Victorville #2
coal Precalciner

D.Y. /

AP-42 Section 11.6
Reference 57
Report Sect. 4
Reference 62

COMPLIANCE TESTING AT SOUTHWESTERN PORTLAND CEMENT

March 18 through 21, 1985

Prepared for

Southwestern Portland Cement
15000 Seventh Street, Suite 201
Victorville, California 92392

April 1985

Prepared by

Pape & Steiner Environmental Services
5801 Norris Road
Bakersfield, California 93308

Report PS-85-411/Project 5401-85

SOUTHWESTERN PORTLAND CEMENT COMPANY

P. O. BOX 937
VICTORVILLE, CALIFORNIA 92392
[redacted]
(619) 245-1681

June 13, 1985

Mr. Tom Upthegrove
San Bernardino County
Air Pollution Control District
15505 Civic Drive
Victorville, CA 92392

Dear Tom:

Subject: Production Rates During Compliance Testing

Compliance testing was done during the week of March 18 through March 21, 1985. These results have been previously submitted to you with my letter of April 19, 1985 along with the compliance test report by Pape & Steiner, #PS-85-411, Project 5401-85, dated April, 1985.

Production rates on the various units tested are as follows:

#2 Kiln - Baghouse Stack

Test Number	1	2	3
Test Dates:	03/20/85	03/21/85	03/21/85
Indicated Kiln Feed Rate (TPH):	230	206.25	206.25
Corrected Kiln Feed Rate (TPH):	205	184	184
Clinker (TPH):	112	100	100
Coal Feed Rates (TPH):			
Pyroclone:	6.61 TPH	5.6	5.6
Kiln:	7.45 TPH	6.8	6.8
Total	14.06	12.4	12.4

Coal - 13,445 BTU/lb. As received.
= 26.89 MM BTU/Ton

Mr. Tom Upthegrove
San Bernardino County
Air Pollution Control District
Page Two
June 13, 1985

#2 Raw Mill - Stack - #27-FDC-14

Test Number	1	2	3
Test Dates:	03/21/85	03/22/85	03/22/85
Average Mill Feed rates (TPH):	250	227	227

#27-FDC-11 - Addditive Feed Belt to Raw Mill #2

Test Number	1	2
Test Dates:	03/22/85	03/22/85
Average Feed Rate (TPH):	12.9	12.9

#12 Finish Mill - Main Dust Collector Stack - #42-FDC-34

Test Number	1	2	3
Test Dates:	03/19/85	03/19/85	03/19/85
Average Mill Feed Rate (TPH):	73.5	73.5	73.5

High Surface Area Grind - Average Blaine = 4560 sq. cm./gram.

#12 Finish Mill Feed Belt Dust Collector #42-FDC-35

Test Number	1	2	3
Test Dates:	03/19/85	03/19/85	03/19/85
Average Mill Feed Rate (TPH):	73.5	73.5	73.5

Sincerely yours,

Douglas Y. MacIver

Douglas Y. MacIver
Manager, Environmental Engineering

DYM:kmr
cc: E. B. Thorn, Jr.
O. G. Dagnan
M. A. Yannone
W. R. McCormick
J. H. Fleming
Walter Mook, APCD

SOUTHWESTERN PORTLAND CEMENT COMPANY

P. O. BOX 937
VICTORVILLE, CALIFORNIA 92392
[redacted]
(619) 245-1681

April 19, 1985

Mr. Walter Mook
Executive Officer
San Bernardino Air Pollution
Control District
15579 Eighth Street
Victorville, CA 92392

Dear Walter:

Subject: Compliance Tests at Southwestern's New Facilities

Enclosed herewith are the results of the compliance tests done by Pape & Steiner Environmental Services which are required by your district and EPA's New Source Performance Standards (INSPS). These tests were conducted on March 19-22, 1985. Tom Upthegrove, an engineer with your district, observed the testing.

As noted by Pape & Steiner's report, the test on the clinker cooler dust collector (GBF-2) was not completed and the test on the clinker belt transfer point dust collector (53FDC-35) was not done because the clinker belt burned up during the early morning of March 21. Testing of these two dust collectors will be rescheduled.

Calibration of the kiln feed scale on March 22 after these tests were done shows that the indicated kiln feed rate was too high during the test periods. It should be noted that the indicated kiln feed rate includes 10-13% returned kiln baghouse dust.

