	39 5/8
10		39 5/8	65		39 5/8
11		39 5/8	66		39 3/4
12	#4318	39 5/8	67		39 3/4
13		39 5/8	68	#4569	39 3/4
14		39 5/8	69		39 3/4
15		39 5/8	70		39 3/4
16	#4412	39 5/8	71		39 3/4
17		39 5/8	72	#4451	39 5/8
18		39 5/8	73		39 3/4
19		39 3/8	74		39 3/8
20	#4442	39 5/8	75		39 3/4
21		39 5/8	76	4360	39 1/2
22		39 1/2	77		39 3/4
23		39 5/8	78		39 1/2
24	#4430	39 5/8	79		39 3/4
25		39 3/8	80	4331	39 3/4
26		39 5/8	81		39 5/8
27		39 1/4	82		39 1/2
28	#4446	39 1/2	83		39 5/8
29		39 5/8	84	#4379	39 5/8
30		39 5/8	85		39 3/4
31		39 5/8	86		39 3/4
32	#4453	39 5/8	87	Called	40
33		39 3/4	88	4342	40
34		39 5/8	89		39 3/8
35		39 3/4	90		39 5/8

APPENDIX F

PROCEDURES

Particulate Loading and Emission Rates

The particulate emission rates were determined per EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1992). In this procedure a preliminary velocity profile of the gases in the flue is obtained by means of a temperature and velocity traverse. On the basis of these values, sampling nozzles of appropriate diameter are selected to allow isokinetic sampling, a necessary prerequisite for obtaining a representative sample.

The sampling train consists of a heated glass-lined sampling probe equipped with a Type S pitot and a thermocouple. The probe is attached to a sampling module which houses the all-glass in line filter holder in a temperature controlled oven. The sampling module also houses the impinger case and a Drierite filled column. The sampling module is connected by means of an umbilical cord to the control module. The control module houses the dry test gas meter, the calibrated orifice, a leakless pump, two inclined manometers, and all controls required for operating the sampling train.

Particulate samples are collected as follows: The sample gas is drawn through the sampling probe isokinetically and passed through a 4-inch diameter Gelman Type A/E glass fiber filter where particulates are removed. The sample gas is then passed through an ice-cooled impinger train and a desiccant-packed column which absorbs remaining moisture. The sample gas then passes through a vacuum pump followed by a dry test gas meter. The gas meter integrates the sample gas flow throughout the course of the test. A calibrated orifice attached to the outlet of the gasmeter provides real time flow rate data.

A representative particulate sample was acquired by sampling for equal periods of time at the centroid of a number of equal area regions in the duct. The sampling rate is adjusted at each test point maintaining isokinetic sampling conditions. Nomographs are used for rapid determination of the sampling rate.

Particulate Loading and Emission Rates

After sampling is complete, the filter is removed and placed in a clean container. The nozzle and inlet side of the filter holder are quantitatively washed with acetone and the washings are stored in a second container. A brush is often used in the cleaning step to help dislodge deposits. The samples are returned to the laboratory where they are logged in and analyzed. The volume of the acetone rinse ("probe wash") is noted and then the rinse is quantitatively transferred to a tared 120 cc porcelain evaporating dish and the acetone evaporated off at 97-105 °F. This temperature is used to prevent condensation of atmospheric moisture due to the cooling effect induced by the evaporation of acetone. The acetone-free sample is then transferred to an oven and dried at 105 °C for 30 minutes, cooled in a desiccator over Drierite, and then weighed to the nearest .01 mg. The filter sample is quantitatively transferred to a 6-inch watch glass and dried in an oven at 105 °C for two hours. The filter and watch glass are then cooled in a desiccator and the filter weighed to the nearest .01 mg. All weighings are performed in a balance room where the relative humidity is hydrostatted to less than 50% relative humidity. Microscopic examination of the samples is performed if any unusual characteristics are observed. The weight of the acetone rinse is corrected for the acetone blank. The Drierite column is weighed on-site and the water collected by Drierite is added to the condensate so that the total amount of absorbed water may be ascertained.

Integrated flue gas samples for Orsat analysis were collected simultaneously with each pollutant sample. The samples were collected in 15-liter gas sampling bags at a constant flow rate throughout each particulate run. The bags were at a constant flow rate throughout each particulate run. The bags were then returned to the laboratory and analyzed by Orsat analysis. Standard commercially prepared solutions were used in the Orsat analyzer (sat. KOH for carbon dioxide and reduced methylene blue for oxygen).

Condensible Organic Compounds Analysis

(State of Wisconsin - EPA Method 5)

Method II-8672-WI

Equipment: Separatory funnel - 500 cc with Teflon stopcock

Powder funnel - 75 mm ID with a glass wool plug

Evaporating dish(es) - 200 cc or 250 cc beaker

Reagents: Methylene chloride

Sodium sulfate - (ACS) granular anhydrous (purified by heating for four hours in a shallow tray)

SAMPLING

An all-glass impinger assembly is used in the back half of the EPA Method 5 sampling train when an organic wet catch is to be collected. The impinger assembly consists of a modified impinger, a Greenburg Smith impinger followed by another modified impinger. The third impinger should have a temperature measuring device at the outlet upstream of a final impinger or desiccant column to monitor the temperature of the outlet gas stream. Prior to the start of the test, each of the first two impingers should be charged with 100 g of Class I water. The Method 5 train should be operated as provided for in EPA Method 5. Ice should be added to the impinger bath to keep the temperature of the gas at the outlet at or less than 68°F. After the post test leak check, the impinger train is removed and impinger contents poured into a tared all-glass sample bottle and closed with a Teflon-lined cap. The sample bottle is then weighed and the total condensate calculated by subtraction of the bottle tare weight and the weight of initial water added to the impingers (200 g). A label is affixed and the sample is returned to the laboratory for analysis. The sample should be stored at 4°C if the analysis is not conducted within 48 hours.

ANALYSIS

1. Sample bottles are removed from storage and the contents quantitatively transferred to a clean 500 cc separatory funnel equipped with a Teflon stopcock.

2. Rinse the sample container with distilled water and add to separatory funnel.

3. Then rinse the sample container with acetone and pour through sodium sulfate into a tare beaker marked A.

4. The sample is then extracted consecutively with three 50 cc aliquots of methylene chloride. The extraction is performed according to normal laboratory practice observing the customary safety precaution of releasing excess pressure after each shaking.

5. After each of the three extractions are completed, the organic solvent should be dried by passing it through a funnel containing anhydrous sodium sulfate and collecting it and two 50 cc rinses in the tared beaker marked A (the same one used to catch the acetone container rinse).

6. Evaporate to dryness in a hood at 70°F or less. Do not evaporate so quickly as to allow evaporative cooling to lower the temperature of the container below the dew point otherwise water will be condensed in the container.

7. Desiccate for two hours in a sealed desiccator and final weigh. Report all results in grams. All weighings should be made to nearest 0.1 mg (four places).

8. The remaining liquid in the separatory funnel is then transferred to a tared beaker marked B and is evaporated to dryness at 220°F ± 10°F. The analyst may take an aliquot of the sample, transferring it to a tared beaker and evaporate to dryness at 220°F ± 10°F. If an aliquot is used, the weight of the sample and aliquot will have to be taken to correct for the total sample weight.

9. After the drying step, the sample is cooled in a desiccator and weighted to a constant weight to the nearest 0.1 mg.

Calculation (if aliquot is taken):

$$\text{grams} = \frac{(\text{grams recovered from aliquot}) \times (\text{total volume (ml) or grams of sample})}{(\text{aliquot volume (ml) or grams used})}$$

If volume is used, it must be used for both the aliquot and sample. The same goes for using weight.

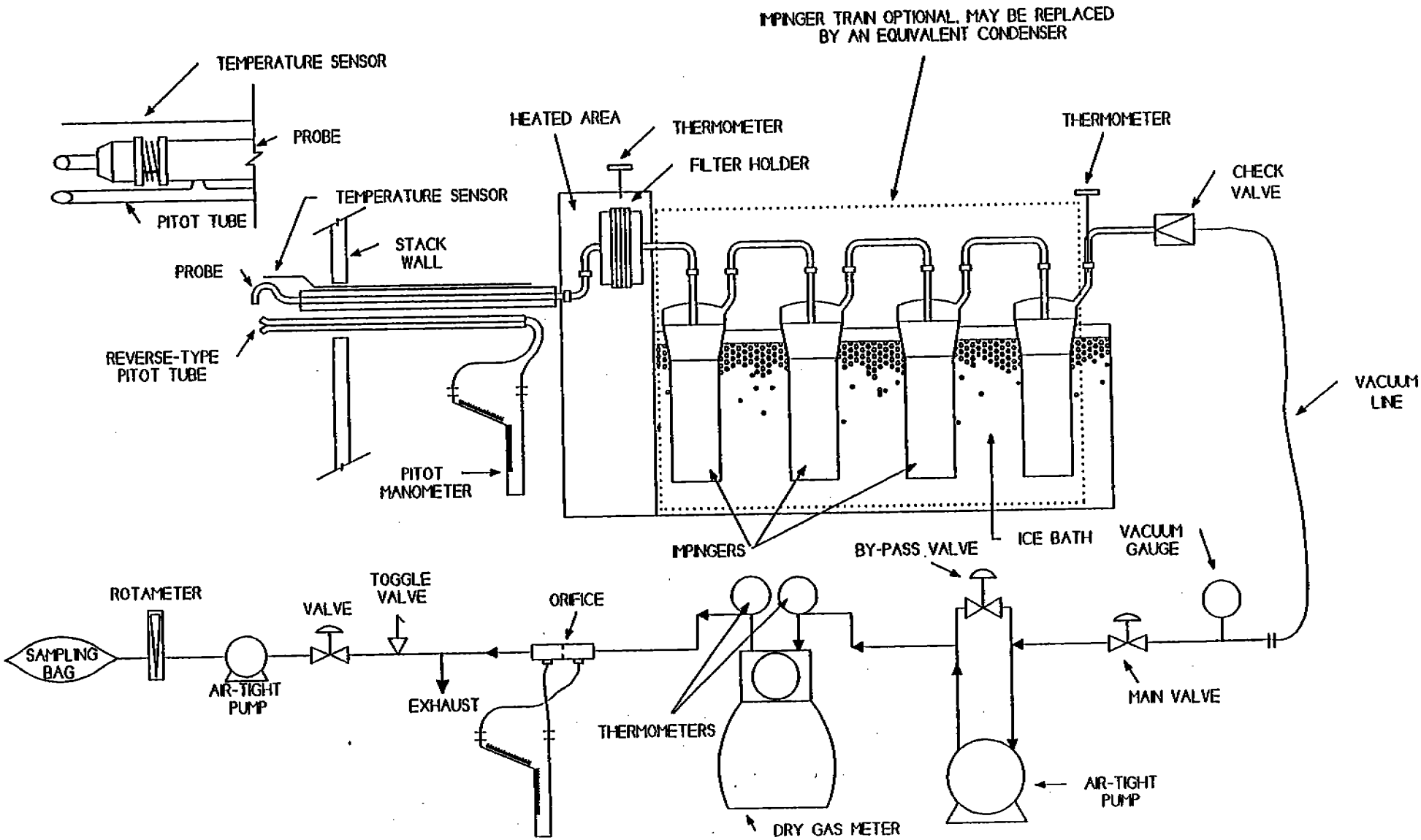
10. A field blank should be analyzed in an identical manner. If a field blank is not submitted, take an aliquot of Class I water equal in volume to the samples and analyze in a similar manner.

11. The results for container A are to be marked in the organic section of Interpoll Form #LSC-03G.

12. The results for container B are to be marked in the inorganic section of Interpoll Form #LSC-03G.

Interpoll Laboratories
(612) 786-6020

PARTICULATE SAMPLING TRAIN



APPENDIX G

CALCULATION EQUATIONS

METHOD 2
CALCULATION EQUATIONS

$$\overline{V_s} = 85.49\ C_p\ (\sqrt{\Delta p})_{avg}\ \sqrt{\frac{T_{s(avg)}}{P_s\ M_s}}$$

$$Q_{s,\,d} = 60\ (1\ -B_{ws})\ \overline{V_s}\ A\ (\frac{528}{T_{s\ (avg)}})\ (\frac{P_s}{29.92})$$

$$Q_a = 60\ \overline{V_s}\ A$$

$$\dot{m}_g = \frac{4.995\ Q_{s,\,d}\ G_d}{1\ -\ B_{ws}}$$

$$RH^* = 100\ (vp_{twb}\ -\ 0.0003641\ P_s\ (T_{db}\ -\ T_{wb}))/vp_{tdb}$$

$$B_{ws}^* = RH(vp_{tdb})/P_s$$

$$\rho = \frac{4.585\ x\ 10^{-2}\ P_s M_s}{T_s\ (avg)}$$

*Alternate equations for calculating moisture content from wet bulb and dry bulb data.

