Background Report Reference

AP-42 Section Number: 10.6.1

Background Report Section: 4

Reference Number: 101

Title: Compliance EmissionTest Report, Particulate Emissions Compliance Testing, Thermal Oil Heater Stack, Houlton, Maine Waferboard Facility, March 4, 1993

Eastmount Engineering, Inc.

March 1993

FILE COPY

Eastmount Engineering

Environmental Consultants — Air Quality Specialists

4-101)

COMPLIANCE EMISSION TEST REPORT

PREPARED FOR: Louisiana-Pacific Corporation
Route 8, Box 8263
Hayward, Wisconsin 54843

CONCERNING: Particulate Emissions Compliance Testing
Thermal Oil Heater Stack
Houlton, Maine Waferboard Facility
March 4, 1993

PREPARED BY: Eastmount Engineering, Inc.
420 Main Street
Walpole, MA 02081

EAST

I hereby certify that all the information contained in this report is true and accurate to the best of my knowledge.

John Siderwicz (SP)
John Siderwicz
Project Director

3-30-93
Date

TABLE OF CONTENTS

APPENDICES

CHAIN OF CUSTODY

All samples were in my custody during the Particulate Emissions Compliance Test Program conducted at Louisiana-Pacific Corporation's Houlton, Maine facility. This includes the time of initial sample preparation through delivery to Eastmount Engineering's laboratory. The chain of custody with our laboratory was maintained through the use of chain of custody forms which are held on file at Eastmount Engineering's laboratory. They are available upon request.

John Siderwicz (SP)

John Siderwicz
Project Director

1.0 COMPENDIUM

Eastmount Engineering, Inc. conducted a compliance particulate emissions test program on behalf of the Louisiana Pacific Corporation. The emissions test program was performed on the exhaust stack of the thermal oil heater units at their Houlton, Maine Waferboard facility. Testing was performed on March 4, 1993.

The objective of the program was to demonstrate the compliance status of the thermal oil heaters in relation to the emission standards set forth by the Maine Department of Environmental Protection (DEP).

All test methods and procedures were performed in strict accordance with the Environmental Protection Agency's Reference Methods 1 through 5, as found in 40 CFR 60, Appendix A, as amended. Detailed descriptions of the test procedures used may be found in Section 4.0.

Three test runs were conducted to constitute the compliance series. Testing was performed while the thermal oil heaters were firing wood bark products at an average heat input of approximately 28 MMBtu/Hr. Process data is presented in Appendix VI of this report. The results of the particulate emissions test series are presented in Table 1-1 below. All lb/MMBtu calculations are based on the Fd-Factor of 9291 dscf/MMBtu, which was calculated as a result of an analysis of a sample of the wood chips.

Particulate emissions test run number 1 was voided due to a loss of load to the thermal oil heaters mid way through the run.

John Siderwicz, Project Director, was in charge of and responsible for all stack testing, including operating the meter box. He was assisted by Dana Andrews, Environmental Technician, who was in charge of locating the probe at the proper traverse point locations and assisting in the field laboratory. Process operations were monitored and recorded by Ms. Susan Somers of the Louisiana Pacific Corporation. The emissions testing program was witnessed by Mr. Scott Mason of the Maine Department of Environmental Protection.

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TABLE 1-1

PARTICULATE EMISSIONS RESULTS

RUN #	EMISSION RATE		
	GRAINS/DSCF	LB/MMBtu	LB/HR
2	.029	.125	3.56
3	.018	.081	2.21
4	.017	.069	2.00
AVG.	.021	.092	2.59
ALLOWED		.15	7.38

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2.0 STACK SCHEMATIC

The following page details a schematic of the Konus oil heater exhaust stack which services the thermal oil heaters at Louisiana Pacific's Houlton, Maine facility.

Defined are the sampling port locations, interior stack dimensions and distances from the ports to the nearest upstream and downstream disturbances.

Figure 2-1 on the following page provides a schematic of the sampling port locations.

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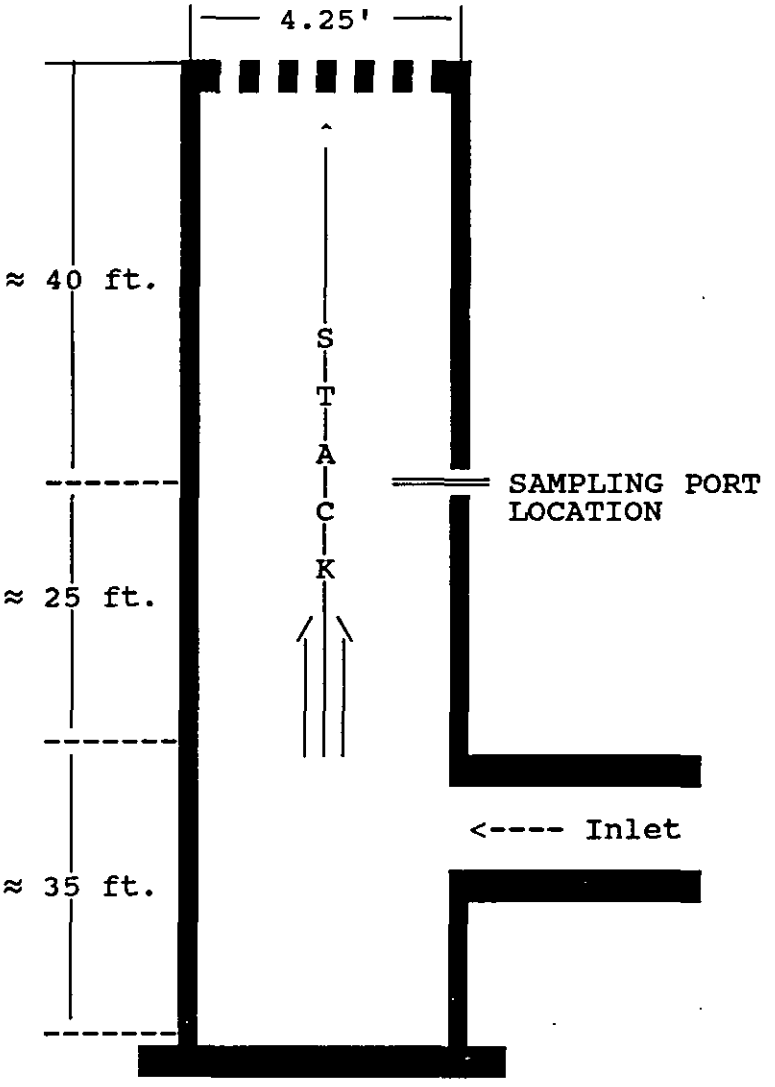
2.0 STACK SCHEMATIC (cont.)



Drawing Not To Scale

FIGURE 2-1

STACK SAMPLE PORT LOCATION

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3.0 TRAVERSE POINT LOCATIONS AND SAMPLING TIME PER POINT

As described in Figure 2.1, the stack internal diameter at the port location is 4.25 feet. The ports are approximately 25 feet, or 5.9 diameters downstream of where the flue meets the stack and approximately 40 feet, or 9.4 diameters upstream from the stack exit.

Based upon the requirements of Method 1, the probe was placed at a total of sixteen (16) traverse points during isokinetic sampling. Each sampling point was sampled for four minutes each for a total test length of 64 minutes.

TABLE 3-1
TRAVERSE POINT LOCATIONS

Traverse Point #	Distance (% Dia.)	Distance	Probe* Markings
1	3.2	1.6"	4.6"
2	10.5	5.4"	8.4"
3	19.4	9.9"	12.9"
4	32.3	16.5"	19.5"
5	67.7	34.5"	37.5"
6	80.6	41.1"	44.1"
7	89.5	45.6"	48.6"
8	96.8	49.4"	52.4"

* adjusted for depth of sample port

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4.0 SAMPLING TRAIN AND ANALYTICAL PROCEDURES

The Konus thermal oil heaters at Louisiana-Pacific Corporation's Houlton, Maine facility were tested for particulate matter in order to satisfy the conditions of the facility's air permit as issued by the Maine Department of Environmental Protection.

Particulate emissions were tested in strict accordance with EPA Ereference Methods 1 through 5, as described in Sections 1.0, 2.0 and 3.0. Three test runs were conducted for these methods. In this section the test procedures that were followed, including sampling and analysis, are discussed.

4.1 DESCRIPTION OF SAMPLING AND ANALYTICAL PROCEDURES

4.1.1 Emission Sampling Equipment

The specific train used during these tests was manufactured by Research Appliance Company (RAC). The design specifications of this train meet all the requirements of EPA's Reference Method 5 as found in the Federal Regulations under Section 40 CFR 60 Appendix A, as amended. The following is a description of the individual pieces of equipment that make up the train.

Nozzle - The nozzle was seamless stainless steel tubing construction of the buttonhook design. A range of sizes suitable for isokinetic sampling was available. All nozzles were calibrated before testing. A sample nozzle calibration sheet may be found in Appendix VIII of this report.

Probe - A six (6) foot heated stainless steel probe with glass liner was used.

Heating System - The filter temperature was regulated by maintaining the IET hot box temperature at $248^{o} \pm 25^{o}F$. This temperature was constantly monitored by use of a thermocouple (located in the hot box) and temperature readout.

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4.0 SAMPLING TRAIN AND ANALYTICAL PROCEDURES (cont.)

Pitot Tube - A Type S pitot tube attached to the probe was used to monitor the stack gas velocity. Since the pitot tube meets all of the dimensional criteria set forth in Method 2 of 40 CFR 60, a coefficient of 0.84 was used.

Filter Holder - A borosilicate glass type filter holder with frit support was used.

Condenser - Four impingers, connected in series with leak-free ground glass fittings, were used as the condenser. The first, third and fourth impingers were of the Greenburg-Smith design modified by replacing the tip with a 1/2" diameter glass tube extending to approximately 1/2" from the bottom of the flask. The second impinger was a standard Greenburg-Smith.

Metering System - A vacuum gauge, inclined manometer, leak-free pump, calibrated thermocouples, and calibrated dry gas meter were the basic components used to meter the dried sample gas through the system. Meter box and thermocouple calibration sheets may be found in Appendix VIII of this report.