The correct rates should be:

Test Number	1	2	3
Date	3/20/85	3/21/85	3/21/85
Test condition, indicated KF rate with returned dust	230 TPH	206.25 TPH	206.25 TPH
Corrected KF rate with returned dust	205 TPH	184 TPH	184 TPH
Clinker	112 TPH	100 TPH	100 TPH

Mr. Walter Mook
Page Two
April 19, 1985

The emissions on the units tested meet all of the established emission limits in your rules and the EPA NSPS. We await your evaluation of how we stand with your new source review limits on carbon monoxide.

As required by your new source review, we are also sending a copy of this report to the EPA, Region IX in San Francisco.

If you have any question, please call.

Sincerely,

Douglas Y. MacIver

Douglas Y. MacIver
Manager, Environmental Engineering

DYM:kmr

Enclosures

cc: E. B. Thorn, Jr.
O. G. Dagnan
M. A. Yannone
W. R. McCormick
G. W. Ogle
EPA; Region IX

#4

COMPLIANCE TESTING AT SOUTHWESTERN PORTLAND CEMENT

March 18 through 21, 1985

Prepared for

Southwestern Portland Cement
15000 Seventh Street, Suite 201
Victorville, California 92392

April 1985

Prepared by

Pape & Steiner Environmental Services
5801 Norris Road
Bakersfield, California 93308

Report PS-85-411/Project 5401-85

TABLE OF CONTENTS

SECTION 1

INTRODUCTION

At the request of Southwestern Portland Cement (SWPC), Pape & Steiner Environmental Services conducted a series of emission tests on the exhaust of baghouse control devices on five new sources at their cement plant near Victorville, California. The purpose of this test program was to demonstrate compliance with EPA and San Bernardino County rules and regulations.

Recently, SWPC completed a large expansion of their Victorville cement plant. A new kiln (#2), raw mill (#2), finish mill (#12) and several belt feed dust collectors (#42-FDC-35, 27-FDC-11) are each equipped with baghouse particulate control devices. The kiln, raw mill and finish mill emissions were tested for EPA. The belt feed dust collector emissions were tested for San Bernardino County APCD. Some problems were encountered with the new Clinker Cooler (#2) equipped with a gravel bed filter and the clinker feed belt dust collector. Compliance demonstration tests were not completed on these two sources.

Pape & Steiner Environmental Services conducted the compliance test program from March 19 through 21, 1985. Triplicate EPA Method 5 tests for filterable particulate were performed on the #2 kiln, #2 raw mill, #12 finish mill and 42-FDC-35. Continuous monitor tests for NO_x, SO_2, CO, CO_2

and O_2 were performed at the baghouse exhaust of #2 kiln using CARB Method 1-100. Triplicate 1-hour tests were run concurrently with the particulate measurements. A grab sample was collected during each test for C_1 through C_6 and greater than C_6 hydrocarbon analysis. Duplicate Method 5 tests were performed on 27-FDC-11. This source is regulated by San Bernardino County. Duplicate measurements were allowed because of circumstances occurring during the test program. The #2 kiln went down during the test program leaving only limited room in the raw feed silos and only duplicate tests could be completed before the silos were full.

Section 2 of this report presents the results for each of the sources tested. Sections 3 and 4 describe the sampling and analysis procedures used. Quality assurance steps taken during this program are described in Section 5. The Appendix contains calculation worksheets, raw data sheets, continuous monitor strip charts and equipment calibration sheets.

SECTION 2

RESULTS

This section of the report presents the results of emission tests conducted on each of five new sources at SWPC Victorville facility.

Tables 2-1 through 2-5 present results from #2 kiln, #2 raw mill, #12 finish mill, 42-FDC-35 and 27-FDC-11 respectively. Feedrate in tons per hour is presented for each test. Flue gas pressure, temperature, velocity and standardized volumetric flowrates were measured for each Method 5 test. Gas analysis of O_2, CO_2 and H_2O was also measured during each test. Filterable particulate emissions are reported as solid particulate and represents matter which is filterable at 250°F. The filterable particulate is determined by combining the catch from the nozzle, probe, filter holder wash, and filter. Pound per hour emission rates are calculated from emission concentration and measured volumetric flowrates for each test.

Table 2-1 also presents gaseous and hydrocarbon emission data collected during the particulate tests. NO_x, SO_2 and CO components are presented on a dry volume basis. Pound per hour emission rates are calculated based on the measured volumetric flowrates from the Method 5 tests. Hydrocarbon components were speciated and lb/hr emission rates were determined by summing the individual component lb/hr emission rates. There were no hydrocarbon species detected greater than propane.