SYMBOLS

A	=	Cross Sectional area of stack, SQ. FT.
A_n	=	Cross sectional area of nozzle, SQ. FT.
B_{ws}	=	Water vapor in gas stream, proportion by volume
C_p	=	Pitot tube coefficient, dimensionless
C_a	=	Concentration of particulate matter in stack gas, wet basis, GR/ACF
C_s	=	Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, GR/DSCF
EA	=	Excess air, percent by volume
γ	=	Dry test meter correction factor, dimensionless
G_d	=	Specific gravity (relative to air), dimensionless
I	=	Isokinetic variation, percent by volume
M_d	=	Molecular weight of stack gas, dry basis, g/g - mole.
$\dot{m}_g$	=	Mass flow of wet flue gas, LB/HR
$\dot{m}_p$	=	Particulate mass flow, LB/HR
M_s	=	Molecular weight of stack gas, wet basis, g/g mole.
M_p	=	Total amount of particulate matter collected, g
P_{bar}	=	Atmospheric pressure, IN. HG. (uncompensated)
P_g	=	Stack static gas pressure, IN. WC.
P_s	=	Absolute pressure of stack gas, IN. HG.
P_{std}	=	Standard absolute pressure, 29.92 IN. HG.
A_a	=	Actual volumetric stack gas flow rate, ACFM
$Q_{s,d}$	=	Dry volumetric stack gas flow rate corrected to standard conditions, DSCFM
RH	=	Relative humidity, %

T_{db}	=	Dry bulb temperature of stack gas, °F
T_{wb}	=	Wet bulb temperature of stack gas, °F
$T_{m(avg)}$	=	Absolute average dry gas meter temperature, °R
$T_{s(avg)}$	=	Absolute average stack temperature, °R
T_{std}	=	Standard absolute temperature, 528 °R (68 °F)
θ	=	Total sampling time, min.
V_{lc}	=	Total volume of liquid collected in impingers and silica gel, ml
V_m	=	Volume of gas sample as measured by dry gas meter, CF
$V_{m(std)}$	=	Volume of gas sample measured by the dry gas meter corrected to standard conditions, DSCF
$V_{w(std)}$	=	Volume of water vapor in the gas sample corrected to standard conditions, SCF
$\bar{V}_s$	=	Average actual stack gas velocity, FT/SEC
vp_{tdb}	=	Vapor pressure at T_{db}, IN. HG.
vp_{twb}	=	Vapor pressure at T_{wb}, IN. HG.
$\overline{\Delta H}$	=	Average pressure differential across the orifice meter, IN. WC.
ΔP	=	Velocity pressure of stack gas, IN. WC.
γ	=	Dry test meter correction coefficient, dimensionless
ρ	=	Actual gas density, LB/ACF

METHOD 3
CALCULATION EQUATIONS

$$\%EA = \frac{100(\%O_2 - 0.5\%\ CO)}{0.264\%\ N_2 - \%O_2 + 0.5\%\ CO}$$

$$M_d = 0.44(\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2 + \%CO)$$

$$M_s = M_d\ (I - B_{ws}) + 0.18\ B_{ws}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

METHOD 5
CALCULATION EQUATIONS

$$V_{m(std)} = 17.65\ V_m\ \gamma\ \left(\frac{P_{bar} + \overline{\Delta H}/13.6}{T_{m(avg)}}\right)$$

$$V_{w(std)} = 0.0472\ V_{lc}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

$$I = 0.0944\ \left(\frac{T_{s(avg)}\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (I - B_{ws})}\right)$$

$$C_s = \frac{15.43\ M_p}{V_{m(std)}}$$

$$C_a = \frac{272.3\ M_p\ P_s}{T_{s(avg)}\ (V_{w(std)} + V_{m(std)})}$$

$$(\dot{m}_p)_1 = 8.5714\ x\ 10^{-3}\ C_s\ Q_{s,d}$$

$$(\dot{m}_p)_2 = \frac{1.3228 \times 10^{-1} M_p A}{\theta A_n}$$

$$\dot{m}_p = \frac{(\dot{m}_p)_1 + (\dot{m}_p)_2}{2}$$

APPENDIX H

SAMPLING TRAIN CALIBRATION DATA

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job LP HAYWARD Date 3-21-96

Operator J. BADEAUX J. LOMBARDO Module No. 13

Instructions:
Operate the control module at a flow rate equal to ΔH@ for 10 minutes before attaching the umbilical.

Record the following data: 1.0023

Bar press 29.26 in.Hg θ = 1.82 ΔH@ 1.82 in.WC.

Time (min)	Volume (CF)	Meter Temp (°F)	
		Inlet	Outlet
	(450.90)		
2.5	452.74	32	18
5.0	454.57	36	19
7.5	456.36	37	20
10	458.14	46	21
	V_m = 7.24	Avg(t_m) = 27.9	°F

Calculate Y_m as follows:

$$Y_m = \frac{1.786}{\theta V_m} \left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_m = \frac{1.786}{(1.0023)(7.24)} \left[\frac{(27.9) + 460}{(29.26)}\right]^{0.5}$$

$$Y_m = 1.005$$

If Y_m is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

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Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: March 26, 1996

Meter Box No. : 13 (Rockwell Dry Test Meter Serial No. 1334119)

Date of Last Calibration: January 5, 1996
Calibration Technician: S. Fjelsta
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
March 19, 1996	6-7451	315.18	639.72	324.54	324.54

* Total volume through meter since last calibration.

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Meter Calibration Sheet EPA/Method 5

Date 1-5-95
Bar. Press. 29.60 IN.HG
Wet Test Meter No. AL-20
Control Module No. 13
Serial No. DTM 1334119
Technician SF

ΔH (IN.WC)		Gas Volume Wet Test Meter	* Cal. Index φ	* Diff. Wet Test Meter ΔP_w	Gas Volume Dry Test Meter (ft^3)		Gas Temperatures			Time θ	Meter Coeff.	Orifice Const.	C_f
							Wet Test t_w	Dry Test					
Nominal	Actual	(ft^3)	(%)	(IN.WC.)	V_{di}	V_{df}	(°F)	t_{di} (°F)	t_{df} (°F)	(Min/ Sec)	Y	ΔH@ .	
0.5	0.5	2	99.85	0.01	295.745	297.811	65	92	72	5/01	0.99664	1.7184	
1.2	1.2	3	99.91	0.025	292.358	295.450	65	95	72	5/01	1.00049	1.8257	
2.0	2.0	3	99.93	0.055	288.874	291.955	65	97	72	3/55	1.00404	1.8506	
3.3	3.3	5	100.00	0.09	282.735	287.843	65	97	71	5/05	1.00581	1.8508	
4.7	4.7	5	100.02	0.12	275.830	280.910	65	94	68	4/16	1.00425	1.8599	
1		2	3	4	5	6	7	8	9	10	Avg	1.00225	1.82	

Positive leak check performed by SF
Meter was in tolerance ☒
Approved by

Meter was not in tolerance ☐: readjusted linkage
Meter was not in tolerance ☐: changed dry test meter
Date 1/9/96

*Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

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H-3

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No 23-5

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .460 IN.

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0

6. B_1 < 5° 0
7. B_2 < 5° 0

8. Z <.125" .02
9. W <.0625" .01

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .760 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☒ Meets all EPA design criteria thus C_p = 0.84
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel.
C_p = _____

Date of Inspection:

2-8-94

Inspected by:

CFR Title 40 Part 60 Appenidix A Method 2

S-348

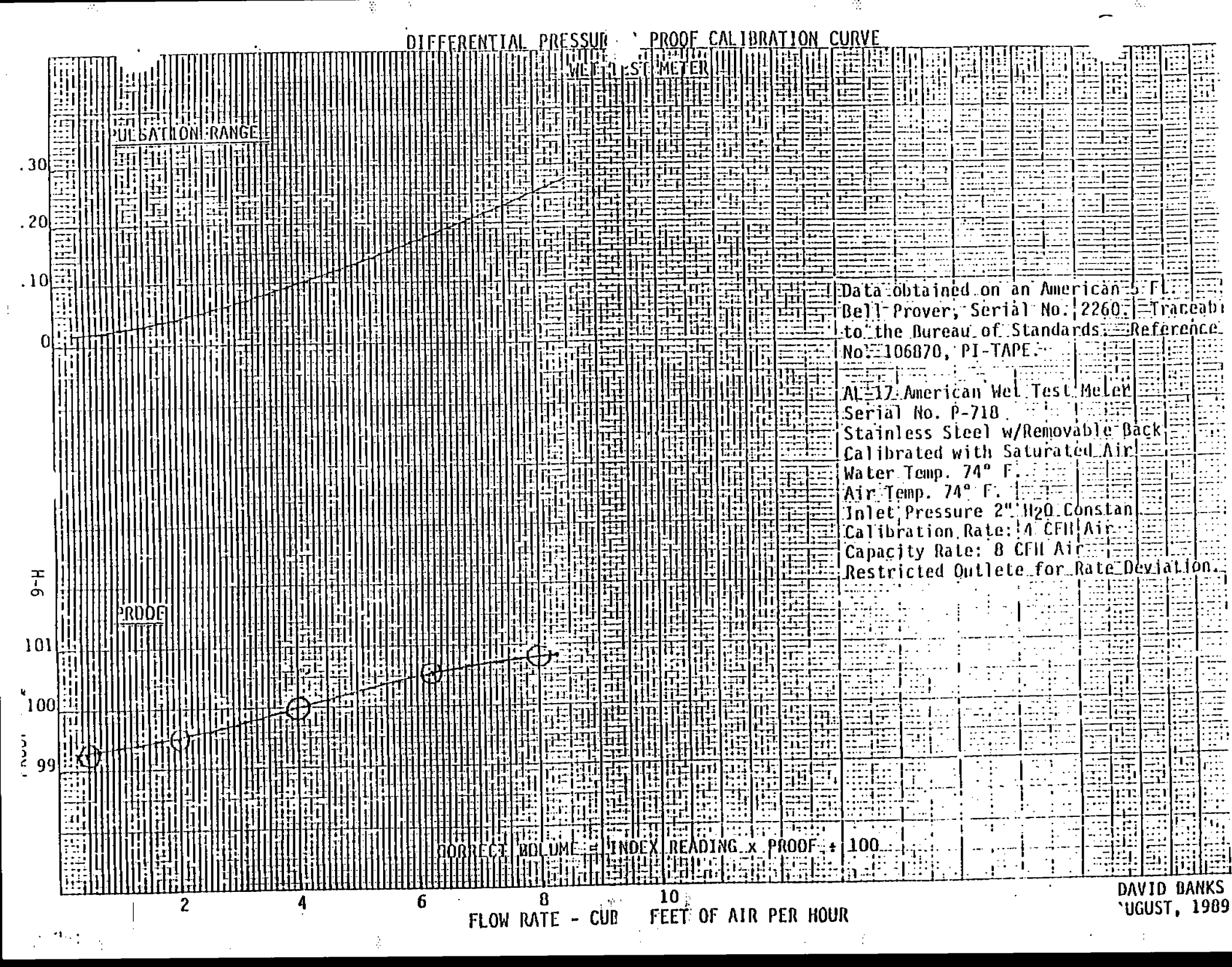
Interpoll Laboratories
(612) 786-6020

Nozzle Calibration Data Sheet

Date of Calibration: 03-21-96
Technician: Jamie Bainville
Nozzle Number: 5-7

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	0.432
2	0.431
3	0.432
Average	0.432


DIFFERENTIAL PRESSUR PROOF CALIBRATION CURVE
WET TEST METER
PULSATION RANGE
.30
.20
.10
0
PROOF
101
100
99
H-6
Data obtained on an American 5 Ft.
Bell Prover, Serial No. 2260. Traceab
to the Bureau of Standards. Reference
No. 106870, PI-TAPE.
AL-17 American Wet Test Meter
Serial No. P-718
Stainless Steel w/Removable Back
Calibrated with Saturated Air
Water Temp. 74° F.
Air Temp. 74° F.
Inlet Pressure 2" H2O Constan
Calibration Rate: 4 CFH Air
Capacity Rate: 8 CFH Air
Restricted Outlete for Rate Deviation.
CORRECT VOLUME = INDEX READING x PROOF ÷ 100
2
4
6
8
10
FLOW RATE - CUB FEET OF AIR PER HOUR
DAVID BANKS
UGUST, 1989

Interpoll Laboratories, Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014-1819

TEL: (612) 786-6020
FAX: (612) 786-7854

RESULTS OF THE MARCH 21, 1996 AIR EMISSION COMPLIANCE TEST OF THE LINE 1 THERMAL OIL HEATER AT THE LOUISIANA PACIFIC PLANT IN HAYWARD, WISCONSIN

Submitted to:

LOUISIANA-PACIFIC CORPORATION
Route 8, Box 8263
Hayward, Wisconsin 54843

Attention:

Keith Seelig

Approved by:



Daniel Despen
Manager
Stationary Source Testing Department

Report Number 6-7451E
April 24, 1996
SL/sll

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3 **AIR EMISSION RESULTS** 6

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B - Location of Test Ports

C - Field Data Sheets

D - Interpoll Laboratories Analytical Data

E - Operational Data

F - Procedures

G - Calculation Equations

H - Sampling Train Calibration Data

ABBREVIATIONS

ACFM	actual cubic feet per minute
cc (ml)	cubic centimeter (milliliter)
DSCFM	dry standard cubic foot of dry gas per minute
DSML	dry standard milliliter
DEG-F (°F)	degrees Fahrenheit
DIA.	diameter
FP	finished product for plant
FT/SEC	feet per second
g	gram
GPM	gallons per minute
GR/ACF	grains per actual cubic foot
GR/DSCF	grains per dry standard cubic foot
g/dscm	grams per dry standard cubic meter
HP	horsepower
HRS	hours
IN.	inches
IN.HG.	inches of mercury
IN.WC.	inches of water
LB	pound
LB/DSCF	pounds per dry standard cubic foot
LB/HR	pounds per hour
LB/10^6BTU	pounds per million British Thermal Units heat input
LB/MMBTU	pounds per million British Thermal Units heat input
LTPD	long tons per day
MW	megawatt
mg/Nm^3	milligrams per dry standard cubic meter
ug/Nm^3	micrograms per dry standard cubic meter
microns (um)	micrometer
MIN.	minutes
ng	nanograms
ohm-cm	ohm-centimeter
PM	particulate matter
PPH	pounds per hour
PPM	parts per million
ppmC	parts per million carbon
ppm,d	parts per million, dry
ppm,w	parts per million, wet
ppt	parts per trillion
PSI	pounds per square inch
SQ.FT.	square feet
TPD	tons per day
ug	micrograms
v/v	percent by volume
w/w	percent by weight
<	≤ (when following a number)

Standard conditions are defined as 68°F (20°C) and 29.92 IN. of mercury pressure.

g:\stack\wp\misc\abbrev.frm

1 INTRODUCTION

On March 21, 1996 Interpoll Laboratories personnel conducted a particulate emission compliance test of the Line 1 Thermal Oil Heater at the Louisiana Pacific Plant in Hayward, Wisconsin. On-site testing was performed by Jamie Bainville and Jim Lorenz. Coordination between testing activities and plant operation was provided by Keith Selig of Louisiana Pacific Corporation. The tests were not witnessed by a member of the Wisconsin Department of Natural Resources.