Gas Density Determination - An ORSAT type combustion analyzer, capable of measuring CO_2, O_2 and CO was used to determine flue gas density. Simultaneous with each isokinetic sampling run an integrated bag sample was extracted in accordance with Method 3.

4.1.2 Emission Sampling Procedures

All sampling procedures were conducted in strict accordance with the Methods prescribed in the Code of Federal Regulations as found in 40 CFR 60 as amended, where available. The following is the sequence of events that occurred prior to and during the actual stack test.

Traverse Points - The traverse points were calculated in accordance with Method 1 and the probes were marked accordingly.

Static Pressure - The static pressure of the stack was checked and recorded.

Preliminary Traverse - A preliminary traverse was conducted. Readings included the pressure drops and gas temperatures.

Nomograph - Once the above information was obtained, the nomograph for the actual test was set up to correlate the isokinetic relationships.

4.0 SAMPLING TRAIN AND ANALYTICAL PROCEDURES (cont.)

Barometric Pressure - Barometric pressure was obtained and recorded by use of an aneroid barometer at the test site.

Sampling Train Set-Up -

(a) The filter was placed in the filter holder and visually checked.
(b) The first two impingers were loaded with 100 ml of deionized water. Volumes were recorded on the field data sheets,
(c) Approximately 200 grams of silica gel was placed in the fourth impinger. Exact weights were logged on the field data sheets,
(d) Crushed ice was placed around the impingers,
(e) Once the entire train was assembled, the probe and hot box heaters were turned on.

Pre-Test Leak Check - Once the heater box was at the desired temperature for testing, the system was leak checked at fifteen inches of vacuum (15"Hg). A leak rate of less than 0.02 CFM was achieved prior to the start of sampling.

Final Check - Once everything was ready to go, plant operations were checked to confirm that the facility was operating at specified capacity.

Sampling - Isokinetic sampling, per Reference Method 5 then took place.

Post-Test Leak Check - Upon completion of each test run, the system was leak checked at the highest vacuum recorded during that run. All leak checks were less than 0.02 CFM and were considered acceptable.

Sample Recovery - All samples were recovered according to the respective Reference Method procedures. Because of the extreme importance of proper sample recovery techniques, details of the sample recovery procedures may be found in the Quality Control section of this report.

Isokinetics - Once all sample recovery was completed, including moisture determination, calculations were conducted to determine the percent isokinetics of the test run.

Operating Data Sheets - All pertinent operating data was logged throughout the test period by qualified plant personnel.

5.0 QUALITY CONTROL PROCEDURES

Throughout all phases of the test program, including sampling, analysis, and data reduction, strict quality control procedures were adhered to.

Sampling was conducted by trained personnel with extensive experience in Reference Method sampling. Gravimetric analysis for particulate was conducted in Eastmount Engineering's laboratory.

All sampling and analysis was conducted in strict accordance with EPA test methods 1-5. The quality control procedures found in the EPA Quality Assurance Handbook for Air Pollution Measurement Systems was adhered to as well.

All chemical reagents used in sampling, recovery and analysis were certified American Chemical Society grade. Filters for particulate analysis were desiccated and weighed to a constant weight before and after testing as specified in the EPA Quality Assurance Handbook. All filters were identified numerically in labelled petri dishes which were sealed and transported to and from the field in a secure carrying case.

Eastmount Engineering's entire equipment inventory is on a schedule of routine maintenance and calibration. This includes meter boxes, thermocouples, barometers, pitot tubes and sampling nozzles.

Meter boxes are calibrated over a full range of flow rates against a wet test meter every six months. After each field use the meter box is given a calibration check against the wet test meter at the average flow rates and highest vacuums experienced in the field.

Thermocouples are calibrated as specified in the EPA Handbook against a NBS traceable mercury in glass thermometer. Pitot tubes are visually inspected for conformance to the dimensional specified in EPA Method 2.

All pitot tubes used by Eastmount meet this criterion and are assigned a pitot tube coefficient of 0.84. Pitot tubes which do not meet the criteria are either repaired or discarded. Nozzles are engraved with identification numbers and are calibrated in the field immediately before use with calipers using a minimum of three (3) diameters.

Isokinetic sampling was conducted following the procedures specified in EPA Reference Methods 1-5 including the selection of the proper number and location of sampling points, collection of gaseous sample for ORSAT analysis, and maintenance of an isokinetic flow rate. Sampling was conducted for one hour and four minutes.

5.0 QUALITY CONTROL PROCEDURES (cont.)

Sample train recovery procedures were conducted in accordance with EPA Method 5. In general, impinger catches were recovered quantitatively for moisture determination, and a probe and sample train front half rinse were conducted using acetone. Filters were removed from the filter holders and placed in the appropriate petri dishes. Blanks were collected and submitted for analysis for acetone and filters used in sampling. Samples were transferred to the appropriate (glass or Nalgene bottles or petri dishes) containers were then labelled for identification, volumes noted and liquid levels marked.

Chain of custody documentation was initiated in the field and maintained on all samples from their recovery through inter-laboratory transfer until their final analysis. Upon Eastmount's return from the field, samples were assigned a sample bank number and logged into the master sample log book.

All calculations were conducted in strict accordance with the equations found in the individual Methods. Isokinetic and emission rate calculations were conducted on a computer and the input data was checked by a person other than the original calculator to ensure that it is correct.

These specific procedures in addition to Eastmount's usual high standard of quality control help validate the results obtained in this test program. Eastmount is staffed by a team of qualified, experienced environmental professionals. As the majority of our emissions testing work is done for compliance purposes, strict QC procedures are incorporated into our everyday work performance.

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6.0 FACILITY DESCRIPTION AND OPERATING CONDITIONS

The Konus thermal oil heaters located at Louisiana-Pacific Corporation's Houlton, Maine, waferboard plant are wood-fired combustors designed to burn wet bark and other wood waste. Particulate emissions from the heaters are controlled by a multiclone in series with a single stage electrostatic precipitator built by Joy Manufacturing. The cleaned flue gas is exhausted to atmosphere via the 100 foot stack.

Process data was recorded by Susan Somers of Louisiana Pacific Corporation throughout the test program. This data is presented in Appendix VI of this report.

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APPENDIX I

COMPUTER INPUT SHEETS

INPUT DATA SHEET

PLANT: LOUISIANA PACIFIC
LOCATION: STACK

RUN #: M5-2
DATE : 3-4-93

Ds (FT)	4.25
Dn (IN)	.317
FILTER #	5827
PIT COEFF	.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	500
IMP-1 (FIN)	157
IMP-2 (FIN)	101
IMP-3 (FIN)	0
IMP-4 (FIN)	509.6
% CO2	4.4
% O2	14.4
% CO	0
P BAR	30.20
P STK	-.50
NO. PTS	16
TEST LNGTH	64
END METER	911.053
LEAK CHECK	.070
INT METER	878.751
BEGIN TIME:	10:27
END TIME:	11:40

TRAV PT	VEL HEAD	SQ ROOT	DELTA H	DRYGAS IN	DRYGAS OUT	STACK TEMP
A1	.16	.40	.80	58	55	520
2	.19	.44	.95	60	55	526
3	.18	.42	.90	66	55	530
4	.20	.45	1.00	70	56	532
5	.20	.45	1.00	72	56	532
6	.19	.44	.95	76	56	534
7	.17	.41	.85	78	58	524
8	.17	.41	.85	79	60	523
B1	.17	.41	.85	67	60	520
2	.18	.42	.90	69	59	528
3	.20	.45	1.00	70	58	528
4	.22	.47	1.10	71	58	533
5	.23	.48	1.15	73	59	533
6	.23	.48	1.15	75	59	533
7	.20	.45	1.00	73	59	520
8	.20	.45	1.00	73	57	521
AVERAGE	.19	.44	.97	70.63	57.50	527.31

INPUT DATA SHEET

PLANT: LOUISIANA PACIFIC
LOCATION: STACK

RUN #: M5-3
DATE : 3-4-93

Ds (FT)	4.25
Dn (IN)	.317
FILTER #	5823
PIT COEFF	.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	500
IMP-1 (FIN)	162
IMP-2 (FIN)	102
IMP-3 (FIN)	0
IMP-4 (FIN)	507.4
% CO2	5.0
% O2	14.6
% CO	0
P BAR	30.20
P STK	-.50
NO. PTS	16
TEST LNGTH	64
END METER	944.433
LEAK CHECK	.083
INT METER	912.400
BEGIN TIME:	13:25
END TIME:	14:36

TRAV PT	VEL HEAD	SQ ROOT	DELTA H	DRYGAS IN	DRYGAS OUT	STACK TEMP
A1	.16	.40	.83	52	52	506
2	.18	.42	.94	56	51	508
3	.19	.44	.99	60	51	510
4	.20	.45	1.04	66	52	510
5	.21	.46	1.09	67	52	514
6	.19	.44	.99	70	52	506
7	.17	.41	.88	71	54	500
8	.17	.41	.88	70	54	497
B1	.14	.37	.73	61	53	502
2	.18	.42	.94	64	53	511
3	.20	.45	1.04	66	54	514
4	.21	.46	1.09	67	53	520
5	.22	.47	1.14	67	53	520
6	.20	.45	1.04	66	53	516
7	.17	.41	.88	69	53	508
8	.17	.41	.88	68	53	507
AVERAGE	.19	.43	.96	65.00	52.69	509.31

INPUT DATA SHEET

PLANT: LOUISIANA PACIFIC
LOCATION: STACK

RUN #: M5-4
DATE : 3-4-93

Ds (FT)	4.25
Dn (IN)	.317
FILTER #	5822
PIT COEFF	.84
IMP-1 (INT)	100
IMP-2 (INT)	100
IMP-3 (INT)	0
IMP-4 (INT)	500
IMP-1 (FIN)	170
IMP-2 (FIN)	102
IMP-3 (FIN)	0
IMP-4 (FIN)	506.5
% CO2	4.8
% O2	14.2
% CO	0
P BAR	30.15
P STK	-.45
NO. PTS	16
TEST LNGTH	64
END METER	977.000
LEAK CHECK	.055
INT METER	944.750
BEGIN TIME:	15:45
END TIME:	17:02