TABLE 2-1. SUMMARY OF SOURCE EMISSION TEST DATA

UNIT TESTED: #2 Kiln LOCATION: Baghouse Outlet

Adjusted rate = Clinker →	112 T/hr	100	100	
Test number	1	2	3	Average
Date	03/20/85	03/21/85	03/21/85	
Test condition	230 TPH	206.5 TPH	206.5 TPH	
KF →	205	184	184	
Barometric pressure (in. Hg)	26.57	26.41	26.41	
Stack pressure (in. Hg)	26.57	26.41	26.41	
Stack area (ft^2)	139.63	139.63	139.63	
Elapsed sampling time (min)	72	72	72	
Volume gas sampled (dscf)	41.972	42.273	45.757	
F-Factor (Factor)	0.546	0.543	0.543	
GAS DATA				
Average gas velocity (fps)	36.19	37.88	38.39	37.49
Average gas temperature (°F)	390	377	387	385
Gas flowrate (dscfm)	160292	169115	169637	166361
Gas analysis (dry percent basis)				
Carbon Dioxide	18.8	16.7	17.5	17.7
Oxygen	9.8	11.0	10.8	10.5
Carbon Monoxide (ppm)	121	57	53	77
Water	4.2	4.3	4.2	4.2
EMISSION CONCENTRATION				
Solid Particulate (gr/dscf)	0.0100	0.0027	0.0022	0.0050
Solid Particulate @ 12% CO_2				
Particulate Matter (gr/dscf)				
Particulate Matter @ 12% CO_2				
Total Sulfate (gr/dscf)				
Total Sulfate @ 12% CO_2				
CO (ppm)	121	57	53	77
CO @ 3% O_2	195	103	94	131
SO_2 (ppm)	10	4	7	7
SO_2 @ 3% O_2	16	7	12	12
NO_x (ppm)	680	623	623	~~622~~ 642 ?
NO_x @ 3% O_2	1097	1126	998	1074
EMISSION RATE				
Solid Particulate (lb/hr)	13.73	3.95	3.16	6.95
Particulate Matter (lb/hr)				
Total Sulfate (lb/hr)				
CO (lb/hr)	84.58	42.04	39.21	55.28
SO_2 (lb/hr)	16.80	6.75	11.85	11.53
NO_x (lb/hr)	780.87	754.79	684.21	739.96
VOC (lb/hr)	0.99	2.04	2.24	1.76
Coal-Feed rates PC	6.61	5.6	5.6	
Kiln	7.45	6.8	6.8	
KFx1.536= CL	14.06	12.4	12.4	
Adjusted #NO_x/MMBTU	2.07	2.26 ~~2.25~~	~~2.05~~ 2.05	2.13 ~~2.24~~
#NO_x/TKF	2-2 3.395	3.656	3.31	3.45
#NO_x/T Clinker	5.21	5.62	5.09	5.31
Adjusted " /T Clinker	6.97	7.56	6.84	7.12

Adjusted 3.88 #NO_x/T

TABLE 2-2. SUMMARY OF SOURCE EMISSION TEST DATA

UNIT TESTED: #2 Raw Mill - #27-FDC-14 LOCATION: Baghouse Outlet

Test number	1	2	3	Average
Date	03-21-85	03-22-85	03-22-85	
Test condition	250 TPH	223 TPH	223 TPH	
Barometric pressure (in. Hg)	26.47	26.37	26.37	
Stack pressure (in. Hg)	26.41	26.34	26.34	
Stack area (ft^2)	28.27	28.27	28.27	
Elapsed sampling time (min)	72	60	60	
Volume gas sampled (dscf)	47.163	38.767	35.905	
F-Factor				
GAS DATA				
Average gas velocity (fps)	52.04	49.80	46.72	49.52
Average gas temperature (^oF)	178	162	172	171
Gas flowrate (dscfm)	16865	60906	56259	59677
Gas analysis (dry percent basis)				
Carbon Dioxide	0.5	0.5	0.5	0.5
Oxygen	20.5	20.5	20.5	20.5
Carbon Monoxide (ppm)	---	---	---	---
Water	4.1	3.6	3.5	3.7
EMISSION CONCENTRATION				
Solid Particulate (gr/dscf)	0.0057	0.0051	0.0041	0.0050
Solid Particulate @ 12% CO_2				
Particulate Matter (gr/dscf)				
Particulate Matter @ 12% CO_2				
Total Sulfate (gr/dscf)				
Total Sulfate @ 12% CO_2				
CO (ppm)				
CO @ 3% O_2				
SO_2 (ppm)				
SO_2 @ 3% O_2				
NO_x (ppm)				
NO_x @ 3% O_2				
EMISSION RATE				
Solid Particulate (lb/hr)	3.00	2.66	1.96	2.54
Particulate Matter (lb/hr)				
Total Sulfate (lb/hr)				
CO (lb/hr)				
SO_2 (lb/hr)				
NO_x (lb/hr)				
lb/MMBtu - EMISSION FACTOR				
Solid Particulate				
Particulate Matter				
Total Sulfate				
SO_2				
NO_x				