Particulate determinations were performed in accordance with EPA Methods 2 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1995). A preliminary volumetric flow rate determination was performed to select the appropriate nozzle diameter required for isokinetic sample withdrawal. An Interpoll Labs sampling train which meets or exceeds specifications in the above-cited reference was used to extract particulate samples by means of a heated glass-lined probe. Wet catch samples were colleccted in the back half of the Method 5 sampling train and analyzed as per Wisconsin DNR Protcol.

An integrated flue gas sample was extracted simultaneously with the particulate sampling train using a specially designed gas sampling system. Integrated flue gas samples were collected in 44-liter Tedlar bags housed in a protective aluminum container. After sampling was complete, the bags were sealed and returned to the laboratory for Orsat analysis. Prior to sampling, the Tedlar bags are leak-checked at 15 IN.HG. vacuum with an in-line rotameter. Bags with any detectable in-leakage are discarded.

Testing was conducted from two test ports oriented at 90° on the stack. These test ports are located approximately 4.8 diameters downstream and 2.3 diameters upstream of the nearest flow disturbance. A 20-point traverse was used to collect representative particulate samples. Each traverse point was sampled 3 minutes to give a total sampling time of 60 minutes per run.

The important results of the test are summarized in Section 2. Detailed results are presented in Section 3. Field data and all other supporting information are presented in the appendices.

2 SUMMARY AND DISCUSSION

The results of the air emission compliance tests are summarized in Table 1. An overview of the results is presented in the table below:

Parameter	Measured
Particulate	
(Dry + Wet Catch)	
. . . . . (GR/DSCF)	0.0147
. . . . . ($LB/10^6BTU$)	0.056
(Dry Catch Only)	
. . . . . (GR/DSCF)	0.010
. . . . . ($LB/10^6BTU$)	0.040

The wet catch portion of the first sampling run was accidentally spilled during recovery, therefore, this run was voided by the Interpoll Laboratories field engineer. An additional test run was performed immediately following the third test run. No other difficulties were encountered in the field or in the laboratory evaluation of the samples. On the basis of these facts and a complete review of the data and results, it is our opinion that the results reported herein are accurate and closely reflect the actual values which existed at the time the test was performed.

Table 1a Summary of the Results of the March 21, 1996 Particulate Emission Test of the Line 1 Thermal Oil Heater Stack at the Louisiana Pacific Plant in Hayward, Wisconsin.

ITEM		Run 1	Run 2	Run 3
Date of test		03-21-96	03-21-96	03-21-96
Time runs were done	(HRS)	1038/1145	1210/1312	1340/1445
Steam flow	(KLB/HR)			
Volumetric flow				
actual	(ACFM)	17922	19125	19072
standard	(DSCFM)	10922	11762	11338
Gas temperature	(DEG-F)	306	310	308
Moisture content	(%V/V)	9.62	8.21	11.53
Gas composition	(%V/V,dry)			
carbon dioxide		7.10	6.50	5.30
oxygen		12.80	13.40	14.80
nitrogen		80.10	80.10	79.90
Isokinetic variation	(%)	97.0	97.5	100.2
Particulate concentration				
actual	(GR/ACF)	.007330	.0113	.00811
standard	(GR/DSCF)	.0120	.0184	.0136
Part. emission rate	(LB/HR)	1.13	1.86	1.33
Emission factor	(LB/MMBTU)	0.041	0.067	0.061

Note: Dry + Organic/Inorganic Wet Catch

Table 1b Summary of the Results of the March 21, 1996 Particulate Emission Test of the Line 1 Thermal Oil Heater Stack at the Louisiana Pacific Plant in Hayward, Wisconsin.

ITEM		Run 1	Run 2	Run 3
Date of test		03-21-96	03-21-96	03-21-96
Time runs were done	(HRS)	1038/1145	1210/1312	1340/1445
Steam flow	(KLB/HR)			
Volumetric flow				
actual	(ACFM)	17922	19125	19072
standard	(DSCFM)	10922	11762	11338
Gas temperature	(DEG-F)	306	310	308
Moisture content	(%V/V)	9.62	8.21	11.53
Gas composition	(%V/V,dry)			
carbon dioxide		7.10	6.50	5.30
oxygen		12.80	13.40	14.80
nitrogen		80.10	80.10	79.90
Isokinetic variation	(%)	97.0	97.5	100.2
Particulate concentration				
actual	(GR/ACF)	.006409	.006016	.00655
standard	(GR/DSCF)	.0105	.009786	.0110
Part. emission rate	(LB/HR)	0.985	0.987	1.07
Emission factor	(LB/MMBTU)	0.035	0.036	0.049

Note: Dry Catch Only

3 RESULTS

The results of all field and laboratory evaluations are presented in this section. Gas composition (Orsat and moisture) are presented first followed by the computer printout of the particulate results. Preliminary measurements including test port locations are given in the appendices.

The results have been calculated on a personal computer using programs written in Extended BASIC specifically for source testing calculations. EPA-published equations have been used as the basis of the calculation techniques in these programs. The particulate emission rate has been calculated using the product of the concentration times flow method.

3.1 Orsat & Moisture Analyses

Test No. 18
Line 1 Thermal Oil Heater Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	03-21-96	03-21-96	03-21-96
Dry basis (orsat)			
carbon dioxide.....	7.10	6.50	5.30
oxygen.....	12.80	13.40	14.80
nitrogen.....	80.10	80.10	79.90
Wet basis (orsat)			
carbon dioxide.....	6.42	5.97	4.69
oxygen.....	11.57	12.30	13.09
nitrogen.....	72.39	73.53	70.69
water vapor.....	9.62	8.21	11.53
Dry molecular weight.....	29.65	29.58	29.44
Wet molecular weight.....	28.53	28.63	28.12
Specific gravity.....	0.985	0.989	0.971
Water mass flow.....(LB/HR)	3261	2950	4145
FO	1.141	1.154	1.151

3.2 Results of Particulate Determinations

Test No. 18
Line 1 Thermal Oil Heater Stack

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	03-21-96	03-21-96	03-21-96
Time run start/end.....(HRS)	1038/1145	1210/1312	1340/1445
Static pressure.....(IN.WC)	-0.12	-0.12	0.00
Cross sectional area (SQ.FT)	14.75	14.75	14.75
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	88.0	79.0	118.0
desiccant.....(GRAMS)	11.0	11.0	12.0
total.....(GRAMS)	99.0	90.0	130.0
Total particulate material..			
.....collected(grams)	0.0342	0.0566	0.0416
Gas meter coefficient.....	1.0023	1.0023	1.0023
Barometric pressure..(IN.HG)	29.26	29.26	29.26
Avg. orif.pres.drop..(IN.WC)	1.75	2.08	2.04
Avg. gas meter temp..(DEF-F)	58.0	65.5	67.6
Volume through gas meter....			
at meter conditions...(CF)	43.72	47.96	47.72
standard conditions.(DSCF)	43.86	47.46	47.03
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.432	.432	.432
Avg.stack gas temp ..(DEG-F)	306	310	308
Volumetric flow rate.....			
actual.....(ACFM)	17922	19125	19072
dry standard.....(DSCFM)	10922	11762	11338
Isokinetic variation.....(%)	97.0	97.5	100.2
Particulate concentration...			
actual.....(GR/ACF)	0.00733	0.01131	0.00811
dry standard.....(GR/DSCF)	0.01203	0.01840	0.01365
Particle mass rate...(LB/HR)	1.126	1.855	1.33
F-factor .....(DSCF/MMBTU)	9140	9140	9140
Emission factor...(LB/MMBTU)	0.041	0.067	0.061

4 RESULTS OF FUEL ANALYSIS

INTERPOLL LABORATORIES, INC.
Fuel Laboratory
(612) 786-6020

Date:	3/28/96
Client:	LOUISIANA-PACIFIC, HAYWARD
Laboratory Log Number:	7451-64-9999
Sample Collected:	3/21/96
Sample Received:	3/22/96
Source:	LINE 1 KONUS
Sample Identification:	TEST 18, WOOD

Proximate and Ultimate Analysis WT %

Proximate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			43.45
Ash		3.16	1.79
Volatile Matter	81.07	78.51	44.40
Fixed Carbon (calculation)	18.93	18.33	10.37
Sulfur	0.02	0.02	0.01
Heating Value, BTU/LB.	8434	8168	4619

Ultimate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			43.45
Ash		3.16	1.79
Carbon	51.54	49.91	28.23
Hydrogen	4.99	4.84	2.74
Nitrogen	0.06	0.06	0.03
Oxygen (calculated)	43.39	42.02	23.76
Sulfur	0.02	0.02	0.01

Respectfully submitted,

David J. Schneider

David J. Schneider, Manager
Chemistry Department

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APPENDIX A

PRELIMINARY VOLUMETRIC FLOW RATE DETERMINATION

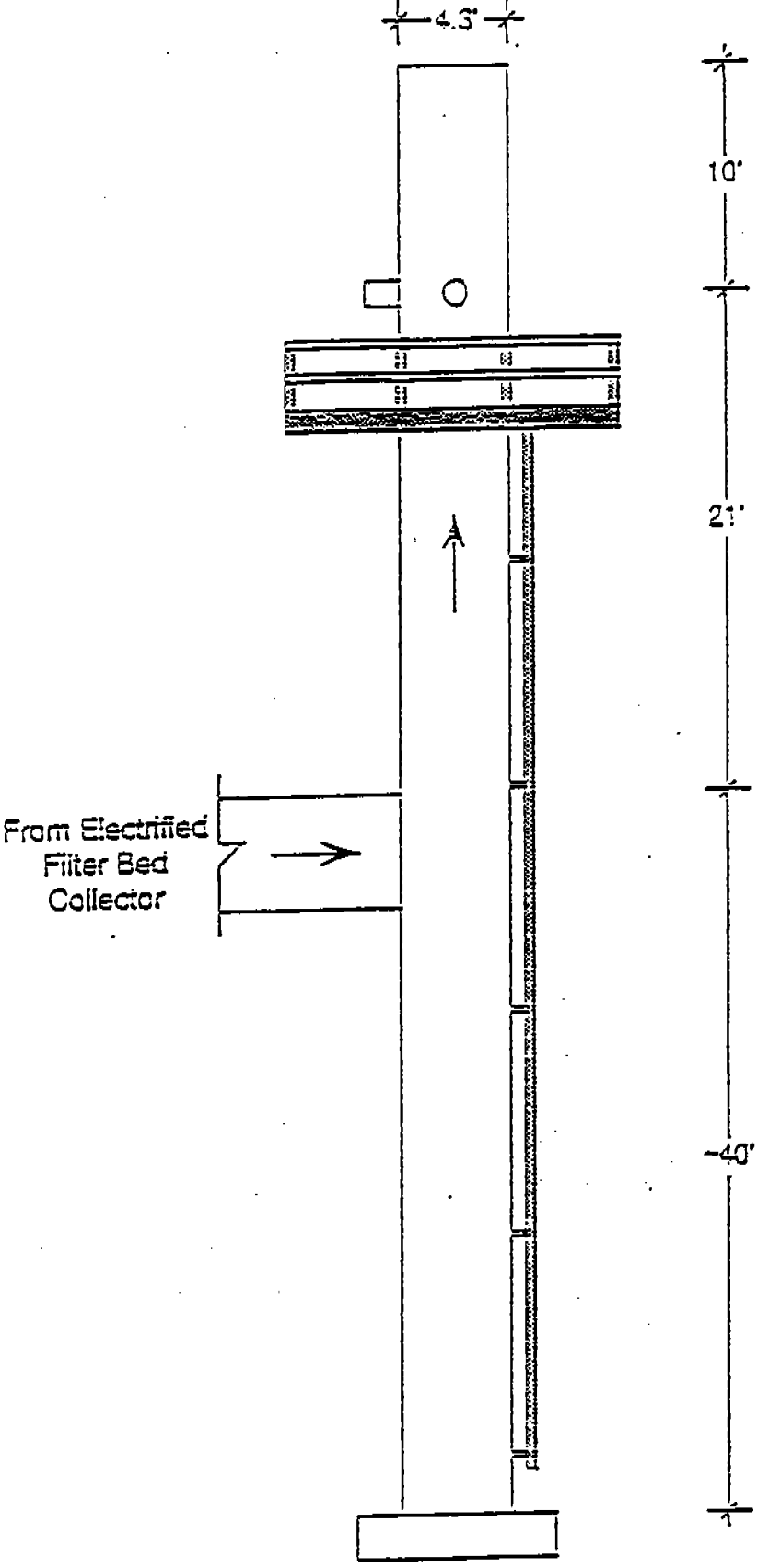
Test No. 18
Line 1 Thermal Oil Heater Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	03-21-96
Time of Determination.....(HRS)	800
Barometric pressure.....(IN.HG)	29.26
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	20
Shape of duct.....	Round
Stack diameter.....(IN)	52
Duct area.....(SQ.FT)	14.75
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.115
Avg. gas temp.....(DEG-F)	288
Moisture content.....(% V/V)	10.78
Avg. linear velocity.....(FT/SEC)	19.8
Gas density.....(LB/ACF)	.05088
Molecular weight.....(LB/LBMOLE)	29.65
Mass flow of gas.....(LB/HR)	53358
Volumetric flow rate.....	
actual.....(ACFM)	17478
dry standard.....(DSCFM)	10761