TRAV PT	VEL HEAD	SQ ROOT	DELTA H	DRYGAS IN	DRYGAS OUT	STACK TEMP
A1	.14	.37	.73	51	53	502
2	.18	.42	.94	55	53	510
3	.20	.45	1.04	60	53	512
4	.20	.45	1.04	62	52	514
5	.22	.47	1.14	64	52	514
6	.22	.47	1.14	64	51	513
7	.19	.44	.99	64	50	503
8	.18	.42	.94	63	50	504
B1	.14	.37	.73	49	47	502
2	.16	.40	.83	54	48	507
3	.18	.42	.94	59	49	511
4	.20	.45	1.04	62	48	518
5	.21	.46	1.09	64	49	515
6	.22	.47	1.14	64	50	517
7	.19	.44	.99	67	50	508
8	.19	.44	.99	71	51	509
AVERAGE	.19	.43	.98	60.81	50.38	509.94

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APPENDIX II

ISOKINETIC CALCULATION SHEETS

ISOKINETIC CALCULATION SHEET

PLANT: LOUISIANA PACIFIC
LOCATION: STACK

RUN #: M5-2
DATE : 3-4-93

TS (`F)=	527.3	% CO2=	4.4	VM (CF) =	32.232
TS (`R)=	987.3	% O2=	14.4	DELTA H (ABS)=	30.27
TM (`F)=	64.1	% CO=	.000	PS (ABS) =	30.16
TM (`R)=	524.1	% N2=	81.2	SQRT DELTA P =	.43884
VI(TOT)=	67.6	CP=	.84	AREA NOZZLE =	.00055
				Y =	1.0070

VM STD	=	$17.64 \frac{(VM)(Y)(DELTA\ H\ ABS)}{(TM)}$	= 33.07	DSCF
VW STD	=	.04707 (VI TOT)	= 3.18	CF
BWO	=	$\frac{VW\ STD}{VW\ STD + VM\ STD}$	= .088	
1-BWO	=	1 - BWO	= .912	
Md (DRY)	=	.44 (% CO2) +.32 (% O2) +.28 (% CO) +.28 (% N2)	= 29.28	LBS/LB MOLE
Ms (WET)	=	MD (1-BWO) + 18 (BWO)	= 28.29	LBS/LB MOLE
G	=	SQRT (TS / PS / MS)	= 1.08	
VS	=	85.49(CP)(G)(SQRT DELTA P)	= 33.9	FPS
H	=	0.002669 (VI TOT)	= .18	
J	=	(DELTA H ABS)(VM)(Y)/(TM)	= 1.87	
K	=	(H) + (J)	= 2.06	
% ISO	=	$\frac{(TS)\ (K)\ (1.667)}{(TIME)\ (VS)\ (PS)\ (AN)}$	= 94.3	

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ISOKINETIC CALCULATION SHEET

PLANT: LOUISIANA PACIFIC
LOCATION: STACK

RUN #: M5-3
DATE : 3-4-93

TS (`F)=	509.3	% CO2=	5.0	VM (CF) =	31.950
TS (`R)=	969.3	% O2=	14.6	DELTA H (ABS)=	30.27
TM (`F)=	58.8	% CO=	.000	PS (ABS) =	30.16
TM (`R)=	518.8	% N2=	80.4	SQRT DELTA P =	.42943
VI(TOT)=	71.4	CP=	.84	AREA NOZZLE =	.00055
				Y =	1.0070

VM STD	=	$17.64 \frac{(VM)(Y)(DELTA\ H\ ABS)}{(TM)}$	= 33.11	DSCF
VW STD	=	.04707 (VI TOT)	= 3.36	CF
BWO	=	$\frac{VW\ STD}{VW\ STD + VM\ STD}$	= .092	
1-BWO	=	1 - BWO	= .908	
Md (DRY)	=	.44 (% CO2) +.32 (% O2) +.28 (% CO) +.28 (% N2)	= 29.38	LBS/LB MOLE
Ms (WET)	=	MD (1-BWO) + 18 (BWO)	= 28.34	LBS/LB MOLE
G	=	SQRT (TS / PS / MS)	= 1.06	
VS	=	85.49(CP)(G)(SQRT DELTA P)	= 32.8	FPS
H	=	0.002669 (VI TOT)	= .19	
J	=	(DELTA H ABS)(VM)(Y)/(TM)	= 1.88	
K	=	(H) + (J)	= 2.07	
% ISO	=	$\frac{(TS)\ (K)\ (1.667)}{(TIME)\ (VS)\ (PS)\ (AN)}$	= 96.2	

ISOKINETIC CALCULATION SHEET

PLANT: LOUISIANA PACIFIC
LOCATION: STACK

RUN #: M5-4
DATE : 3-4-93

TS (`F)=	509.9	% CO2=	4.8	VM (CF) =	32.195
TS (`R)=	969.9	% O2=	14.2	DELTA H (ABS)=	30.22
TM (`F)=	55.6	% CO=	.000	PS (ABS) =	30.12
TM (`R)=	515.6	% N2=	81.0	SQRT DELTA P =	.43349
VI(TOT)=	78.5	CP=	.84	AREA NOZZLE =	.00055
				Y =	1.0070

VM STD	=	$17.64 \frac{(VM)(Y)(DELTA\ H\ ABS)}{(TM)}$	= 33.52	DSCF
VW STD	=	.04707 (VI TOT)	= 3.69	CF
BWO	=	$\frac{VW\ STD}{VW\ STD + VM\ STD}$	= .099	
1-BWO	=	1 - BWO	= .901	
Md (DRY)	=	.44 (% CO2) +.32 (% O2) +.28 (% CO) +.28 (% N2)	= 29.34	LBS/LB MOLE
Ms (WET)	=	MD (1-BWO) + 18 (BWO)	= 28.21	LBS/LB MOLE
G	=	SQRT (TS / PS / MS)	= 1.07	
VS	=	85.49(CP)(G)(SQRT DELTA P)	= 33.3	FPS
H	=	0.002669 (VI TOT)	= .21	
J	=	(DELTA H ABS)(VM)(Y)/(TM)	= 1.90	
K	=	(H) + (J)	= 2.11	
% ISO	=	$\frac{(TS)\ (K)\ (1.667)}{(TIME)\ (VS)\ (PS)\ (AN)}$	= 97.1	

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APPENDIX III

PARTICULATE EMISSION CALCULATION SHEETS

PARTICULATE
EMISSION CALCULATION SHEET

PLANT: LOUISIANA PACIFIC
LOCATION: STACK

RUN #: M5-2
DATE : 3-4-93

	FILTER	BEAKER	BLANKS FILTER	BLANKS ACETONE
NO. :	5827	6	5806	525
FINAL:	.6420	63.4383	.6087	64.8718
TARE :	.6017	63.4143	.6090	64.8700
NET :	.0403	.0240	* .0000	.0018/258ML

VOLUME OF RINSE 226

Mn = 64.30
Ar = - 1.58

Mn = 62.72 Mg AS = 14.19 SQ FT

Qs = 3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS) = 851089 DSCFH
14185 DSCFM
28853 ACFM

CS = (2.205 X 10-6) (Mn) / (VM STD) = 4.182e-6 LBS/SCF

CS' = 0.0154 (Mn) / (VM STD) = .029 GRAINS /SCF

CS' = AT 12% CO2 = .080 GRAINS /SCF

PMR = (QS) (CS) = 3.56 LBS/HR

E = (F-FACTOR) X (CS) X (20.9/20.9-%O2) = .125 LB/MMBtu
9291

* NOTE: NEGATIVE FILTER WEIGHTS REPORTED AS ZERO

PARTICULATE
EMISSION CALCULATION SHEET

PLANT: LOUISIANA PACIFIC
LOCATION: STACK

RUN #: M5-3
DATE : 3-4-93

	FILTER	BEAKER	BLANKS FILTER	BLANKS ACETONE
NO. :	5823	62	5806	525
FINAL:	.6323	63.5578	.6087	64.8718
TARE :	.6030	63.5451	.6090	64.8700
NET :	.0293	.0127	* .0000	.0018/258ML

VOLUME OF RINSE 333

Mn = 42.00
Ar = - 2.32

Mn = 39.68 Mg AS = 14.19 SQ FT

Qs = 3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS) = 835833 DSCFH
13931 DSCFM
27954 ACFM

CS = (2.205 X 10-6) (Mn) / (VM STD) = 2.642e-6 LBS/SCF

CS' = 0.0154 (Mn) / (VM STD) = .018 GRAINS /SCF

CS' = AT 12% CO2 = .044 GRAINS /SCF

PMR = (QS) (CS) = 2.21 LBS/HR

E = (F-FACTOR) X (CS) X (20.9/20.9-%O2) = .081 LB/MMBtu
9291

* NOTE: NEGATIVE FILTER WEIGHTS REPORTED AS ZERO

PARTICULATE
EMISSION CALCULATION SHEET

PLANT: LOUISIANA PACIFIC
LOCATION: STACK

RUN #: M5-4
DATE : 3-4-93

	FILTER	BEAKER	BLANKS FILTER	BLANKS ACETONE
NO. :	5822	506	5806	525
FINAL:	.6243	66.7886	.6087	64.8718
TARE :	.5986	66.7761	.6090	64.8700
NET :	.0257	.0125	* .0000	.0018/258ML

VOLUME OF RINSE 274

Mn = 38.20
Ar = - 1.91

Mn = 36.29 Mg AS = 14.19 SQ FT

Qs = 3600(1-BWO)(VS)(AS)(17.64)(PS)/(TS) = 838026 DSCFH
13967 DSCFM
28311 ACFM

CS = (2.205 X 10-6) (Mn) / (VM STD) = 2.387e-6 LBS/SCF

CS' = 0.0154 (Mn) / (VM STD) = .017 GRAINS /SCF

CS' = AT 12% CO2 = .042 GRAINS /SCF

PMR = (QS) (CS) = 2.00 LBS/HR

E = (F-FACTOR) X (CS) X (20.9/20.9-%O2) = .069 LB/MMBtu
9291

* NEGATIVE FILTER WEIGHTS REPORTED AS ZERO

F FACTOR CALCULATION SHEET

Louisiana Pacific — Runs M5-1,2,3

Oil Heater — March 4, 1993

Wood Chip Analysis (dry basis)

$$F\ FACTOR = \frac{1000000\ (3.64\%H+1.53\%C+0.57\%S+0.14\%N-0.46\%O)}{GCV}$$

% HYDROGEN	=	6.10
% CARBON	=	51.13
% SULFUR	=	.17
% NITROGEN	=	.33
% OXYGEN	=	38.86
GCV (Btu/lb)	=	8901

CALCULATED F - FACTOR = 9291

Eastmount Engineering Inc. • 420 Main Street • Walpole, MA 02081 • (508) 668-9005 • FAX (508) 668-4989