APPENDIX B

LOCATION OF TEST PORTS



HAYWARD, WI
DRAWING 10
LINE 1
THERMAL OIL HEATER
STACK
ELEVATION

APPENDIX C

FIELD DATA SHEETS

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 2 Field Data Sheet

Job: LP HAWARD
Source: LINE 1 THERMO OIL HEATER STACK
Test: 1B Run Date: 3-21-96
Stack Dimen.: ~~Ø~~ 52 IN.
Dry Bulb: °F Wet bulb: °F
Manometer: ☒ Reg. ☐ Exp ☐ Elec.
Barometric Pressure: 29.26 IN.HG
Static Pressure: -.115 IN.WC
Operators: S. BAINVILLE, J. Lorenz
Pitot No.: V23-5 C_p: .84

Drawing of Test Site

Cross-section View	Elevation View

Traverse Point No.	Fraction of Diameter	Distance From Stack Wall (IN.)	Distance From End of Port (IN.)	Velocity	Temp. of Gas
		Port Length: 6.5 IN.		Time Start: 800	HRS
A 1		1.35	7.85	.06	
2		4.26	10.76	.07	
3		7.59	14.09	.075	
4		11.75	18.25	.09	
5		17.79	24.29	.095	
6		34.22	40.71	.105	
7		40.24	46.74	.11	
8		44.41	50.90	.1	
9		47.74	54.24	.105	
10		50.64	57.14	.08	
B 1				.07	
2				.09	
3				.1	
4				.11	
5				.11	
6				.09	
7				.07	
8				.065	
9				.06	
10				.055	
Temp. Meas. Device & S/N:				Time End:	HRS

R or nothing = reg. manometer; S = expanded; E = electronic

460.4
454.3

INTERPOLL LABORATORIES, INC
(612) [illegible]-6020

EPA Method 5 Field Data Sheet

Job: LP/HAYWARD
Source: LINE NO.1 KOHLS STACK
Date: 3-21-96 Test: 18 Run: 1

Operators: JB/JL
Meter Box No.: 13 ΔH@ 1.82 in.WC
Gasmeter Coeff.: 1.0023

Nozzle No.: S-7
Nozzle Dia.: .432 in.
Bar. Press.: 29.26 in.Hg

Pitot No.: 23V-5
C_p: .840
H_2O: 10 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	(9:50)	458.33											
1	3	459.89	.045	.86	9.78	2	200	234	229	39	41	32	
2	6	461.61	.050	1.03	1.43	2	200				45	34	
3	9	463.50	.055	1.48	3.71	3	203	241	235	37	49	34	
4	12	465.25	.055	1.13	5.45	3	205				50	36	
5	15	467.33	.080	1.65	7.56	4	207	237	245	39	57	37	
6	18	469.20	.100	2.06	9.91	5	209				55	39	
7	21	472.20	.110	2.27	2.39	5	290	236	260	40	57	38	
8	24	474.67	.100	2.07	4.76	5	291				56	38	
9	27	476.84	.090	1.74	6.96	4	291	243	271	38	55	41	
10	30	479.00	.080	1.50	9.01	4	280				58	40	
1	33	480.92	.075	1.41	0.97	3	286	247	272	41	57	43	
2	36	482.86	.070	1.31	2.86	3	286				60	44	
3	39	484.97	.085	1.59	4.94	4	290	245	270	40	60	44	
4	42	487.28	.105	1.95	7.25	5	293				61	45	
5	45	489.40	.100	1.86	9.51	4	295	243	271	41	60	45	
6	48	491.35	.080	1.48	1.52	4	297				61	46	
7	51	493.35	.080	1.49	3.55	4	293	246	274	41	60	46	
8	54	495.33	.075	1.39	5.50	4	299				59	46	
9	57	497.30	.065	1.20	7.32	3	297	244	271	42	59	46	
10	60	499.13	.07	1.30	9.21	4	296				59	47	
	(955)												
	θ = 60	V_m = 40.8		ΔH = 1.54							Avg. = 57.3		

C-3

081194-G:\STACK\WP\FORMS\S-518

...TERNATIONAL LABORATORIES, INC
(612) ...-6020

EPA Method 5 Field Data Sheet

Job LP/HAYWARD
Source Unit No. 1 Kovus STACK
Date 3-21-96 Test 18 Run 2

Operators J.B. / J.L
Meter Box No. 13 ΔH@ 1.82 in.WC
Gasmeter Coeff. 1.0023

Nozzle No. S-7
Nozzle Dia. .432 in.
Bar. Press. 29.26 in.Hg

Pitot No. 23V-5'
C_p .840
H_2O 12 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	1038	(499.67)											
B 1	3	501.80	.075	1.50	1.71	4	301	232	245	39	50	47	
2	6	504.05	.100	1.97	4.02	5	302				57	47	
3	9	506.35	.095	1.86	6.28	5	304	239	257	40	59	47	
4	12	508.63	.105	2.06	8.67	5	305				60	47	
5	15	511.08	.110	2.17	1.11	5	309	236	254	39	62	49	
6	18	513.40	.050	1.98	3.51	5	308				63	49	
7	21	515.70	.060	1.58	5.57	5	310	232	268	38	64	50	
8	24	517.80	.060	1.59	7.69	5	309				64	50	
9	27	519.80	.075	1.49	9.72	4	308	233	270	39	64	50	
10	30	521.59	.060	1.20	1.54	3	305				64	50	
A 1	33	523.18	.050	.99	3.20	3	307	032	272	40	62	51	
2	36	524.93	.055	1.10	4.95	3	299				63	51	
3	39	526.71	.060	1.20	6.77	3	303	228	269	39	64	52	
4	42	528.83	.080	1.60	8.88	4	306				64	52	
5	45	531.17	.095	1.90	1.17	5	306	231	270	39	65	52	
6	48	533.48	.100	2.00	3.52	5	305				65	52	
7	51	536.12	.130	2.56	6.19	6	309	234	270	38	65	52	
8	54	538.80	.11	2.19	8.65	6	307				65	53	
9	57	541.08	.11	2.19	1.12	6	305	232	268	40	67	54	
10	60	543.39	.095	1.91	3.42	5	303				67	55	
	(1145)												
	θ = 60	V_m = 43.72		ΔH = 1.75							Avg. =	58.0	

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INTERPOLL LABORATORIES, INC.
(612) 5-6020

EPA Method 5 Field Data Sheet

Job LP/HAYWARD
Source LINE Kbol KOMUS STACK
Date 3-21-96 Test 18 Run 3

Operators JB./R.D.
Meter Box No. 13 ΔH@ 1.82 in.WC
Gasmeter Coeff. 1.0023

Nozzle No. S-7
Nozzle Dia. .432 in.
Bar. Press. 29.26 in.Hg

Pitot No. 23v-5
C_p .840
H_2O 12 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head (in.WC)	Orifice Meter (in.WC)	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
	(12:10)	(543.63)											
A 1	3	545.67	.065	1.35	5.56	B	305				63	58	
2	6	547.66	.07	1.45	7.57	4	308	224	245	39	68	57	
3	9	549.81	.08	1.67	9.73	4	307				69	58	
4	12	551.96	.08	1.67	1.89	4	309	231	252	39	70	58	
5	15	554.25	.100	2.08	4.30	5	310				70	58	
6	18	556.97	.130	2.70	7.05	6	310	235	257	40	69	58	
7	21	559.75	.128	2.66	9.77	6	311				69	58	
8	24	562.37	.122	2.53	2.43	6	312	236	264	39	71	59	
9	27	564.85	.105	2.18	4.90	5	312				71	59	
10	30	567.26	.094	1.98	7.26	5	304	234	263	41	72	61	
B 1	33	569.71	.097	2.05	9.65	5	304				68	61	
2	36	572.32	.114	2.38	2.23	5	309	234	258	40	70	61	
3	39	574.93	.120	2.51	4.88	6	309				72	62	
4	42	527.58	.125	2.60	7.59	6	314	239	268	40	72	62	
5	45	580.22	.115	2.39	0.18	6	315				73	62	
6	48	582.86	.120	2.50	2.83	6	314	234	270	41	73	63	
7	51	585.42	.106	2.20	5.32	5	317				74	63	
8	54	587.60	.088	1.83	7.60	4	317	234	271	41	74	63	
9	57	589.50	.060	1.26	9.48	3	313				73	63	
10	60	591.54	.075	1.58	1.54	3	309	237	269	40	74	64	
	(1312)												
	60 0 -	V_m - 47.96		2.08 ΔH -							Avg. - 65.5		

C-7

ERP ... LAE ...TO..., IN...
(612) 7... 6020

EPA Method 5 Field Data Sheet

Job LAPHAM WOOD
Source LF-C No 1 KOMUS STACK
Date 3-21-96 Test 1B Run 4

[redacted] S BAR-VALUE 3.L
ΔH@ 1.82 in.WC
[redacted] 1.0027

Nozzle No. S-7
Nozzle Dia. .432 in.
Bar. Press. 29.26 in.Hg

Pitot No. 230-S1
C_p .840
H_2O 10 %

Traverse Point No.	Sampling Time (min)	Sample Vol. (cf)	Velocity Head	Orifice	Des. Vol. (cf)	VAC. (in.Hg)	Temperatures (°F) Stack	Probe	Oven	Imp.	Gas/In	Gas/Out	Oxygen (% v/v)
[redacted]	(1340)	(592.00)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
B 1	3	594.50	.105	2.21	4.48	5	304	233	245	37	62	60	
2	6	596.80	.090	1.87	6.77	4	306				64	60	
3	9	599.40	.100	2.20	9.31	5	307	235	250	37	65	60	
4	12	601.57	.120	2.48	1.44	5	308				67	59	
5	15	604.50	.120	2.49	4.57	5	310	234	247	39	69	60	
6	18	607.10	.120	2.49	7.21	5	312				70	60	
7	21	609.70	.110	2.29	9.75	5	312	246	256	38	71	60	
8	24	612.00	.095	1.98	2.10	5	311				71	61	
9	27	614.36	.090	1.88	4.40	4	310	249	259	39	72	61	
10	30	616.48	.075	1.57	6.51	4	308				72	61	
A 1	33	618.30	.055	1.15	8.31	3	308	256	259	38	70	62	
2	36	620.30	.075	1.59	0.43	4	299	~~250~~	~~260~~		72	62	
3	39	622.45	.075	1.59	2.55	4	301	250	261	39	73	63	
4	42	624.90	.100	2.10	4.98	5	308				74	63	
5	45	627.41	.100	2.10	7.41	5	310	245	269	40	74	63	
6	48	629.83	.110	2.31	9.96	6	311				74	63	
7	51	632.40	.110	2.30	2.51	6	312	240	271	40	74	64	
8	54	635.00	.105	2.20	5.00	6	313				74	63	
9	57	637.46	.100	2.10	7.44	6	310	243	269	41	74	64	
10	60	639.72	.09	1.91	9.76	5	304				74	64	
	(1445)												
[redacted]	0 - 60	V_m - 47.72	[redacted]	ΔH - 2.04	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	Avg. - 67.6	[redacted]	

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APPENDIX D

INTERPOLL LABORATORIES ANALYTICAL RESULTS

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 3 Data Reporting Sheet - Orsat Analysis

Job: LP/HAYWARD
Team Leader: TB
Date Submitted:
Test No.: 18
Date of Analysis:

Source: Line 1 Kohls
Test Site: Stack
Date of Test: 3-21-96
No. of Runs Completed: 3
Technician: ET

Test/ Run	Sample Log No. and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
18-1	7451-61	1	0	7.1	19.9	7.1	12.8	
		2	0	7.1	19.9	7.1	12.8	
	☒B☐F	Avg				7.1	12.8	
18-2	62	1	0	6.5	19.9	6.5	13.4	
		2	0	6.5	19.9	6.5	13.4	
	☒B☐F	Avg				6.5	13.4	
18-3	63	1	0	5.3	20.1	5.3	14.8	
		2	0	5.3	20.1	5.3	14.8	
	☒B☐F	Avg				5.3	14.8	
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						
		1						
		2						
	☐B☐F	Avg						

☒ Ambient Air QA Check
☒ Orsat Analyzer System Leak Check
☒ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9-O_2}{CO_2}$

F = Flask (250 cc all glass)

B = Tedlar Bag (5 layer)

EPA Method 3 Guidelines

Fuel Type	FO Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Impinger Catch Data Reporting Sheet

Protocol: ☐Minnesota ☒Wisconsin ☐Iowa ☐EPA Method 202 ☐Other

Job: LP / Hayward — Source/Site: Line No. 1 Komus / Stack

Date Submitted: 3-22-96 — Test No.: 18

Date of Analysis: 3-27-96 — Technician: B.O.

	Solvent Phase	Aqueous Phase
Test: 18 Run: 1	Dish No: 58	Dish No: 703
Log No: 7451-57I	Dish + Sample Wt: 40.7126 g	Dish + Sample Wt: 46.8705 g
Color & Appearance:	Dish Tare Wt: 40.7126 g	Dish Tare Wt: 46.8704 g
	Fraction Wt: 0.0000 g	Fraction Wt: 0.0001 g
Comments:	Smpl Vol: 200 ml, Aliqt: 200 ml, Factor: 1.000	Smpl Vol: 200 ml, Aliqt: 100 ml, Factor: 2.000
	Sample Wt: 0.0000 g	Sample Wt: 0.0002 g
Test: 18 Run: 2	Dish No: 62	Dish No: 714
Log No: -58I	Dish + Sample Wt: 50.8913 g	Dish + Sample Wt: 48.6346 g
Color & Appearance:	Dish Tare Wt: 50.8883 g	Dish Tare Wt: 48.6341 g
	Fraction Wt: 0.0030 g	Fraction Wt: 0.0005 g
Comments:	Smpl Vol: 240 ml, Aliqt: 240 ml, Factor 1.000	Smpl Vol: 240 ml, Aliqt: 100 ml, Factor 2.400
	Sample Wt: 0.0030 g	Sample Wt: 0.0015 g
Test: 18 Run: 3	Dish No: 65	Dish No: 718
Log No: -59I	Dish + Sample Wt: 44.6607 g	Dish + Sample Wt: 41.3981 g
Color & Appearance:	Dish Tare Wt: 44.6570 g	Dish Tare Wt: 41.3909 g
	Fraction Wt: 0.0037 g	Fraction Wt: 0.0072 g
Comments:	Smpl Vol: 320 ml, Aliqt: 320 ml, Factor 1.000	Smpl Vol: 320 ml, Aliqt: 100 ml, Factor 3.200
	Sample Wt: 0.0037 g	Sample Wt: 0.0230 g
Test: 18 Run: 4	Dish No: 68	Dish No: 728
Log No: -60I	Dish + Sample Wt: 43.1614 g	Dish + Sample Wt: 42.9810 g
Color & Appearance:	Dish Tare Wt: 43.1548 g	Dish Tare Wt: 42.9805 g
	Fraction Wt: 0.0066 g	Fraction Wt: 0.0005 g
Comments:	Smpl Vol: 310 ml, Aliqt: 310 ml, Factor 1.000	Smpl Vol: 310 ml, Aliqt: 100 ml, Factor 3.100
	Sample Wt: 0.0066 g	Sample Wt: 0.0016 g

Note: Factor = Sample Volume/Aliquot Volume

Blank Solvent Wt. 0.0000 g

√gV	RUN 1	RUN 2	RUN 3	RUN 4
Results of Solvent Phase g	0.0000	0.0030	0.0037	0.0066
Results of Aqueous Phase g	0.0000 D-2	0.0013	0.0228	0.0014

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Solvent Rinse Data Reporting Sheet

☒ EPA Method 5 Probe Wash ☐ EPA Method 29 Probe Wash ☐ EPA Method 202 Cup & Tube Wash

Job: LP / HAYWARD
Source/Site: LINE 1 KONUS STACK
Date Submitted:
Test No.: 18
Date of Analysis: 4-4-96
Technician: SCB

Transport Leakage ☐ None ☒ _____ ml
Solvent: _____

Test: 18	Run: 0	Dish No: 23	
Log No: 7451-56P		Dish + Sample Wt: 46.0848	g
Volume of Solvent	120 ml	Dish Tare Wt: 46.0847	g
*Solvent Residue	ug/ml	Sample Wt: .0001	g
Test: 18	Run: 1	Dish No: 882	
Vol. of Solvent	130 ml	Dish + Sample Wt: 38.1182	g
Log Number -57P		Dish Tare Wt: 38.0970	g
Comments		Sample Wt: .0212	g
Test: 18	Run: 2	Dish No: 849	
Vol. of Solvent	150 ml	Dish + Sample Wt: 46.5371	g
Log Number -58P		Dish Tare Wt: 46.5298	g
Comments		Sample Wt: .0073	g
Test: 18	Run: 3	Dish No: 93	
Vol. of Solvent	160 ml	Dish + Sample Wt: 53.9928	g
Log Number -59P		Dish Tare Wt: 53.9832	g
Comments		Sample Wt: .0096	g

*Solvent Residue _____ ug/ml = [(Sample Wt. _____ g) (10^6)]/Vol. of Sol. _____ ml

EPA-M5 Acetone Residue Blank Spec. ≤ 7.8 ug/ml

√SLV

		RUN 0	RUN 1	RUN 2	RUN 3
Results of Solvent Rinse	g	.0001	.0011 D-3	.0072	.0095

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Solvent Rinse Data Reporting Sheet

☒ EPA Method 5 Probe Wash ☐ EPA Method 29 Probe Wash ☐ EPA Method 202 Cup & Tube Wash

Job: LP/HAYWARD
Date Submitted:
Date of Analysis: 4-4-96
Source/Site: LINE 1 KONUS STACK
Test No.: 18
Technician: SCB

Transport Leakage ☐ None ☒ _____ ml
Solvent: _____

Test: 18	Run: 4	Dish No: 622	
Log No: 7451-607		Dish + Sample Wt: 48.8508	g
Volume of Solvent	165 ml	Dish Tare Wt: 48.8492	g
*Solvent Residue	ug/ml	Sample Wt: .0016	g
Test:	Run:	Dish No:	
Vol. of Solvent	ml	Dish + Sample Wt:	g
Log Number		Dish Tare Wt:	g
Comments		Sample Wt:	g
Test:	Run:	Dish No:	
Vol. of Solvent	ml	Dish + Sample Wt:	g
Log Number		Dish Tare Wt:	g
Comments		Sample Wt:	g
Test:	Run:	Dish No:	
Vol. of Solvent		Dish + Sample Wt:	g
Log Number		Dish Tare Wt:	g
Comments		Sample Wt:	g

*Solvent Residue _____ ug/ml = [(Sample Wt. _____ g) (10^6)]/Vol. of Sol. _____ ml

EPA-M5 Acetone Residue Blank Spec. ≤ 7.8 ug/ml

✓SV

	RUN 4	RUN	RUN	RUN
Results of Solvent Rinse g	0.0015	D-4		

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Filter Gravimetrics Reporting Sheet

Fiter Type: [X] EPA Method 5 ☐ EPA Method 29 ☐ EPA Method 202 ☐ Other_____

Job: LP/HAYWARD
Date Submitted:
Date of Analysis: 4-8-6

Source/Site: LINE 1 KONUS STACK
Test No.: 18
Technician: SCB

Test: 1D Run: 0	Filter No: 7988
Field Blank:	Filter Type: 4" G.F.
Log No: 7451-56F	Filter + Sample Wt: .9561 g
Color: WHITE	Filter Tare Wt: .8561 g
	Sample Wt: .0000 g
Test: 1D Run: 1	Filter No: 7989
Log No: -57F	Filter Type: 4" G.F.
Color: LIGHT TAN	Filter + Sample Wt: .8694 g
	Filter Tare Wt: .8463 g
	Sample Wt: .0231 g
Test: 1D Run: 2	Filter No: 7977
Log No: -58F	Filter Type: 4" G.F.
Color: LIGHT TAN	Filter + Sample Wt: .9824 g
	Filter Tare Wt: .9597 g
	Sample Wt: .0227 g
Test: 1D Run: 3	Filter No: 7986
Log No: -59F	Filter Type: 4" G.F.
Color: LIGHT TAN	Filter + Sample Wt: .8771 g
	Filter Tare Wt: .8565 g
	Sample Wt: .0206 g

√gV

	RUN 0	RUN 1	RUN 2	RUN 3
Results of Filter Analysis g	.0000	.0231	.0227	.0206

	RUN	RUN	RUN	RUN
Total Mass g				

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Sample Chain of Custody

Job LP/HAYWARD Source LINE No. 1 KOLUS Site STACK Log No. 7451
Field Engineer J. BAZNVILLE Date of Test 3-21-96 Test No. 18 No. of Runs 4

No. Items	Sample Type		Analysis		Sequence No.	Comments
	Probe Wash: ☒ Acetone ☐ $MeCl_2$	☐ DI Water ☐ _____	☒ EPA M-5 ☐ EPA M-29	☐ EPA M-201A ☒ _____		
	Filter: ☒ 4" Glass ☐ SS Thimble	☐ Pallflex ☐ 2.5" Glass	☐ EPA M-5 ☐ EPA M-29 ☐ EPA M-201A	☐ EPA M-17		
	Impingers: ☒ DI Water ☐ 3% H_2O_2 ☐ 1N NaOH ☐ 2,4-DNPH	☐ H_2SO_4 ☐ HNO_3/H_2O_2 ☐ $KMnO_4/H_2SO_4$ ☒ ACETONE RINSE	☐ MN Protocol ☒ WI Protocol ☐ EPA M-202 ☐ EPA M6,8 ☐ Acid Gases	☐ IA Protocol ☐ Formaldehyde ☐ EPA M-29 ☐ EPA M-26 ☐ _____		
	Integrated Gas: ☒ Tedlar Bag	☐ _____	☐ EPA M-3 ☐ _____	☐ EPA M-10		
—	**Oxides of Nitrogen:**		☐ EPA M-7A ☐ _____			
	Fuel Lab: ☒ Fuel Sample	☐ Aggregate	☐ Per S-0163			
—	**Particle Sizing:**		☐ X-Ray Sdgraph ☐ _____	☐ Cascade Imp		
—	**Miscellaneous:**	☐ _____	☐ _____			

Fuel Type:
Coal: ☐ Bituminous ☐ Anthracite ☐ Lignite
Wood: ☒ Wood Waste ☐ Dust ☐ Bark
Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6
Misc: ☐ Natural Gas ☐ RDF ☐ _____

Relinquished by/Affiliation	Accepted by/Affiliation	Date
James Baznville INTERPOLL LABS	Interpoll	3/20/96 1115

033094-G:\STACK\WP\FORMS\S-278.2

APPENDIX E

OPERATIONAL DATA

HAYWARD LINE 1 THERMAL OIL (REVISED)

CONTENTS PAGE

TEST SCHEDULES 1
LINE 2 THERMAL OIL , DRYER & PRESS DATA SUMMARY 2

LINE 1 THERMAL OIL HEATER MARCH 21, 1996 PM

PRODUCTION/SUMMARY 3
PRESS REPORT 4
PRESS CHARTS 5
KONUS DATA SHEETS 6-8
PRESS RTO CHART 9
BOARD WEIGHTS/THICKNESSES 10

HAYWARD TESTING MARCH 21st, 1996
Test schedule

Line 1 Thermal Oil Stack

	POLLUTAN	RUN #1	RUN #2	RUN #3
3-21	PM	850-955	1038-1145	1210-1312

HAYWARD LINE 1 TESTING MARCH 21, 1996
Line 1 process data summary

LINE 1 THERMAL OIL HEATER MARCH 21, 1996 - PM

18.73 =Production rate in Tons per hour
0.58 =K3 estimated Tons per hour of fuel burned based on fuel measurement
10.41 =K3 estimated mmBTU per hour input based on fuel measurement
0.88 =K4 estimated Tons per hour of fuel burned based on fuel measurement
15.77 =K4 estimated mmBTU per hour input based on fuel measurement
1.45 =Total tons of dry bark per hour input
26.18 =Total mmBTU per hour input

2

HAYWARD LINE 1 MARCH 21, 1996
THERMAL OIL STACK - PM

DATA TIME	START=	08:45	END=	08:55	HOURS=	0.17
	START=	09:10	END=	13:15	HOURS=	4.08
					TOTAL=	4.25

BOARD WEIGHTS - LBS

average weights determined by taking bundle weights divided by peices per unit over the testing period.

7/16"

per/peice 48.77

per/ 8' x 16' 195.07

PLANT PRODUCTION RATE

4.25	=hours during testing
68	=pressloads
816	=no. of 8'x16' boards produced (pressloads x 8 boards per load)
159,179	=lbs of finished product (boards produced x weight of finished board)
37,454	=lbs of finished product per hour (lbs of finshed product / hours)
18.73	=tons of finished product per hour (lbs of finshed product per hour / 2000 lb)

FUEL BURNING RATE ESTIMATED BY BARK INPUT

K1

13.89	=K1 fuel callbration in pounds per count
589	=K1 counts during testing hours
8,181	=K1 lbs of wet fuel burned during testing
4.25	=hours during testing
39.90%	=average moisture content of fuel
4,917	=total pounds of dry fuel burned during testing (wet pounds x (1- moisture content))
1,156.92	=lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
0.58	=tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
9,000	=estimated BTU content per pound of dry fuel,
10.41	=estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)

K2

13.89	=K2 fuel calibration in pounds per count
892	=K2 counts during testing hours
12,390	=K2 lbs of wet fuel burned during testing
4.25	=hours during testing
39.90%	=average moisture content of fuel
7,446	=total pounds of dry fuel burned during testing (wet pounds x (1- moisture content))
1,752.07	=lbs of dry fuel burned per hour during testing (pounds of dry fuel / testing hours)
0.88	=tons of dry fuel burned per hour during testing (pounds of dry fuel / 2000 lbs)
9,000	=estimated BTU content per pound of dry fuel,
15.77	=estimated mmbtu input per hour (lbs of dry fuel per hour x btu content)

FUEL BURNING RATE ESTIMATED TEMPERATURE DIFFERENTIAL

K1

454.40	=average incoming oil temperature on degrees f.
481.30	=average outgoinging oil temperature on degrees f.
60	=temperature differential at 100% capacity in degrees f
26.9	=actual temperature differential
19.4	=maximum mmbtu input at 100% capacity
8.70	=estimated mmbtu input per hour (actual temp. diff. / max temp. diff.) x max mmbtu input
9,000	=estimated BTU content per pound of dry fuel,
0.48	=estimated tons of dry fuel burned per hour during testing (btu input / btu content of dry fuel/2000)

K2

428.30	=average incoming oil temperature on degrees f.
471.40	=average outgoinging oil temperature on degrees f.
60	=temperature differential at 100% capacity in degrees f
43.1	=actual temperature differential
19.4	=maximum mmbtu input at 100% capacity
13.94	=estimated mmbtu input per hour (actual temp. diff. / max temp. diff.) x max mmbtu input
9,000	=estimated BTU content per pound of dry fuel,
0.77	=estimated tons of dry fuel burned per hour during testing (btu input / btu content of dry fuel/2000)

PRESS REPORT - LINE (1) 2 DATE: 2.17.06.