APPENDIX IV

LABORATORY RESULTS

EASTMOUNT ENGINEERING
LABORATORY
SUMMARY OF RESULTS

PROJECT NUMBER: 93-015
PROJECT NAME: LOUISIANA PACIFIC
ANALYSIS: METHOD 5, GRAVIMETRIC

FILTER

SAMPLE DESCRIPTION	FILTER #	TEST DATE	TARE WEIGHT (g)	FINAL WEIGHT (g)	RESIDUE WEIGHT (g)
M5-2	5827	03/04/93	.6017	.6420	.0403
M5-3	5823	03/04/93	.6030	.6323	.0293
M5-4	5822	03/04/93	.5986	.6243	.0257
BLANK FILTER	5806	03/04/93	.6090	.6087	-.0003

FRONT 1/2 ACETONE

SAMPLE DESCRIPTION	BEAKER #	TEST DATE	TARE WEIGHT (g)	FINAL WEIGHT (g)	RESIDUE WEIGHT (g)	VOLUME (mL)
M5-2	6	03/04/93	63.4143	63.4383	.0240	226
M5-3	62	03/04/93	63.5451	63.5578	.0127	333
M5-4	506	03/04/93	66.7761	66.7886	.0125	274
ANK ACETONE	525	03/04/93	64.8700	64.8718	.0018	258

FINAL FILTER WEIGHTS ARE HOT WEIGHTS.

APPENDIX V

NOMENCLATURE SHEETS

NOMENCLATURE

Ar	Acetone residue - result of Blank evaporation.
AREA NOZZLE	Area of the nozzle in square feet.
AS	Area of the stack in square feet.
BDL	Below detectable limits.
BWO	The amount of moisture in the flue gas.
C	Concentration of NOX as NO2.
% CO	Percent of carbon monoxide in the flue gas.
% CO2	Percent of carbon dioxide in the flue gas.
Cp	Pitot tube coefficient.
CS	The concentration in the stack in pounds per standard cubic foot.
CS'	The concentration in the stack in grains per standard cubic foot.
CS12	The concentration in the stack in grains per standard cubic foot corrected to 12% CO2.
DELTA H	The meter orifice differential.
DELTA H (ABS)	The meter orifice differential, absolute condition in inches of mercury
Dn (IN)	Diameter of the nozzle in inches.
DRY GAS IN	Temperature of the dry gas meter inlet degrees Fahrenheit.
DRY GAS OUT	Temperature of the dry gas meter outlet degrees Fahrenheit.
Ds (FT)	Diameter of the stack in feet.
E (F factor)	The emission rate in pounds per million Btu derived by use of the F factor method.
E (Heat Input)	The emission rate in pounds per million Btu derived by use of calculated heat input.
END METER	The dry gas meter reading at the end of the test.

NOMENCLATURE (cont.)

F factor	The theoretical amount of air in dry standard cubic feet (DSCF) needed to combust a million Btu's worth of fuel.
Filter Catch	The amount of particulate captured on the filter during testing, reported in milligrams.
INT METER	The dry gas meter reading at the beginning of the test.
Md (DRY)	The dry molecular weight of the flue gas in pounds per pound mole.
MN	The amount of particulate collected by washing the nozzle, probe, and front half of the glassware, reported in milligrams.
MN'	The milligrams of particulate collected minus the blank.
Ms (WET)	Wet or actual molecular weight of the flue gas in pounds per pound mole.
% N2	The percent of nitrogen in the flue gas.
NO PTS	Number of traverse points.
% O2	Percent of oxygen in the flue gas.
P BAR	Barometric pressure at test location.
P STK	Static pressure of the stack in inches of water.
PMR	The emission rate in pounds per hour.
PS (ABS)	Absolute pressure conditions in the stack in inches of mercury.
Qs	The volumetric flow rate of the flue gas in dry standard cubic feet per hour.
SQ ROOT	The square root of each velocity head measurement.
SQRT DELTA P	The average of the square roots of the measured pressure drops.
Stack Temp or TS (`F)	The temperature of the stack in degrees Fahrenheit.

NOMENCLATURE (cont.)

TS (`R)	The temperature of the stack in degrees Rankine.
T (Hot Box)	Temperature around the filter box, degrees Fahrenheit.
TM (`F)	Average temperature of the dry gas meter in degrees Fahrenheit.
TM (`R)	Average temperature of the dry gas meter in degrees Rankine.
Va	Volume of sample aliquot titrated (ml)
Vt	Volume of barium perchlorate titrant used.
VEL HEAD	The pressure drop measured across the pitot tubes.
VI (TOT)	The amount of water collected in the impingers in milliliters.
VM (CF)	The volume sampled through the dry gas meter in cubic feet.
VM STD	Volume sampled through the dry gas meter corrected to standard conditions.
VS	Velocity of the stack gas in feet per second.
VW STD	The amount of moisture collected, converted to standard cubic feet.
Y	Meter box calibration factor.
e	Sampling time in minutes.

APPENDIX VI

FIELD DATA SHEETS - UNIT OPERATING CONDITIONS

GOULD ENERGY DIVISION
P. O. BOX 214
CRESSON, PA 16630
STANDARD LABORATORIES, INC.

DATE: 3-12-93
SAMPLE NO. 198286

77181
EASTMOUNT ENGINEERING
420 MAIN STREET
WALPOLE, MA 02081

SAMPLE ID: WOOD CHIP SAMPLE

OPERATING CO.:
SAMPLED BY: CUSTOMER PROVIDED
MINE:
LOCATION:

DATE SAMPLED:
WEATHER:
GROSS WEIGHT:

DATE RECEIVED: 3/10/93

OTHER ID: P.O. 3615 REQ. 93-015

CERTIFICATE OF ANALYSIS

	ASTM METHOD	AS RECEIVED	DRY BASIS
MOISTURE	D2961 D3302 D3173	44.74%	XXX
ASH	D3174	1.88%	3.41%
SULFUR	D3177 METHOD A	.09%	.17%
CARBON	D3178	28.25%	51.13%
HYDROGEN	D3178	3.38%	6.11%
NITROGEN	D3179	.18%	.33%
OXYGEN	D3176	21.48%	38.86%
BTU/LB	D2015 D1989	4919	8901
= BTU/LB			9215
LBS OF SO2 PER MILLION BTU			.38
LBS OF SULFUR PER MILLION BTU			.191

APPROVED BY

APPROVED BY

PAGE 1 OF 1
427

BLACK SEAL ANALYSIS

HOULTON THERMAL OIL HEATER TESTING 3-4-93
PROCESS DATA

CONTENTS

TEST SCHEDULE

THERMAL OIL HEATER TESTING
APPROXIMATE RUN TIMES

TEST NO.	DATE	POLLUTANT	RUN #1	RUN #2	RUN #3
1	3–4	TSP	1040–1150	1335–1445	1545–1700

HOULTON THERMAL OIL HEATER TESTING 3-4-93

PROCESS DATA SUMMARY

HOULTON THERMAL OIL HEATER TESTING 3-4-93

17.1 =PLANT PRODUCTION RATE IN TONS PER HOUR

1.65 = ESTIMATED TONS OF DRY FUEL INPUT BASED ON TEMP. DIFFERENTIAL

29.7 = ESTIMATED mmBTU INPUT BASED ON TEMP. DIFFERENTIAL*

*input to be verified by f factor

HOULTON THERMAL OIL HEATER TESTING 3–4–93
10:30 – 17:00

BOARD WEIGHTS – LBS
WEIGHTS OF APPROXIMATELY EVERY 24TH
UNTRIMMED BOARD
(RECORDED WEIGHT IN KG., CONVERTED TO LB, 1KG = 2.2046LB)

87.2	84.9	87.2	89	85.5	86.05 KG = AVERAGE
86.9	83.1	88	87.4	86.1	UNTRIMMED
86.5	79.9	87.4	86	87.6	MAT WEIGHT
85.3	83.7	86.8	83.5	87.1	
86.1	85.5	85.7	85	85.1	189.71 KG = AVERAGE
84.2	84.3	86.3	84.7	87.4	UNTRIMMED
86.7	85.4	88.1	85.1	86.8	MAT WEIGHT
85.2	84.6	89.7	87.4		
84.3	85.5	88.1	87		
86.1	85.4	86.9	85.8		
86.1	88	89.9	85.5		176.43 LB = AVERAGE
86.1	84.9	88.6	85.6		FINISHED BOARD
					WEIGHT
					(UNTRIMMED MAT
					WEIGHT – TRIM
					WEIGHT)