OPERATOR MEARS SHIFT: 4th CREW: C

THICKNESS 7/16 PRESS LDS: 196 7/16

OVERALL TIMER: 157 DECOMPRESSION TIME: 14←1

PRESS TEMP: 215 TOTAL REJECTS: —

LOG COUNT: 1,435

LINE SPEED	THKNS.	FROM	TO
55	7/16	700	923
58	7/16	923	210
59	7/16	210	700

S-89
C 23

F.C.O.S. HYD. RADIATOR: 10:00 TIME

PRESS BLOWN DOWN: 9:30

SPINNER HEADS FLUSHED: — TIME

SURFACE BLENDER HOSED: — TIME

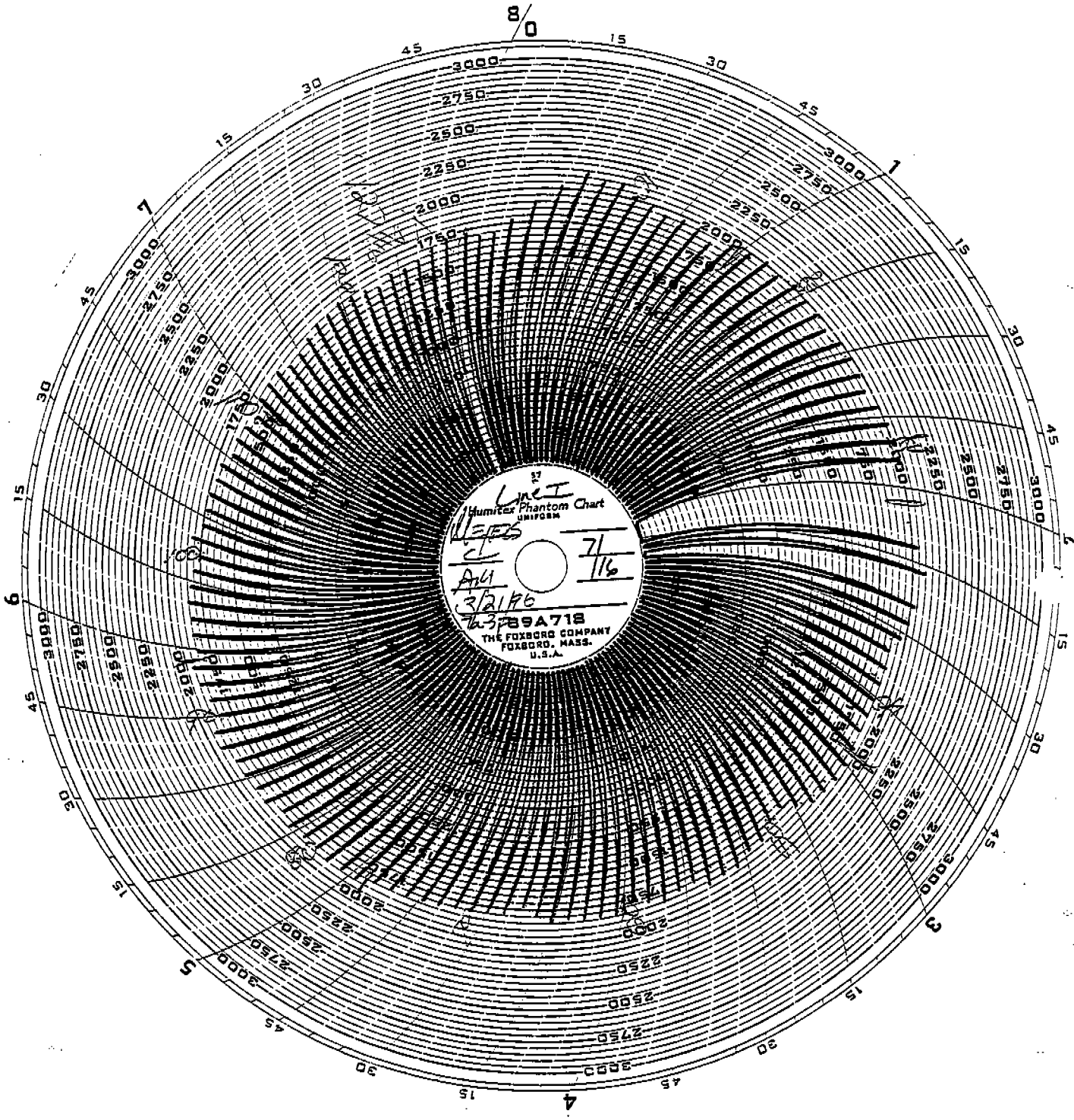
FORMER HYD RADIATOR: — TIME
L.S. C

DOWNTIME FROM	DOWNTIME TO	DOWNTIME (MINS) M	E	O	KEY	REASONS FOR DOWNTIME
—	—	—				Replaced Trim Screen.
900	9:18		18			Fuse blown for Loader Elect Brake
						Kept tripping out Loader Elect.

DOWNTIME CODE: M - MECHANICAL 18 E - ELECTRICAL O - OPERATOR

4

LINE I
PRESS CHART
3/21/96
0700 - 1500



5

KONUS DATA READINGS EVERY 10 MINUTES / BY Pat m DATE 3-21-96 PAGE 1 OF 1

PLANT Hayward L.P.

TIME	K1 OIL IN TEMP	K1 OIL OUT TEMP	K1 I.D. FAN W.C	K2 OIL IN TEMP	K2 OIL OUT TEMP	K2 I.D. FAN W.C	K3 OIL IN TEMP	K3 OIL OUT TEMP	K3 I.D. FAN W.C	K4 OIL IN TEMP	K4 OIL OUT TEMP	K4 I.D. FAN W.C	FUEL COUNT K1	FUEL COUNT K2	FUEL COUNT K3	FUEL COUNT K4	ONCE/HR BARK MOISTURE
8:30	234	253	-0.4	219	233	-3							333	412			40.1
8:45	233	251	-0.4	219	241	-2.6							560	472			39.6
9:00	235	254	-0.3	221	247	-2.2							418	519			39.8
9:15	239	256	-0.4	219	253	-2.0							457	561			40.5
9:30	239	258	-0.4	225	250	-2.4							490	605			39.3
9:45	232	250	-0.4	219	245	-2.2							528	661			40.2
10:00	232	244	-0.4	219	244	-2.4							556	702			40.3
10:15	232	246	-0.4	219	240	-2.4							593	757			39.6
10:30	232	244	-0.4	216	238	-2.4							629	816			
10:45	233	256	-0.4	220	242	-2.2							672	873			
11:00	236	256	-0.4	223	249	-2.4							717	929			
11:15	240	257	-0.4	227	248	-2.4							770	997			
11:30	235	254	-0.4	220	239	-2.6							819	1059			
11:45	236	253	-0.4	221	244	-2.4							864	1106			
12:00	237	256	-0.4	224	251	-2.2							911	1145			
12:15	235	247	-0.4	221	246	-2.2							953	1184			
12:30	232	241	-0.4	217	237	-2.4							1004	1271			
12:45	233	241	-0.5	218	242	-2.4							1050	1276			
1:00	234	240	-0.5	218	241	-2.4							1105	1325			
1:15	231	241	-0.5	216	237	-2.6							1149	1364			
1:30	234	252	-0.4	220	243	-2.4							1201	1422			
1:45	234	254	-0.4	220	244	-2.4							1251	1475			
2:00	238	256	-0.4	225	246	-2.2							1291	1524			
2:15	235	255	-0.5	225	249	-2.2							1335	1586			
2:30	241	256	-0.4	229	251	-2.2							1374	1631			
2:45	234	250	-0.5	221	250	-1.6							1416	1685			
3:00	231	253	-0.4	220	248	-2.2							1458	1729			

E-7

6

Konus EFB Readings
Plant Hayward L.P.
readings every 10 minutes

date 3-21-96
by Pat M

time	K1 and K2						K3 and K4					
	Bed Volt	Bed Current	Ion Volt	Ion Current	EFB Press.	Baghouse Press.	Bed Volt	Bed Current	Ion Volt	Ion Current	EFB Press.	Baghouse Press.
8:30	11.5	1.4	30	3.8	0.8	3.5						
8:45	4.5	1.4	28	3.8	1.6	2.5						
9:00	12.0	1.6	28	3.6	2.0	2.0						
9:15	12.0	1.4	28	3.4	2.2	2.5						
9:30	12.0	1.4	28	3.6	2.2	2.5						
9:45	12.0	1.6	28	3.6	2.4	2.0						
10:00	12.0	1.6	28	3.6	2.6	2.0						
10:15	12.0	1.6	28	3.6	2.6	2.0						
10:30	12.0	1.6	28	3.8	2.6	2.0						
10:45	11.5	1.6	28	3.8	2.0	2.5						
11:00	11.5	1.8	27	4.0	1.8	2.0						
11:15	11.5	2.0	27	4.0	1.8	2.5						
11:30	11.5	2.0	27	3.6	1.8	2.0						
11:45	10.0	1.8	27	4.0	2.0	2.5						
12:00	11.5	2.0	28	3.4	2.2	2.5						
12:15	11.5	2.0	27	3.4	2.0	2.5						
12:30	11.5	1.8	27	3.6	2.4	2.0						
12:45	11.5	1.8	27	3.6	2.6	2.0						
1:00	9.0	1.6	27	3.8	2.4	2.5						
1:15	11.5	1.6	27	3.8	2.2	2.5						
1:30	11.5	1.8	28	3.6	2.0	2.5						
1:45	9.5	2.2	29	3.8	2.0	2.5						
2:00	11.5	2.0	29	3.8	2.0	2.0						
2:15	11.6	2.0	28	3.6	2.2	2.5						
2:30	11.0	2.0	29	3.6	2.0	2.0						
2:45	11.0	2.2	28	3.8	2.0	2.5						
3:00	11.0	2.0	28	3.8	2.0	2.5						

E-8

SHIFT: (I) OR II
LINES 1 & 2

K-1 - K-2

	7	8	9	10	11	12	1	2	3	4	5	6
Bed Voltage (KV)	13	12.5	12	12	11.5	11.5	11.5	11.5	10	11	11	11
Bed Amperage (MA)	.08	.10	.14	.15	.17	.20	.16	.18	.20	.21	.22	.22
Ionizer Voltage (KV)	27	28	28	27	29	29	28	29	28	28	28	26
Ionizer Amperage (MA)	3.0	3.2	3.6	3.8	3.9	3.4	3.6	3.9	4.0	3.6	3.0	3.4
EFB Pressure Drop (In.)	0	1.7	1.7	2.2	2.6	2.2	2.4	2.1	2.0	1.8	1.6	1.6
Inlet Temperature	378	395	404	411	416	418	403	411	418	419	420	419
Outlet Temperature	290	299	303	312	320	323	323	323	327	327	330	329
Rock Flow	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Condition Code*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

Rock Usage/Shift: _____

K-3 - K-4

	7	8	9	10	11	12	1	2	3	4	5	6
Bed Voltage (KV)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	7	7	7	7	7
Bed Amperage (MA)	.20	.20	.20	.19	.18	.18	.20	.20	.18	.18	.18	.17
Ionizer Voltage (KV)	21	21	21	21	26	26	21	21	21	21	21	21
Ionizer Amperage (MA)	2.0	2.0	2.0	2.1	2.6	2.0	2.0	2.2	2.0	2.0	2.1	2.2
EFB Pressure Drop (In.)	.04	.04	.05	.04	.04	.04	.05	.04	.04	.04	.04	.04
Inlet Temperature	499	475	484	449	439	439	443	435	449	453	448	480
Outlet Temperature	395	398	396	397	403	403	407	403	404	405	407	408
Rock Flow	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
Condition Code*	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

Rock Usage/Shift: _____

Baghouse Pressure Drop: (in.)		7	8	9	10	11	12	1	2	3	4	5	6
	L-I	2.4	2.3	2.5	2.4	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.1
	L-II	4.8	4.8	4.8	4.7	4.7	4.7	4.4	4.4	4.6	4.4	4.4	4.6

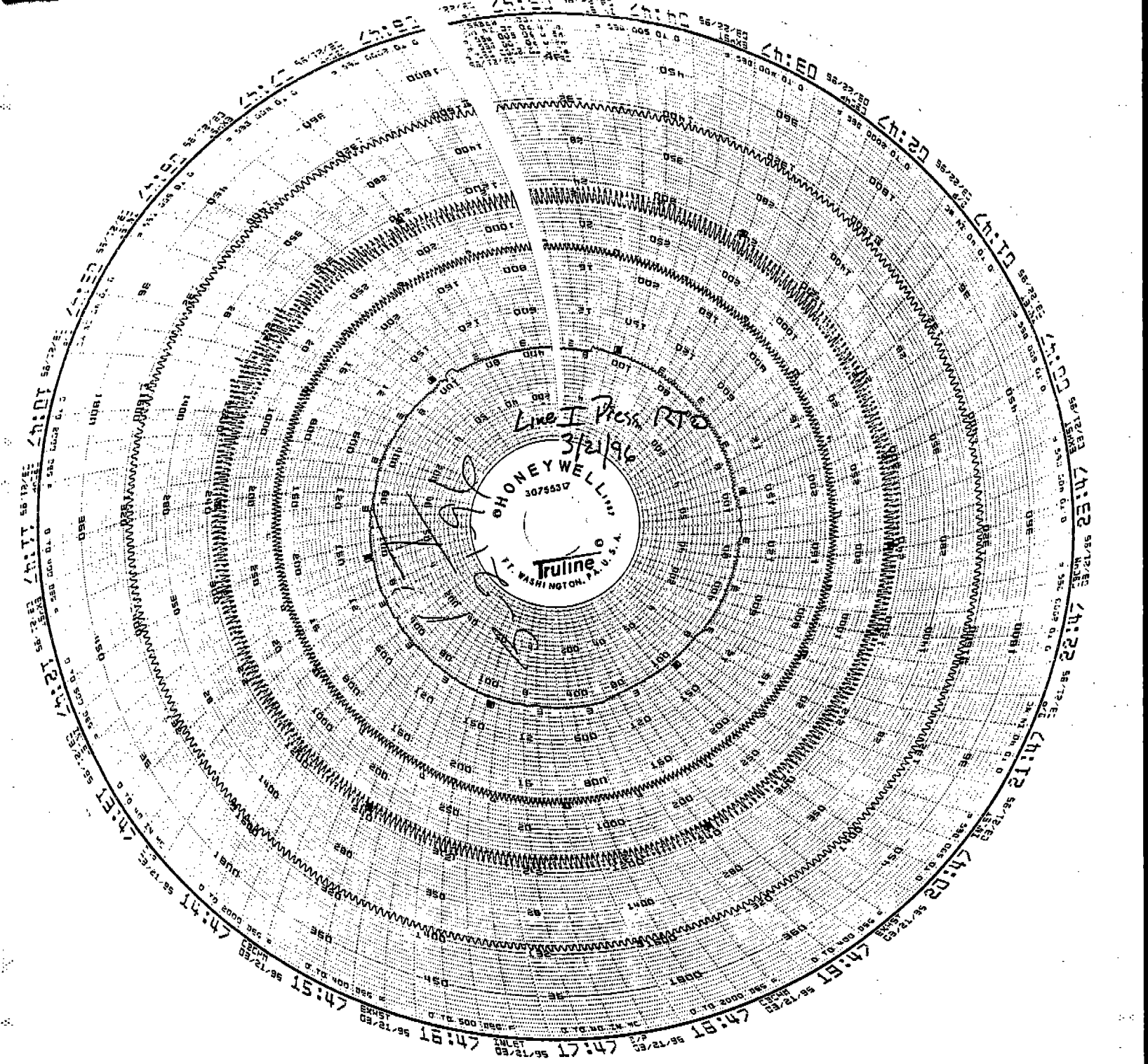
Comments/Problems: _____

*Condition Codes
1) Start up/shutdown
2) Konus down
3) Moisture in bed
4) Adding rock
5) Power Outage
6) Checking EFB
7) Konus on oil
8) Maintenance

VOLUME PER SHIFT

LINE I	1½
LINE II	1½

123/EFBFORMS/KNSRPT


Line I Press. RTD
3/21/96
HONEYWELL
Truline
FT. WASHINGTON, PA. U.S.A.

DATE: 3-21-96 - 1
SHIFT/CREW: 1A 2B C
OPERATOR: AK W SW

3/21 1-3
16 11475

UNIT/ THICKNESS	WEIGHT	HEIGHT	UNIT/ THICKNESS	WEIGHT	HEIGHT
7/16	#4206	39 3/4	7/16 36	#4433	39 3/4
2	Called	39 3/4	37		39 1/2
3		40	38		39 5/8
4	#4208	39 5/8	39		39 5/8
5		40	40	#4376	39 5/8
6		40	41		39 3/4
7	Called	40	42		39 5/8
8	#4411	40 1/4	43		39 1/2
9		39 7/8	44	#4436	39 1/2
10		39 1/2	45		39 1/2
11		39 1/2	46		39 3/4
12	#4418	39 1/2	47		39 3/4
13		39 1/2	48	#4569	39 3/4
14		39 1/2	49		39 3/4
15		39 5/8	50		39 3/4
16	#4412	39 1/2	51		39 3/4
17		39 1/2	52	#4451	39 1/2
18		39 1/2	53		39 3/4
19		39 3/8	54		39 5/8
20	#4442	39 1/2	55		39 3/4
21		39 1/2	56	4360	39 1/2
22		39 1/2	57		39 3/4
23		39 1/2	58		39 1/2
24	#4430	39 1/2	59		39 3/4
25		39 3/8	60	4331	39 3/4
26		39 1/2	61		39 1/2
27		39 1/4	62		39 1/2
28	#4446	39 1/2	63		39 1/2
29		39 1/2	64	#4379	39 1/2
30		39 1/2	65		39 3/4
31		39 5/8	66		39 3/4
32	#1453	39 5/8	67	Called	40
33		39 3/4	68	4342	40
34		39 5/8	69		39 7/8
35		39 3/4	70		39 1/2

APPENDIX F

PROCEDURES

Particulate Loading and Emission Rates

The particulate emission rates were determined per EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1992). In this procedure a preliminary velocity profile of the gases in the flue is obtained by means of a temperature and velocity traverse. On the basis of these values, sampling nozzles of appropriate diameter are selected to allow isokinetic sampling, a necessary prerequisite for obtaining a representative sample.

The sampling train consists of a heated glass-lined sampling probe equipped with a Type S pitot and a thermocouple. The probe is attached to a sampling module which houses the all-glass in line filter holder in a temperature controlled oven. The sampling module also houses the impinger case and a Drierite filled column. The sampling module is connected by means of an umbilical cord to the control module. The control module houses the dry test gas meter, the calibrated orifice, a leakless pump, two inclined manometers, and all controls required for operating the sampling train.

Particulate samples are collected as follows: The sample gas is drawn through the sampling probe isokinetically and passed through a 4-inch diameter Gelman Type A/E glass fiber filter where particulates are removed. The sample gas is then passed through an ice-cooled impinger train and a desiccant-packed column which absorbs remaining moisture. The sample gas then passes through a vacuum pump followed by a dry test gas meter. The gas meter integrates the sample gas flow throughout the course of the test. A calibrated orifice attached to the outlet of the gasmeter provides real time flow rate data.

A representative particulate sample was acquired by sampling for equal periods of time at the centroid of a number of equal area regions in the duct. The sampling rate is adjusted at each test point maintaining isokinetic sampling conditions. Nomographs are used for rapid determination of the sampling rate.

Particulate Loading and Emission Rates

After sampling is complete, the filter is removed and placed in a clean container. The nozzle and inlet side of the filter holder are quantitatively washed with acetone and the washings are stored in a second container. A brush is often used in the cleaning step to help dislodge deposits. The samples are returned to the laboratory where they are logged in and analyzed. The volume of the acetone rinse ("probe wash") is noted and then the rinse is quantitatively transferred to a tared 120 cc porcelain evaporating dish and the acetone evaporated off at 97-105 °F. This temperature is used to prevent condensation of atmospheric moisture due to the cooling effect induced by the evaporation of acetone. The acetone-free sample is then transferred to an oven and dried at 105 °C for 30 minutes, cooled in a desiccator over Drierite, and then weighed to the nearest .01 mg. The filter sample is quantitatively transferred to a 6-inch watch glass and dried in an oven at 105 °C for two hours. The filter and watch glass are then cooled in a desiccator and the filter weighed to the nearest .01 mg. All weighings are performed in a balance room where the relative humidity is hydrostatted to less than 50% relative humidity. Microscopic examination of the samples is performed if any unusual characteristics are observed. The weight of the acetone rinse is corrected for the acetone blank. The Drierite column is weighed on-site and the water collected by Drierite is added to the condensate so that the total amount of absorbed water may be ascertained.

Integrated flue gas samples for Orsat analysis were collected simultaneously with each pollutant sample. The samples were collected in 15-liter gas sampling bags at a constant flow rate throughout each particulate run. The bags were at a constant flow rate throughout each particulate run. The bags were then returned to the laboratory and analyzed by Orsat analysis. Standard commercially prepared solutions were used in the Orsat analyzer (sat. KOH for carbon dioxide and reduced methylene blue for oxygen).

Condensible Organic Compounds Analysis

(State of Wisconsin - EPA Method 5)

Method II-8672-WI

Equipment: Separatory funnel - 500 cc with Teflon stopcock

Powder funnel - 75 mm ID with a glass wool plug

Evaporating dish(es) - 200 cc or 250 cc beaker

Reagents: Methylene chloride

Sodium sulfate - (ACS) granular anhydrous (purified by heating for four hours in a shallow tray)

SAMPLING

An all-glass impinger assembly is used in the back half of the EPA Method 5 sampling train when an organic wet catch is to be collected. The impinger assembly consists of a modified impinger, a Greenburg Smith impinger followed by another modified impinger. The third impinger should have a temperature measuring device at the outlet upstream of a final impinger or desiccant column to monitor the temperature of the outlet gas stream. Prior to the start of the test, each of the first two impingers should be charged with 100 g of Class I water. The Method 5 train should be operated as provided for in EPA Method 5. Ice should be added to the impinger bath to keep the temperature of the gas at the outlet at or less than 68°F. After the post test leak check, the impinger train is removed and impinger contents poured into a tared all-glass sample bottle and closed with a Teflon-lined cap. The sample bottle is then weighed and the total condensate calculated by subtraction of the bottle tare weight and the weight of initial water added to the impingers (200 g). A label is affixed and the sample is returned to the laboratory for analysis. The sample should be stored at 4°C if the analysis is not conducted within 48 hours.

ANALYSIS

1. Sample bottles are removed from storage and the contents quantitatively transferred to a clean 500 cc separatory funnel equipped with a Teflon stopcock.

2. Rinse the sample container with distilled water and add to separatory funnel.

3. Then rinse the sample container with acetone and pour through sodium sulfate into a tare beaker marked A.

4. The sample is then extracted consecutively with three 50 cc aliquots of methylene chloride. The extraction is performed according to normal laboratory practice observing the customary safety precaution of releasing excess pressure after each shaking.

5. After each of the three extractions are completed, the organic solvent should be dried by passing it through a funnel containing anhydrous sodium sulfate and collecting it and two 50 cc rinses in the tared beaker marked A (the same one used to catch the acetone container rinse).

6. Evaporate to dryness in a hood at 70°F or less. Do not evaporate so quickly as to allow evaporative cooling to lower the temperature of the container below the dew point otherwise water will be condensed in the container.

7. Desiccate for two hours in a sealed desiccator and final weigh. Report all results in grams. All weighings should be made to nearest 0.1 mg (four places).

8. The remaining liquid in the separatory funnel is then transferred to a tared beaker marked B and is evaporated to dryness at 220°F ± 10°F. The analyst may take an aliquot of the sample, transferring it to a tared beaker and evaporate to dryness at 220°F ± 10°F. If an aliquot is used, the weight of the sample and aliquot will have to be taken to correct for the total sample weight.

9. After the drying step, the sample is cooled in a desiccator and weighted to a constant weight to the nearest 0.1 mg.

Calculation (if aliquot is taken):

$$\text{grams} = \frac{(\text{grams recovered from aliquot}) \times (\text{total volume (ml) or grams of sample})}{(\text{aliquot volume (ml) or grams used})}$$

If volume is used, it must be used for both the aliquot and sample. The same goes for using weight.

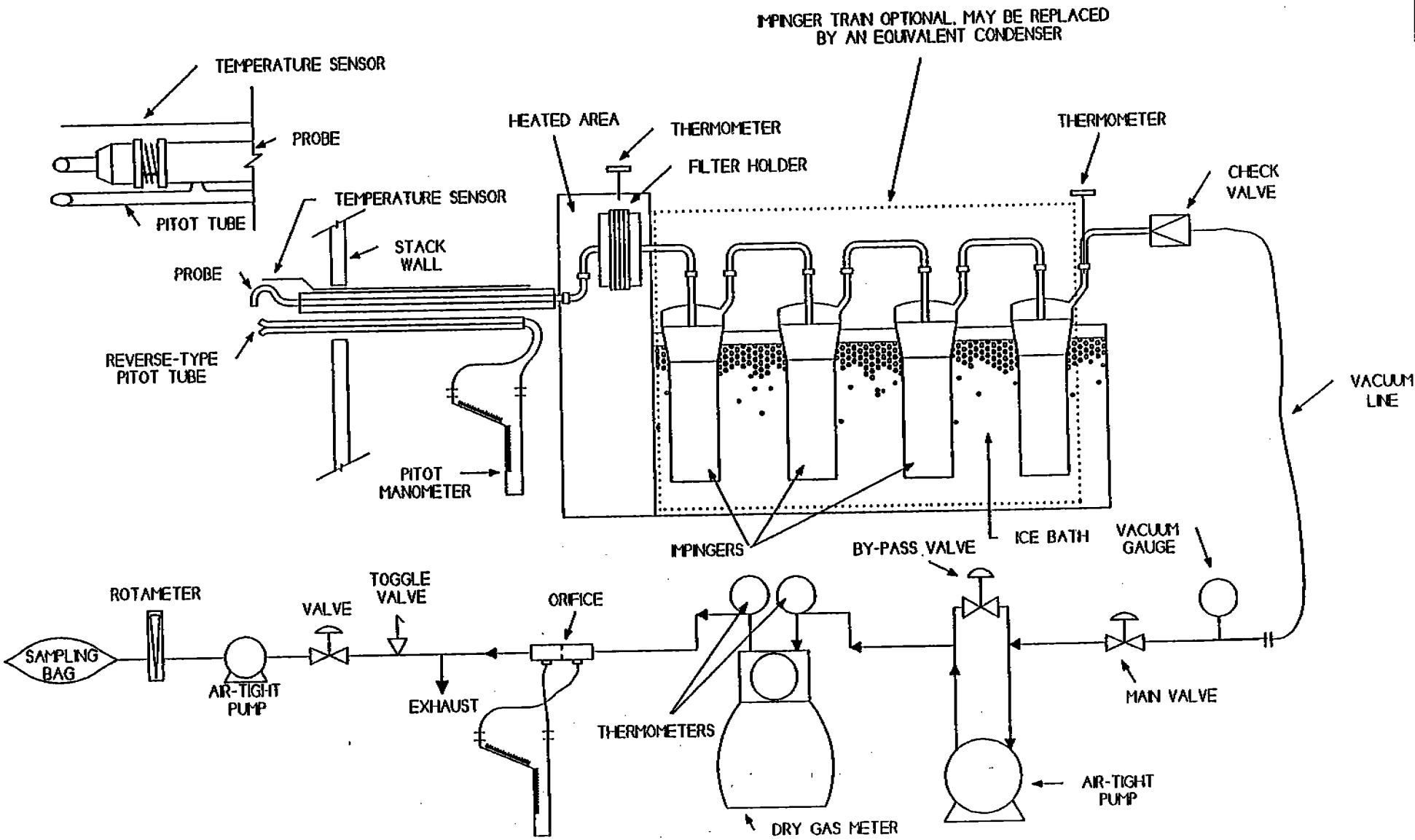
10. A field blank should be analyzed in an identical manner. If a field blank is not submitted, take an aliquot of Class I water equal in volume to the samples and analyze in a similar manner.