7.0% = TRIM

PLANT PRODUCTION RATE

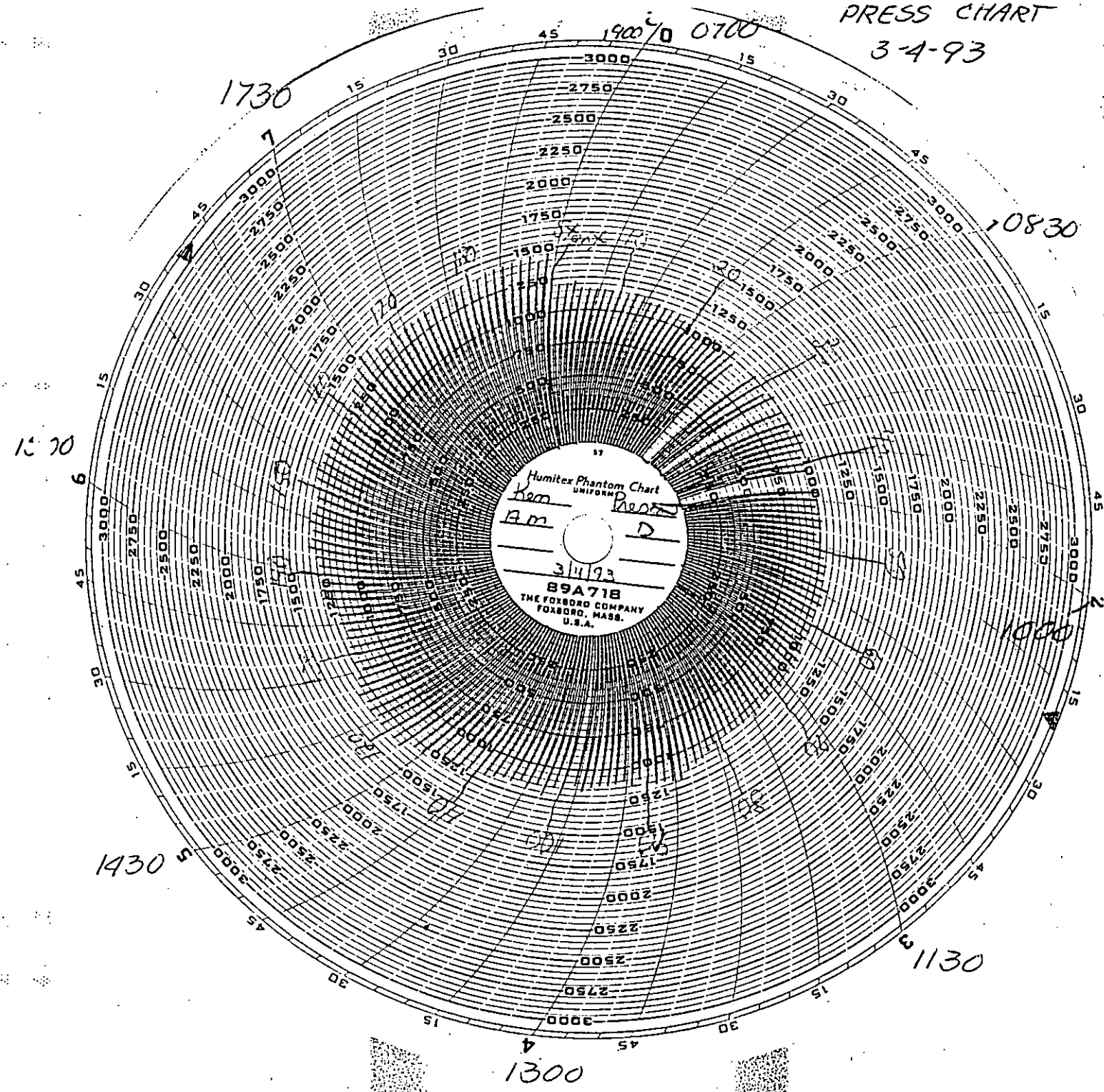
6.5 =HOURS DURING TESTING
105 =PRESSLOADS
1260 =NO. OF (8' X 16') BOARDS PRODUCED (PRESSLOADS x 8 BOARDS/LOAD)
222302 =LBS FINISHED PRODUCT (BOARDS x WEIGHT OF FINISHED BOARD)
34200 =LBS FINISHED PRODUCT PRODUCED PER HOUR (LBS FINISHED PROD./TESTING HOURS)
17.1 =TONS FINISHED PRODUCT PRODUCED PER HOUR (LB FINISHED PROD/HR / 2000 LB)

SLR wt in kilograms

Load #									
17	85.1	33	84.1	49	84.2	65	84.9	81	91.7
	86.1		84.2		84.2		85.		81.1
18	85.5	34	85.7	50	86.1	66	85.2	82	83.7
	84.6		83.6		85.7		84.7		83.6
19	85.3	35	83.2	51	86.3	67	84.3	83	84.1
	85.5		83.3		86.4		84.2		84.9
20	84.6	36	83.3	* 52	87.2	68	84.3	84	85.5
	84.9		83.1		86.7		85.4		84.1
21	84.1	37	82.9	53	86.7	69	86.1	85	84.1
	84.3		83.1		86.9		85.7		85.1
22	84.7	38	83.1	54	86.9	70	86.1	86	84.3
	84.		83.		86.4		86.2		84.3
23	84.1	39	83	55	86.5	71	85.4	87	85.2
	84.4		84.1		85.6		86.2		85.7
24	84.7	40	85.2	56	86.5	72	86.1	88	85.4
	84.7		85.		87.		84.5		85.6
25	85.8	41	85.1	57	85.3	73	87.1	89	86.1
	86.1		84.7		87.		87.9		84.4
26	84.4	42	84.6	58	85.3	74	86.1	90	84.6
	86.3		84.5		85.6		86.7		84.5
27	86.1	43	83.7	59	85.2	75	85.5	91	85.1
	86.2		83.5		86.4		86.1		85.2
28	85.7	44	83.3	60	86.1	76	84.9	92	85.5
	85.4		83.7		86.		84.7		86.
29	86.1	45	83.7	61	84.9	77	83.7	93	86.3
	86.2		83.2		86.1		83.5		85.4
30	85.1	46	85.4	62	84.2	78	83.1	94	85.4
	85.4		85.2		84.7		83.4		86.8
31	84.1	47	83.7	63	86.7	79	83.	95	87.2
	84.3		85.4		87.7		79.4		87.1
32	84.3	48	84.6	64	86.7	80	79.9	96	88
	84.7		84.9		85.1		80.3		87

97	86.1		113	89.3		129	85.1		145	87.7		162	86.		
	84.7			90.9			84.4			86.2			85.1	178	85.9
98	84.9		114	89.7		130	83.5		146	85.6		163	86.3		86.4
	85.			88.4			84.1			87.1			87	179	84.8
99	85.9		115	89.1		131	83.9		147	86.4		164	86.4		86.5
	84.3			87.7			83.8			85.2			87.9	180	87.1
100	87.2		116	88.1		132	85.		148	85.5		165	90.8		86.7
	86.7			86.9			84.4			87.1			87.4	181	85.3
101	87.1		117	87.7		133	85.7		149	86.3		166	88.8		86.3
	88			88.8			85.5			86.2			89.1	182	86.9
102	88		118	86.9		134	84.7		150	86.1		167	85.5		85.7
	86.9			87.6			84.5			86.5			85.9	183	88.4
103	87.4		119	89.4		135	83.9		151	86.6		168	84.8		87.3
	88.3			89.3			84.1			85.9			84.8	184	87.6
104	87.4		120	89.8		136	85.1		152	87.6		169	86.9		87.
	87.5			89.			84.2			85.9			86.1		
105	85.4		121	88.6		137	87.3		153	87.5		170	86.1	185	87.7
	85.9			88.2			86.7			86.8			87.2		88.5
106	86.8		122	88.6		138	87.4		154	87.1		171	87.	186	88.7
	86.1			86.1			86.1			87.6			86.7		87.7
107	87.7		123	88.3		139	86.2		155	86.1		172	84.1	187	88.7
	86.			89.3			86.1			86.8			86.8		87.7
108	85.7		124	89.		140	87.		156	85.1		173	85.7	188	87.4
	86.1			88.7			86.			86.3			87.8		86.7
109	87.1		125	88.4		141	86.5		157	86.4		174	87.1	189	87.9
	85.7			86.9			86.1			86.			86.7		88.1
110	86.3		126	87.4		142	85.8		158	87.4		175	87.5	190	
	87.8			86.8			86.8			84.8			86.1		
111	88.8		127	86.1		143	85.9		159	86.3		176	85.2	191	
	87.4			86.3			87.8			88.9			85.4		
112	88.1		128	86.		144	85.5		160	86.8		177	85.3		
	89.4			87.1			85.7			85.9			85.2		
									161	87.8					
										86.7					

PRESS CHART
3-4-93



PRESSLOADS
1030 - 1700
=105

LOUISIANA-PACIFIC CORP. PRESS REPORT
HOULTON, MAINE

OPERATOR K.P. SHIFT (AM) PM CREW D DATE 3/4/93

LINE SPEED	FROM	TO	THICK-NESS	PRESS LOADS	PRESS TEMP	OVERALL TIMER	DECOMP. TIMER	REASON FOR LINESPEED CHANGE
57'	700	1225	7/16	83	208°	160	18.1	Start
54'	1225	325	7/16 15%	46	209°	175	18.1	Dry bins a little low.
52'	325	700	7/16	60	209°	160	18.1	More.

TOTALS 189 (3/8" FOOTAGE) = 338698

FLKR STROKES 1268 TDT 26 min PEABODY OIL BURNERS: DEBARKER DOWN TIME 3.40

KONUS #1 1830 KONUS #2 2870 SANDER DOWN TIME 4.45

DOWN-TIME FROM	TO	DOWNTIME (MINS.) M	E	O	QC	REASON FOR DOWN TIME
840	848			8		Surface blender plug
904	913			9		" " "
945	952	7				Work on surface blender.
1155	1157			2		Headrax jammed in lug chain.

*** MAINTENANCE / LOCK-OUT LOG ***

MOTOR # LOCKED OUT	FROM	TO	BRIEF DESCRIPTION OF WORK BEING DONE	INITIALS OF PERSON LOCKING OUT
				ZA

HOULTON THERMAL OIL HEATER TESTING 3-4-93
10:30 - 17:00
TSP TESTING

FUEL BURNING RATE ESTIMATED BY BARK INPUT

15.83 =RIGHT SIDE FUEL CALIBRATION IN LB/COUNT
982 =RIGHT SIDE COUNTS DURING TESTING HOURS
825+1108-474
15545 =RIGHT SIDE - LB. OF WET FUEL BURNED DURING TESTING
13.93 =LEFT SIDE FUEL CALIBRATION IN LB/COUNT
1530 =LEFT SIDE COUNTS DURING TESTING HOURS
1340-485+1074
21313 =LEFT SIDE - LB. OF WET FUEL BURNED DURING TESTING
6.5 =HOURS DURING TESTING
36858 =TOTAL LB. OF WET FUEL BURNED DURING TESTING
44.0% =AVERAGE MOISTURE CONTENT OF FUEL
20651 =TOTAL LB. OF DRY FUEL BURNED DURING TESTING (LB WET FUEL X (1- % MOISTURE)
3177 =LB. OF DRY FUEL BURNED PER HOUR (TOTAL LB OF DRY FUEL BURNED / TESTING HOURS
1.59 =TONS OF DRY FUEL BURNED PER HOUR (TOTAL LB OF DRY FUEL BURNED PER HOUR / 2000 LB)
9000 = ESTIMATED BTU CONTENT OF DRY FUEL (BTU / LB)
28.59 = ESTIMATED MMBTU INPUT PER HOUR (LB OF FUEL/HR x BTU CONTENT)

FUEL BURNING RATE ESTIMATED TEMPERATURE DIFFERENTIAL

229.20 = AVERAGE INCOMING OIL TEMPERATURE IN DEGREES C (DEG F = 9/5 DEG. C + 32)
444.6 = AVERAGE INCOMING OIL TEMPERATURE IN DEGREES F
250.98 = AVERAGE OUTGOING OIL TEMPERATURE IN DEGREES C (DEG F = 9/5 DEG. C + 32)
483.8 = AVERAGE OUTGOING OIL TEMPERATURE IN DEGREES F
65 = TEMPERATURE DIFFERENTIAL AT 100% CAPACITY IN DEG. F
39.2 = ACTUAL TEMPERATURE DIFFERENTIAL
49.2 = MAXIMUM BTU INPUT IN MM BTU/HR
29.7 = ESTIMATED MMBTU INPUT PER HOUR (ACTUAL TEMP. DIFF./ MAX. TEMP. DIFF. x MAX. HEAT INPUT)

9000 = ESTIMATED BTU CONTENT OF DRY FUEL (BTU / LB)
1.65 = ESTIMATED TONS OF DRY FUEL INPUT BASED ON TEMPERATURE DIFFERENTIAL (BTU INPUT/BTU CONTENT OF DRY FUEL / 2000 lb)

input to be verified by f factor

KONUS UNIT - KONUS ESP
15 MIN READINGS REPORT

3/4/93 Carl #1

TIME	#1 KONUS OIL TEMP IN	#1 KONUS OIL TEMP OUT	#1 KONUS FUEL COUNT	#2 KONUS OIL TEMP IN	#2 KONUS OIL TEMP OUT	#2 KONUS FUEL COUNT	BARK MOISTURE EVERY HALF HOUR	1 E.S.P. KV	1 E.S.P. MA	1 E.S.P. H	#2 E.S.P. KV	#2 E.S.P. MA	#2 E.S.P. A	SPARKS
715	234	259		239	263		40.6%	290	60	20	40	20	16	52
730	231	256		236	257			290	65	20	36	30	18	40
745	229	257		232	250			300	80	20	38	20	18	28
800	228	250	162	233	255	266	47%	295	75	20	40	30	18	36
815	228	251		233	258			290	70	20	38	20	16	54
830	228	254	285	231	250	385		290	80	20	40	30	18	26
845	224	247		229	249			290	80	20	42	40	18	18
900	230	253	319	234	249	575	45%	290	60	20	42	30	18	32
915	228	250		233	252			300	60	20	42	30	18	36
930	226	252	389	229	249	623		290	60	20	42	30	18	32
945	218	241		218	241			300	70	20	40	30	18	30
1000	225	251	473	235	252	753	49%	300	60	80	40	40	20	20
1015	229	252		225	258			300	60	20	42	40	18	36
1030	224	248	544	228	251	863		310	75	20	40	30	18	38
1045	221	245		233	251			300	70	15	40	30	18	36
1100	226	248	615	236	256	972	43.2%	290	60	15	42	35	18	20
1115	229	253		235	254			280	60	15	42	30	16	26
1130	227	251	694	231	250	1097		300	60	20	40	30	18	16
1145	221	241		234	251			300	60	20	40	20	16	30
1200	223	249	773	235	252	1218	43%	300	60	20	40	30	16	32
1215	225	246		235	254			300	60	20	42	30	18	26
1230	226	245	845	237	256	1341		300	70	20	40	30	18	30
1245	221	246		239	258			300	60	20	42	20	16	32
100	232	254	919	238	259	1447	42.6%	300	60	20	40	30	18	28
115	225	243		238	257			340	60	20	42	60	18	20
130	223	243	1004	235	251	1581		340	60	20	42	80	18	22
145	223	243		235	251			340	60	20	40	60	18	26
200	226	246	1070	237	252	1681	43.2%	340	70	20	40	60	18	36
215	227	250		234	253			340	70	20	50	60	18	32
230	228	248	1143	239	257	1796		340	60	20	40	80	18	26
245	228	249		240	256			340	60	20	42	80	18	30
300	228	252	1218	233	252	1941	43.8%	340	70	20	42	60	18	36
315	226	250		239	251			340	60	20	42	60	18	22
330	226	251	1295	238	253	2035		340	60	20	44	60	20	26

01

KONUS UNIT - KONUS ESP
15 MIN READINGS REPORT

3/4/93 Coal #2

TIME	#1 KONUS OIL TEMP IN	#1 KONUS OIL TEMP OUT	#1 KONUS FUEL COUNT	#2 KONUS OIL TEMP IN	#2 KONUS OIL TEMP OUT	#2 KONUS FUEL COUNT	BARK MOISTURE EVERY HALF HOUR	1 E.S.P. KV	1 E.S.P. MA	1 E.S.P. H	#2 E.S.P. KV	#2 E.S.P. MA	#2 E.S.P. A	SPARKS
345	226	250		239	253			340	60	10	42	60	18	20
400	227	249	1379	234	253	2159	46.6%	340	60	10	40	40	18	28
415	225	248		237	252			330	60	20	42	30	18	20
430	225	248	1449	238	255	2273		320	40	20	44	30	18	32
445	226	250		239	254			330	80	20	40	40	18	28
500	228	255	1526	236	256	2393	45.4%	320	60	20	42	40	18	32
515	233	258		247	265			320	60	10	42	30	18	48
530	233	262	1606	234	254	2521		320	60	10	40	30	18	40
545	223	250		237	257			320	60	20	44	30	18	36
600	227	250	1672	237	258	2624	45.3%	320	60	20	42	20	16	32
615	229	256		240	260			320	60	20	41	20	16	28
630	227	252	1757	228	252	2757		320	60	20	44	30	16	36
645	224	248		237	253			320	60	20	44	30	18	30
700	227	251	1830	232	251	2820	46%	320	60	20	42	30	16	34
715	228	250		235	259			320	60	20	42	30	18	42
730	227	251	76	239	252	119		320	70	20	40	20	16	36
745	229	253		234	258			320	60	20	42	20	16	44
800	230	255	150	230	253	234	44.6%	310	60	10	42	20	18	38
815	227	245		236	259			300	60	10	40	20	18	36
830	226	243	224	236	259	349		310	60	20	42	20	18	40
845	225	246		235	248			320	60	20	42	20	18	28
900	227	250	301	233	252	468	45.0%	310	60	10	42	20	18	32
915	227	248		238	256			310	60	20	44	30	18	28
930	227	249	377	239	251	587		300	60	20	40	30	18	28
945	229	249		232	255			310	60	10	42	30	18	30
1000	225	243	458	237	256	713	46.6%	310	60	20	42	30	18	32
1015	224	244		235	253			300	60	10	42	30	18	26
1030	225	247	532	235	254	829		300	60	20	40	20	18	32
1045	224	245		233	249			300	60	10	44	30	18	32
1100	222	243	607	233	250	944	45.2%	310	60	10	42	20	18	26
1115	225	241		235	254			300	60	20	44	20	16	32
1130	227	247	684	238	251	1063		300	60	20	40	20	16	34
1145	229	256		230	252			310	60	10	44	30	18	32
1200														

TRANSLATION TABLE

#1 ESP

KILOVOLTS TO METER SCALE

KV	METER SCALE	KV	METER SCALE
25.5	200	310	37.15
26.55	210	320	38.3
27.6	220	330	39.45
28.65	230	340	40.6
29.7	240	350	41.75
30.75	250	360	42.9
31.8	260	370	44.05
32.85	270	380	45.2
33.9	280	390	46.35
34.95	290	400	47.5
36	300		

M. STILE
HOULTON

APPENDIX VII

FIELD DATA SHEETS - METHOD 5 TESTING

FIELD DATA SHEET
GENERAL INFORMATION

PROJECT #: 93-015
PLANT: Louisiana-Pacific
LOCATION: Stack
Ds (ft): 4.25
Dn (in): .317
FILTER #: 5827
Cp: .84
P BAR: 30.2
P STACK: -.50

RUN #: M5-2
DATE: 3/4/93
OF POINTS: 16
TEST LENGTH: 64
END METER READING: 911.057
INT. METER READING: 876.757
BEGIN TIME: 1027
END TIME: 1140
SIGEL COND

IMP-1 (INT)	100	IMP-1 (FIN)	157
IMP-2 (INT)	100	IMP-2 (FIN)	101
IMP-3 (INT)	0	IMP-3 (FIN)	6
IMP-4 (INT)	500	IMP-4 (FIN)	509.4
IMP-5 (INT)		IMP-5 (FIN)	
IMP-6 (INT)		IMP-6 (FIN)	
IMP-7 (INT)		IMP-7 (FIN)	
IMP-8 (INT)		IMP-8 (FIN)	

PROJECT DIRECTOR: J Sidorwicz
METERBOX OPERATOR: J Sidorwicz
PROBE OPERATOR: D. Andrews
ORSAT ANALYST: D. Andrews
FIELD LABORATORY: J. Sidorwicz
CHAIN OF CUSTODY: J. Sidorwicz
PLANT COORDINATOR: Susan Sorey
AGENCY REP: S. Mason

% CO2 4.4
% O2 14.4
% CO

TOTAL VOLUMES INCLUDING RINSES:

FRONT HALF / IMPINGERS
FRONT HALF / IMPINGERS
BACK HALF / IMPINGERS
BACK HALF / IMPINGERS

COMMENTS:

FIELD DATA SHEET
TRAVERSE POINT INFORMATION

PAGE 1 OF 1

SAMPLING TIME PER POINT 4 min.