11. The results for container A are to be marked in the organic section of Interpoll Form #LSC-03G.

12. The results for container B are to be marked in the inorganic section of Interpoll Form #LSC-03G.

Interpoll Laboratories
(612) 786-6020

PARTICULATE SAMPLING TRAIN



APPENDIX G

CALCULATION EQUATIONS

METHOD 2
CALCULATION EQUATIONS

$$\overline{V_s} = 85.49\ C_p\ (\sqrt{\Delta p})_{avg}\ \sqrt{\frac{T_{s(avg)}}{P_s\ M_s}}$$

$$Q_{s,\,d} = 60\ (1\ -B_{ws})\ \overline{V_s}\ A\ (\frac{528}{T_{s\ (avg)}})\ (\frac{P_s}{29.92})$$

$$Q_a = 60\ \overline{V_s}\ A$$

$$\dot{m}_g = \frac{4.995\ Q_{s,\,d}\ G_d}{1\ -\ B_{ws}}$$

$$RH^* = 100\ (vp_{twb}\ -\ 0.0003641\ P_s\ (T_{db}\ -\ T_{wb}))/vp_{tdb}$$

$$B^*_{ws} = RH(vp_{tdb})/P_s$$

$$\rho = \frac{4.585\ x\ 10^{-2}\ P_s M_s}{T_s\ (avg)}$$

*Alternate equations for calculating moisture content from wet bulb and dry bulb data.

SYMBOLS

A	=	Cross Sectional area of stack, SQ. FT.
A_n	=	Cross sectional area of nozzle, SQ. FT.
B_{ws}	=	Water vapor in gas stream, proportion by volume
C_p	=	Pitot tube coefficient, dimensionless
C_a	=	Concentration of particulate matter in stack gas, wet basis, GR/ACF
C_s	=	Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, GR/DSCF
EA	=	Excess air, percent by volume
γ	=	Dry test meter correction factor, dimensionless
G_d	=	Specific gravity (relative to air), dimensionless
I	=	Isokinetic variation, percent by volume
M_d	=	Molecular weight of stack gas, dry basis, g/g - mole.
$\dot{m}_g$	=	Mass flow of wet flue gas, LB/HR
$\dot{m}_p$	=	Particulate mass flow, LB/HR
M_s	=	Molecular weight of stack gas, wet basis, g/g mole.
M_{tp}	=	Total amount of particulate matter collected, g
P_{bar}	=	Atmospheric pressure, IN. HG. (uncompensated)
P_g	=	Stack static gas pressure, IN. WC.
P_s	=	Absolute pressure of stack gas, IN. HG.
P_{std}	=	Standard absolute pressure, 29.92 IN. HG.
A_a	=	Actual volumetric stack gas flow rate, ACFM
$Q_{s,d}$	=	Dry volumetric stack gas flow rate corrected to standard conditions, DSCFM
RH	=	Relative humidity, %

T_{db}	=	Dry bulb temperature of stack gas, °F
T_{wb}	=	Wet bulb temperature of stack gas, °F
$T_{m(avg)}$	=	Absolute average dry gas meter temperature, °R
$T_{s(avg)}$	=	Absolute average stack temperature, °R
T_{std}	=	Standard absolute temperature, 528 °R (68 °F)
θ	=	Total sampling time, min.
V_{lc}	=	Total volume of liquid collected in impingers and silica gel, ml
V_m	=	Volume of gas sample as measured by dry gas meter, CF
$V_{m(std)}$	=	Volume of gas sample measured by the dry gas meter corrected to standard conditions, DSCF
$V_{w(std)}$	=	Volume of water vapor in the gas sample corrected to standard conditions, SCF
$\bar{V}_s$	=	Average actual stack gas velocity, FT/SEC
vp_{tdb}	=	Vapor pressure at T_{db}, IN. HG.
vp_{twb}	=	Vapor pressure at T_{wb}, IN. HG.
$\overline{\Delta H}$	=	Average pressure differential across the orifice meter, IN. WC.
ΔP	=	Velocity pressure of stack gas, IN. WC.
γ	=	Dry test meter correction coefficient, dimensionless
ρ	=	Actual gas density, LB/ACF

METHOD 3
CALCULATION EQUATIONS

$$\%EA = \frac{100(\%O_2 - 0.5\%\ CO)}{0.264\%\ N_2 - \%O_2 + 0.5\%\ CO}$$

$$M_d = 0.44(\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2 + \%CO)$$

$$M_s = M_d\ (I - B_{ws}) + 0.18\ B_{ws}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

METHOD 5
CALCULATION EQUATIONS

$$V_{m(std)} = 17.65\ V_m\ \gamma\ \left(\frac{P_{bar} + \overline{\Delta H}/13.6}{T_{m(avg)}}\right)$$

$$V_{w(std)} = 0.0472\ V_{lc}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

$$I = 0.0944\ \left(\frac{T_{s(avg)}\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (I - B_{ws})}\right)$$

$$C_s = \frac{15.43\ M_p}{V_{m(std)}}$$

$$C_a = \frac{272.3\ M_p\ P_s}{T_{s(avg)}\ (V_{w(std)} + V_{m(std)})}$$

$$(\dot{m}_p)_1 = 8.5714\ x\ 10^{-3}\ C_s\ Q_{s,d}$$

$$(\dot{m}_p)_2 = \frac{1.3228 \times 10^{-1} M_p A}{\theta A_n}$$

$$\dot{m}_p = \frac{(\dot{m}_p)_1 + (\dot{m}_p)_2}{2}$$

APPENDIX H

SAMPLING TRAIN CALIBRATION DATA

INTERPOLL LABORATORIES, INC.
(612) 786-6020

EPA Method 5 Gas Metering System Quality Control Check Data Sheet

Job LP HAYWARD Date 3-21-96

Operator J. BATEVILLE J. LOMEVIC Module No. 13

Instructions:
Operate the control module at a flow rate equal to ΔH@ for 10 minutes before attaching the umbilical.

Record the following data: 1.0023

Bar press 29.26 in.Hg θ = 1.67 ΔH@ 1.82 in.WC.

Time (min)	Volume (CF)	Meter Temp (°F)	
		Inlet	Outlet
	(450.90)		
2.5	452.74	32	18
5.0	454.57	36	19
7.5	456.36	37	20
10	458.14	46	21
	V_m = 7.24	Avg(t_m) = 27.9	°F

Calculate Y_m as follows:

$$Y_m = \frac{1.786}{\theta V_m} \left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_m = \frac{1.786}{(1.0023)(7.24)} \left[\frac{(27.9) + 460}{(29.26)}\right]^{0.5}$$

$$Y_m = 1.005$$

If Y_m is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

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Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: March 26, 1996

Meter Box No. : 13 (Rockwell Dry Test Meter Serial No. 1334119)

Date of Last Calibration: January 5, 1996
Calibration Technician: S. Fjelsta
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
March 19, 1996	6-7451	315.18	639.72	324.54	324.54

* Total volume through meter since last calibration.

H-2

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Meter Calibration Sheet EPA/Method 5

Date 1-5-95
Bar. Press. 29.60 IN.HG
Wet Test Meter No. AL-20

Control Module No. 13
Serial No. DTM 1334118
Technician SF

ΔH (IN.WC)		Gas Volume Wet Test Meter	* Cal. Index	* Diff. Wet Test Meter	Gas Volume Dry Test Meter (ft³)		Gas Temperatures			Time	Meter Coeff.	Orifice Const.	C_1
							Wet Test	Dry Test					
Nominal	Actual	(ft³)	(%)	ΔP_w (IN.WC.)	V_{di}	V_{df}	t_w (°F)	t_{di} (°F)	t_{do} (°F)	θ (Min/Sec)	Y	ΔH@	
0.5	0.5	2	99.85	0.01	295.745	297.811	65	92	72	5/01	0.99664	1.7184	
1.2	1.2	3	99.91	0.025	292.358	295.450	65	95	72	5/01	1.00049	1.8257	
2.0	2.0	3	99.93	0.055	288.874	291.955	65	97	72	3/55	1.00404	1.8506	
3.3	3.3	5	100.00	0.09	282.735	287.843	65	97	71	5/05	1.00581	1.8508	
4.7	4.7	5	100.02	0.12	275.830	280.910	65	94	68	4/16	1.00425	1.8599	
										Avg	1.00225	1.82	
	2	3	4	5	6	7	8	9	10				

Positive leak check performed by SF
Meter was in tolerance
Approved by

Meter was not in tolerance ☐: readjusted linkage
Meter was not in tolerance ☐: changed dry test meter
Date 1/9/96

*Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

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H-3

Interpoll Laboratories, Inc.
(612) 786-6020

S-Type Pitot Tube Inspection Sheet

Pitot Tube No. 23-5

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .460 IN.

Alignment:

4. α_1 < 10° 0
5. α_2 < 10° 0

6. B_1 < 5° 0
7. B_2 < 5° 0

8. Z <.125" .02
9. W <.0625" .01

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .760 IN.
11. Pitot to probe sheath 3.0 IN.
12. Pitot to thermocouple (parallel to probe) 3.0 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☒ Meets all EPA design criteria thus C_p = 0.84
☐ Does not meet EPA design criteria - thus calibrate in wind tunnel.
C_p = _____

Date of Inspection: 2-8-94

Inspected by: [signature]

CFR Title 40 Part 60 Appenidix A Method 2

S-348

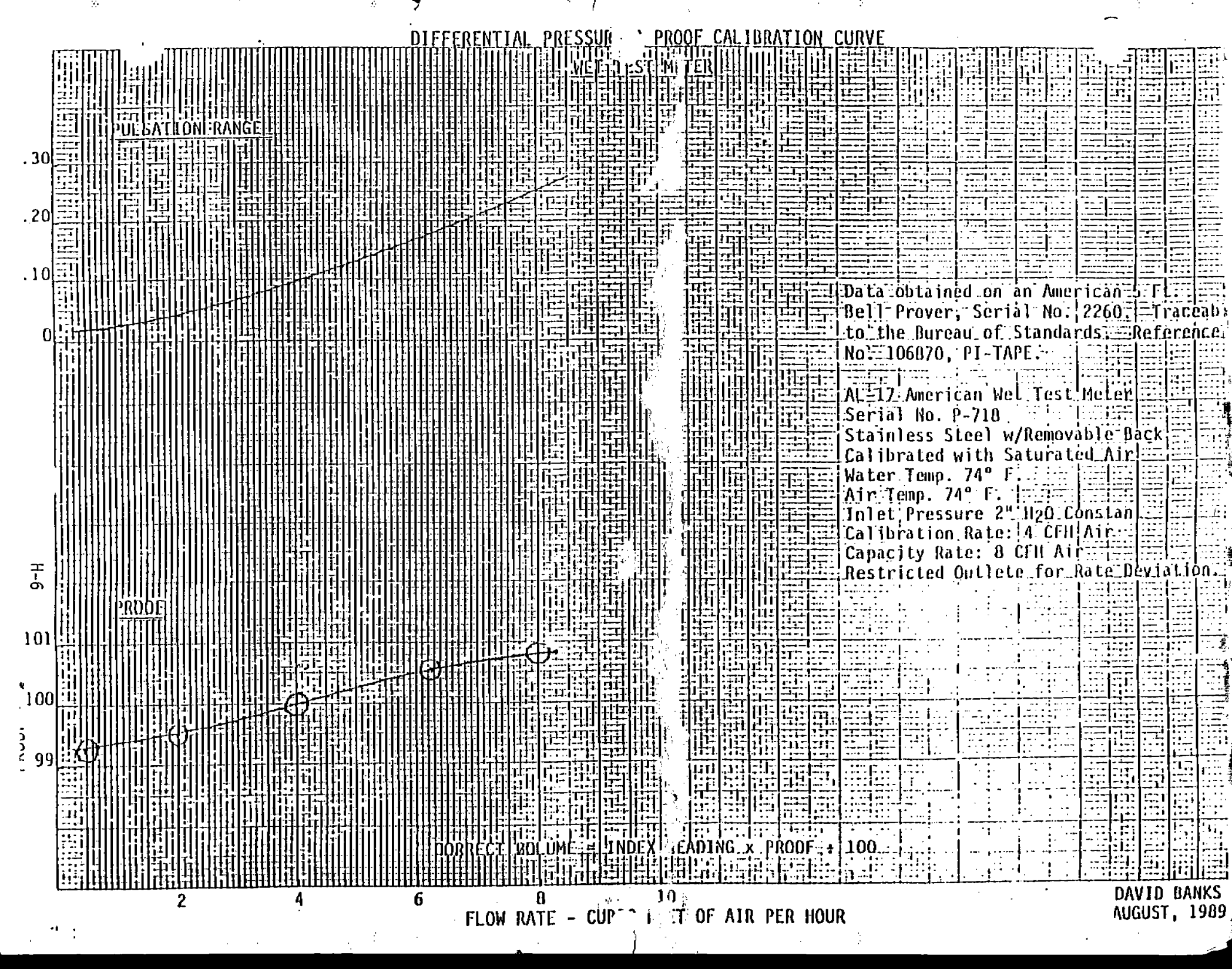
Interpoll Laboratories
(612) 786-6020

Nozzle Calibration Data Sheet

Date of Calibration: 03-21-96
Technician: Jamie Bainville
Nozzle Number: 5-7

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	0.432
2	0.431
3	0.432
Average	0.432


DIFFERENTIAL PRESSUR PROOF CALIBRATION CURVE
WET TEST METER
PULSATION RANGE
.30
.20
.10
0
Data obtained on an American 5 Ft.
Bell Prover, Serial No. 2260. Traceab
to the Bureau of Standards. Reference
No. 106070, PI-TAPE.
AL-17 American Wet Test Meter
Serial No. P-710
Stainless Steel w/Removable Back
Calibrated with Saturated Air
Water Temp. 74° F.
Air Temp. 74° F.
Inlet Pressure 2" H2O Constan
Calibration Rate: 4 CFH Air
Capacity Rate: 8 CFH Air
Restricted Outlete for Rate Deviation.
PROOF
101
100
99
CORRECT VOLUME = INDEX READING x PROOF ÷ 100
2
4
6
8
10
FLOW RATE - CUBIC FEET OF AIR PER HOUR
DAVID BANKS
AUGUST, 1989