PLANT Louisiana-Pacific

RUN # 145-2

LOCATION Stack (Kamyr Oil Heater)

DATE 3/4/93

878.251

	TRAV. NO.	DELTA P	DELTA H	METER READING	DGM IN	DGM OUT	HOT BOX	IMPG TEMP	STACK TEMP	VAC	
0	A1	.16	.80	880.5	58	55	237	40	520	1	
3	2	.19	.95	882.5	60	55	265	42	526	1	13.8
12	3	.18	.90	884.5	66	55	271	47	530	1	
16	4	.20	1.00	886.6	70	56	272	48	532	1	
20	5	.20	1.00	888.6	72	56	261	51	532	1	13.5
24	6	.19	.95	890.7	76	56	252	51	534	1	
28	7	.17	.85	892.6	78	58	241	58	524	1	
32	8	.17	.85	894.530	79	60	240	61	523	1	
				894.600							
36	1	.17	.85	896.5	67	60	262	49	520	1	14.2
	2	.18	.90	898.4	69	59	249	54	528	1	
	3	.20	1.00	900.5	70	58	253	53	528	1	
	4	.22	1.10	902.6	71	58	260	54	533	1	
	5	.23	1.15	904.7	73	59	260	53	533	1	14.5
	6	.23	1.15	906.8	75	59	263	55	533	1	
	7	.20	1.00	909.0	73	59	262	56	520	1	
	8	.20	1.00	911.053	73	57	266	58	521	1	13.5

COMMENTS: DELTA P * 5 = DELTA H

BOX # EE1 Y = 1.007 DELTA H @ = 2.03

START TIME : ~~1200~~ 1027

END TIME : 1140

INITIAL LEAK CHECK .01 AT 10 INCHES HG

FINAL LEAK CHECK .01 AT 2 INCHES HG

Mid Leak ck .004@2"

* 157 T.W. .6017 F.W. .640

101

0

509.6

5.5% CO_2

Sara L Mar

EASTMOUNT ENGINEERING INC. • 420 MAIN STREET • WALPOLE MA 02081 • (508) 668-9005

Nozzle = .317 P_b 29.95

FIELD DATA SHEET
GENERAL INFORMATION

PROJECT #: 93-015
PLANT: Louisiana-Pacific
LOCATION: Stack
Ds (ft): 4.25
Dn (in): .317
FILTER #: 5823
Cp: .84
P BAR: 30.2
P STACK: -.50

RUN #: M5-3
DATE: 3/4/93
OF POINTS: 16
TEST LENGTH: 64
END METER READING: 944.433
INT. METER READING: 912.400
BEGIN TIME: 1325
END TIME: 1436
SIGEL COND

IMP-1 (INT)	100	IMP-1 (FIN)	162
IMP-2 (INT)	100	IMP-2 (FIN)	102
IMP-3 (INT)	0	IMP-3 (FIN)	0
IMP-4 (INT)	500	IMP-4 (FIN)	507.4
IMP-5 (INT)		IMP-5 (FIN)	
IMP-6 (INT)		IMP-6 (FIN)	
IMP-7 (INT)		IMP-7 (FIN)	
IMP-8 (INT)		IMP-8 (FIN)	

PROJECT DIRECTOR: J. Siderwicz
METERBOX OPERATOR: J. Siderwicz
PROBE OPERATOR: D. Andrews
ORSAT ANALYST: J. Siderwicz
FIELD LABORATORY: J. Siderwicz
CHAIN OF CUSTODY: J. Siderwicz
PLANT COORDINATOR: Susan Somers
AGENCY REP: S. MASON

% CO2 5.0
% O2 14.6
% CO

TOTAL VOLUMES INCLUDING RINSES:

FRONT HALF		IMPINGERS	
FRONT HALF		IMPINGERS	
BACK HALF		IMPINGERS	
BACK HALF		IMPINGERS	

COMMENTS:

FIELD DATA SHEET
TRAVERSE POINT INFORMATION

PAGE 1 OF 1

SAMPLING TIME PER POINT 4 min

PLANT Louisiana-Pacific

RUN # 145-3

LOCATION Stack (Konus Oil Heater)

DATE 3/4/93

912.400

TRAV. NO.	DELTA P	DELTA H	METER READING	DGM IN	DGM OUT	HOT BOX	IMPG TEMP	STACK TEMP	VAC
A1	.16	.83	914.3	52	52	240	39	506	1
2	.18	.94	916.3	56	51	260	38	508	1
3	.19	.99	918.3	60	57	260	39	510	1
4	.20	1.04	920.4	66	52	268	40	510	1
5	.21	1.09	922.6	67	52	268	42	514	1
6	.19	.99	924.6	70	52	265	45	506	1
7	.17	.88	926.6	71	54	261	46	500	1
8	.17	.88	928.517	70	54	254	46	497	1
			928.600						
A1	.14	.73	930.3	61	53	228	40	502	1
2	.18	.94	932.3	64	53	230	40	511	1
3	.20	1.04	934.3	66	54	252	41	514	1
4	.21	1.09	936.4	67	53	269	42	520	1
5	.22	1.14	938.5	67	53	272	43	520	1
6	.20	1.04	940.6	66	53	272	43	516	1
7	.17	.88	942.5	69	53	263	43	508	1
8	.17	.88	944.433	68	53	245	43	507	1

COMMENTS:

DELTA P * 5.2 = DELTA H

BOX # EFI Y = 1.007 DELTA H @ = 2.03

START TIME : 1325

END TIME : 1436

INITIAL LEAK CHECK .016 AT 8 INCHES HG

FINAL LEAK CHECK .006 AT 2 INCHES HG

Mid Point Leak ck .004@3"

Scott I Mason

EASTMOUNT ENGINEERING INC. • 420 MAIN STREET • WALPOLE MA 02081 • (508) 668-9005

FIELD DATA SHEET
GENERAL INFORMATION

PROJECT #: 93-015
PLANT: Louisiana-Pacific
LOCATION: Stack
Ds (ft): 4.25
Dn (in): .317
FILTER #: 5822
Cp: .84
P BAR: 30.15
P STACK: -.45

RUN #: M5-4
DATE: 3/4/93
OF POINTS: 16
TEST LENGTH: 64
END METER READING: 977.000
INT. METER READING: 944.750
BEGIN TIME: 1545
END TIME: 1702
SIGEL COND.

IMP-1 (INT)	100	IMP-1 (FIN)	170
IMP-2 (INT)	100	IMP-2 (FIN)	102
IMP-3 (INT)	0	IMP-3 (FIN)	0
IMP-4 (INT)	500	IMP-4 (FIN)	506.5
IMP-5 (INT)		IMP-5 (FIN)	
IMP-6 (INT)		IMP-6 (FIN)	
IMP-7 (INT)		IMP-7 (FIN)	
IMP-8 (INT)		IMP-8 (FIN)	

PROJECT DIRECTOR J. Sederwicz
METERBOX OPERATOR J. Sederwicz
PROBE OPERATOR D. Andrews
ORSAT ANALYST D. Andrews
FIELD LABORATORY J. Sederwicz
CHAIN OF CUSTODY J. Sederwicz
PLANT COORDINATOR Susan Somers?
AGENCY REP S. Mason

% CO2 4.8
% O2 14.2
% CO

TOTAL VOLUMES INCLUDING RINSES:

FRONT HALF		IMPINGERS	
FRONT HALF		IMPINGERS	
BACK HALF		IMPINGERS	
BACK HALF		IMPINGERS	

COMMENTS:

FIELD DATA SHEET
TRAVERSE POINT INFORMATION

PAGE 1 OF 1

SAMPLING TIME PER POINT 4 min.

PLANT Louisiana-Pacific

RUN # M5-4

LOCATION Stack

DATE 3/4/93

944.750

TRAV. NO.	DELTA P	DELTA H	METER READING	OGM IN	OGM OUT	HOT BOX	IMPG TEMP	STACK TEMP	VAC
A1	.14	.73	946.4	51	53	243	36	502	1
2	.18	.94	948.4	55	53	271	37	510	1
3	.20	1.01	950.5	60	53	272	38	512	1
4	.20	1.04	952.6	62	52	268	36	514	1
5	.22	1.14	954.7	64	52	247	36	514	1
6	.22	1.14	957.0	64	51	244	37	513	1
7	.19	.99	959.1	64	50	235	38	503	1
8	.18	.94	961.045	63	50	249	38	504	1
			961.100						
B1	.14	.73	962.9	49	47	270	35	502	1
2	.16	.83	964.7	59	48	266	37	507	1
3	.18	.94	966.7	59	49	253	37	511	1
4	.20	1.04	968.7	62	48	244	38	518	1
5	.21	1.09	970.8	64	49	260	37	515	1
6	.22	1.14	972.8	64	50	267	38	517	1
7	.19	.99	974.9	67	50	271	38	508	1
8	.19	.99	977.000	71	51	265	39	509	1

COMMENTS: Static -.45

DELTA P * 5.2 = DELTA H

BOX # EEI Y = 1.007 DELTA H @ = 2.03

START TIME : 1545

END TIME : ~~1600~~ 1702

INITIAL LEAK CHECK .008 AT 8 INCHES HG

FINAL LEAK CHECK .003 AT 5 INCHES HG

Mid Point Leak ck .002 @ 3"

APPENDIX VIII

EQUIPMENT CALIBRATION SHEETS

POST
METER BOX CALIBRATION SHEET

BOX #:EEI
PRES BAR: 29.58

DATE: 8MARCH93
VACUUM: 1.00

RUN #	VOLUME WET	VOLUME DRY	DELTA H	DELTA H /13.6	PRES BAR (ABS)	TIME (MINS)
1	10.00	10.175	.97	.071	29.65	19.31
2	10.00	10.311	.97	.071	29.65	19.26
3	10.00	10.176	.97	.071	29.65	19.29

RUN #	TEMP WET ('F)	TEMP DRY INLET	TEMP DRY OUT	TEMP DRY (AVG)	Y	DELTA H @
1	67	102	88	95.0	1.033	1.94
2	67	96	85	90.5	1.011	1.95
3	66	94	83	88.5	1.022	1.95
				AVERAGE	1.022	1.95
				MAX % DEV	1.11	
				ALLOWABLE % DEV	2.00	

PRE CAL Y = 1.007 % DIFFERENCE = 1.45 %

ALLOWABLE = 5.00 %

FORMULAS:

Y=

$$\frac{(V_w)(P_b)(T_d)}{(V_d)(P_b\ ABS)(T_w)}$$

DELTA H @=

$$\frac{0.0317\ (DELTA\ H)}{(P_b)(T_d)} * \left[\frac{(T_w)(TIME)}{(V_w)}\right]^2$$

CALIBRATION BY:

John Siderwicz

JOHN SIDERWICZ

METER BOX CALIBRATION SHEET

BOX NUMBER: EEI
PRESS BAR : 29.96

DATE: 29 DEC 92
DUE: 29 JUNE 93

RUN #	VOLUME WET	VOLUME DRY	DELTA H	DELTA H /13.6	PRES BAR (ABS)	TIME (MINS)
1	5	5.144	.50	.0368	30.00	13.04
2	5	5.098	1.00	.0735	30.03	9.48
3	10	10.166	1.50	.1103	30.07	16.05
4	10	10.443	2.00	.1471	30.11	13.98
5	10	10.341	3.00	.2206	30.18	11.51
6	10	10.523	4.00	.2941	30.25	10.10

RUN #	TEMP WET (°F)	TEMP DRY INLET	TEMP DRY OUT	TEMP DRY (AVG)	Y	DELTA H @
1	66.33	88.667	74.667	81.7	.9991	1.84
2	67.00	93.667	77.000	85.3	1.012	1.94
3	67.00	99.667	79.667	89.7	1.022	2.07
4	67.00	102.667	81.667	92.2	.9984	2.08
5	66.67	106.000	84.000	95.0	1.012	2.10
6	66.00	110.000	85.000	97.5	.9974	2.14
				AVERAGE	1.007	2.03
				MAX % DEVIATION	1.50	
				ALLOWABLE % DEV	2.00	

FORMULAS:

$$Y = \frac{(V_w)(P_b)(T_d)}{(V_d)(P_b\ ABS)(T_w)}$$

$$\text{DELTA H @} = \frac{0.0317\ (\text{DELTA H})}{(P_b)(T_d)} * \left[\frac{(T_w)(\text{TIME})}{(V_w)}\right]^2$$

CALIBRATION BY: Craig E. Scott

CRAIG E. SCOTT

Eastmount Engineering Inc. • 420 Main Street • Walpole, MA 02081 • (508) 668-9005 • FAX (508) 668-4989

NOZZLE CALIBRATION SHEET

PROJECT NUMBER: 93-015

TEST DATE: 3/4/93

CALIBRATED BY: I.S.

POINT #	NOZZLE # 5/16-15	NOZZLE #	NOZZLE #
1	.318		
2	.317		
3	.317		
AVERAGE	.317		
	METAL	METAL	METAL
	PYREX	PYREX	PYREX
	QUARTZ	QUARTZ	QUARTZ

POINT #	NOZZLE #	NOZZLE #	NOZZLE #
1			
2			
3			
AVERAGE			
	METAL	METAL	METAL
	PYREX	PYREX	PYREX
	QUARTZ	QUARTZ	QUARTZ

Eastmount Engineering Inc. • 420 Main Street • Walpole, MA 02081 • (508) 668-9005 • FAX (508) 668-4989

PROJECT #: Louisiana Pacific 93-015

EASTMOUNT ENGINEERING LABORATORY

FILTER TARE WEIGHTS
PACKING LIST

FILTER #	TARE WEIGHT (g)
5799	0.6043
5801	0.6046
5802	0.6054
5805	0.6092
5806	0.6090
5822	0.5986
5823	0.6030
5824	0.6029
5827	0.6017
5830	0.6043

THERMOCOUPLE CALIBRATION SHEET

SET #: 6'-4
TC #: 4

DATE 9/28/92

STANDARD ('F)	THERMOCOUPLE ('F)	% DIFFERENCE (ABSOLUTE)
34	34	.00
212	212	.00
338	342	.50
	MAXIMUM	.50
	ALLOWABLE	1.50

CALIBRATION BY: 

JOE HENNIGAR

TEMPERATURE INDICATOR CALIBRATION FORM

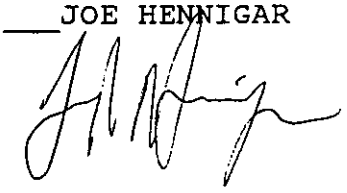
INDICATOR S/N:#7 CAL DATE: 2MAR93

REFERENCE S/N:1061-8277K DUE DATE: 2MAR93

	REFERENCE SET POINT							
CHANNEL NO.	0	32	212	250	320	600	800	1000
1	1	33	212	250	321	601	801	1002
2	1	33	212	250	321	600	801	1000
3	1	33	212	251	322	600	802	1002
4	1	34	212	251	322	600	801	1002
5	1	33	212	251	322	601	802	1002
6	3	34	213	251	322	601	802	1001
7								
8								
9								
10								

% DIFF: .66

CALIBRATED BY: JOE HENNIGAR



THERMOCOUPLE CALIBRATION SHEET

HR.

TC #: 196 DATE: 9/28/92

STANDARD ('F)	THERMOCOUPLE ('F)	% DIFFERENCE (ABSOLUTE)
33.0	32	.20
212.0	211	.15
349	350	.12
	MAXIMUM	.20
	ALLOWABLE	1.50

CALIBRATION BY: Joe Hennigar

JOE HENNIGAR

Eastmount Engineering Inc. • 420 Main Street • Walpole, MA 02081 • (508) 668-9005 • FAX (508) 668-4989

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 6 Oct 92 Thermocouple number 69 IET Hot Bop #5

Ambient temperature 49 Barometric pressure 30.25 in. Hg

Calibrator KD Reference: mercury-in-glass 14-995-5E + 14-983-10E

other

Reference point number[a]	Source[b] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °F	Temperature difference,[c] %
	ICE BATH	1	32	
	BOILING OIL	100	213	
	HOT OIL	156	311	

[a]Every 30°C (50°F) for each reference point.

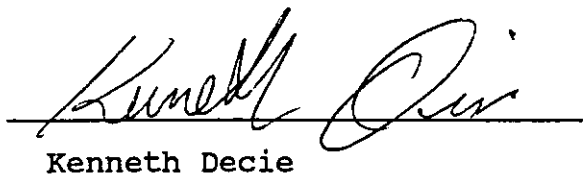
[b]Type of calibration system used.

[c]$\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right] 100 \leq 1.5\%$.

THERMOCOUPLE CALIBRATION SHEET

TC #: IET - 5 - 69 DATE: 10/5/92

STANDARD ('F)	THERMOCOUPLE ('F)	% DIFFERENCE (ABSOLUTE)
33.80	32	.36
212.00	213	.15
313	311	.23
	MAXIMUM	.36
	ALLOWABLE	1.50

CALIBRATION BY: 

Kenneth Decie

METER BOX CALIBRATION SHEET

BOX NUMBER: 1
PRESS BAR : 29.95

DATE: 30 NOV 92
DUE: 30 MAY ~~92~~ 93

RUN #	VOLUME WET	VOLUME DRY	DELTA H	DELTA H /13.6	PRES BAR (ABS)	TIME (MINS)
1	5	5.06	.50	.0368	29.99	12.97
2	5	5.07	1.00	.0735	30.02	9.41
3	10	10.176	1.50	.1103	30.06	16.03
4	10	10.251	2.00	.1471	30.10	13.40
5	10	10.278	3.00	.2206	30.17	11.51
6	10	10.326	4.00	.2941	30.24	10.00

RUN #	TEMP WET (`F)	TEMP DRY INLET	TEMP DRY OUT	TEMP DRY (AVG)	Y	DELTA H @
1	65	80.75	75	77.9	1.011	1.82
2	65	89.5	75.75	82.6	1.017	1.90
3	65.5	96.75	77.25	87.0	1.019	2.06
4	65.25	100.25	79.5	89.9	1.016	1.91
5	65	104	81	92.5	1.016	2.10
6	65	107.5	83	95.3	1.014	2.10
				AVERAGE	1.016	1.98
				MAX % DEVIATION	.45	
				ALLOWABLE % DEV	2.00	

FORMULAS:

$$Y = \frac{(V_w)(P_b)(T_d)}{(V_d)(P_b\ ABS)(T_w)}$$

$$\text{DELTA H @} = \frac{0.0317\ (\text{DELTA H})}{(P_b)(T_d)} * \left[\frac{(T_w)(\text{TIME})}{(V_w)}\right]$$

CALIBRATION BY: Kenneth M. Decie

KENNETH DECIE

THERMOCOUPLE CALIBRATION SHEET

SET #: METER BOX #1 - IN DATE: 12/28/88

STANDARD ('F)	THERMOCOUPLE ('F)	% DIFFERENCE (ABSOLUTE)
212	215	.45
72	74	.38
32	33	.20
	MAXIMUM	.45
	ALLOWABLE	1.50

SET #: METER BOX #1 - OUT DATE: 12/28/88

STANDARD ('F)	THERMOCOUPLE ('F)	% DIFFERENCE
212	209	.45
72	70	.38
32	32	.00
	MAXIMUM	.45
	ALLOWABLE	1.50

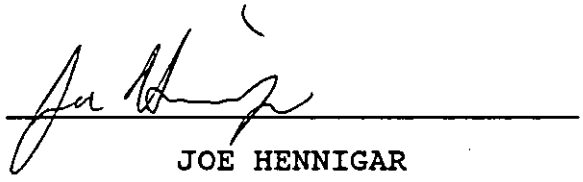
CALIBRATION BY: A. STRATTON

THERMOCOUPLE CALIBRATION SHEET

SET #: 6'-3
TC #: 18

DATE 9/28/92

STANDARD ('F)	THERMOCOUPLE ('F)	% DIFFERENCE (ABSOLUTE)
35	35	.00
212	212	.00
342	342	.00
	MAXIMUM	.00
	ALLOWABLE	1.50

CALIBRATION BY: 

JOE HENNIGAR