TABLE 2-3. SUMMARY OF SOURCE EMISSION TEST DATA

UNIT TESTED: #12 Finish Mill E42-FDC-34 LOCATION: Baghouse Outlet

Test number	1	2	3	Average
Date	03/19/85	03/19/85	03/19/85	
Test condition	73.5 TPH	73.5 TPH	73.5 TPH	4560 Blaine surface
Barometric pressure (in. Hg)	27.36	27.36	27.36	
Stack pressure (in. Hg)	27.35	27.35	27.35	
Stack area (ft^2)	18.03	18.03	18.03	
Elapsed sampling time (min)	120	120	120	
Volume gas sampled (dscf)	71.390	66.799	70.549	
F-Factor				
GAS DATA				
Average gas velocity (fps)	19.50	18.61	19.74	19.28
Average gas temperature (°F)	188	188	191	189
Gas flowrate (dscfm)	14322	13669	14510	14167
Gas analysis (dry percent basis)				
Carbon Dioxide	0	0	0	0
Oxygen	20.9	20.9	20.9	20.9
Carbon Monoxide (ppm)	---	---	---	---
Water	8.8	8.9	8.4	8.7
EMISSION CONCENTRATION				
Solid Particulate (gr/dscf)	0.0039	0.0014	0.0019	0.0024
Solid Particulate @ 12% CO_2				
Particulate Matter (gr/dscf)				
Particulate Matter @ 12% CO_2				
Total Sulfate (gr/dscf)				
Total Sulfate @ 12% CO_2				
CO (ppm)				
CO @ 3% O_2				
SO_2 (ppm)				
SO_2 @ 3% O_2				
NO_x (ppm)				
NO_x @ 3% O_2				
EMISSION RATE				
Solid Particulate (lb/hr)	0.48	0.16	0.25	0.30
Particulate Matter (lb/hr)				
Total Sulfate (lb/hr)				
CO (lb/hr)				
SO_2 (lb/hr)				
NO_x (lb/hr)				
lb/MMBtu - EMISSION FACTOR				
Solid Particulate				
Particulate Matter				
Total Sulfate				
SO_2				
NO_x				

TABLE 2-4. SUMMARY OF SOURCE EMISSION TEST DATA

UNIT TESTED: #42-FDC-35 Finish Mill Belt Feed Dust Collector LOCATION: Baghouse Outlet

Test number	1	2	3	Average
Date	03/19/85	03/19/85	03/19/85	
Test condition	73.5 TPH	73.5 TPH	73.5 TPH	
Barometric pressure (in. Hg)	27.45	27.45	27.45	
Stack pressure (in. Hg)	27.43	27.43	27.43	
Stack area (ft^2)	1.88	1.88	1.88	
Elapsed sampling time (min)	126	126	126	
Volume gas sampled (dscf)	82.430	66.546	72.290	
F-Factor				
GAS DATA				
Average gas velocity (fps)	41.26	33.01	36.72	37.00
Average gas temperature (^oF)	76	69	82	79
Gas flowrate (dscfm)	4162	3311	3668	3714
Gas analysis (dry percent basis)				
Carbon Dioxide	0	0	0	0
Oxygen	20.9	20.9	20.9	20.9
Carbon Monoxide (ppm)	---	---	---	---
Water	0.7	0.7	0.5	0.6
EMISSION CONCENTRATION				
Solid Particulate (gr/dscf)	0.0048	0.0061	0.0063	0.0057
Solid Particulate @ 12% CO_2				
Particulate Matter (gr/dscf)				
Particulate Matter @ 12% CO_2				
Total Sulfate (gr/dscf)				
Total Sulfate @ 12% CO_2				
CO (ppm)				
CO @ 3% O_2				
SO_2 (ppm)				
SO_2 @ 3% O_2				
NO_x (ppm)				
NO_x @ 3% O_2				
EMISSION RATE				
Solid Particulate (lb/hr)	0.17	0.17	0.20	0.18
Particulate Matter (lb/hr)				
Total Sulfate (lb/hr)				
CO (lb/hr)				
SO_2 (lb/hr)				
NO_x (lb/hr)				
lb/MMBtu - EMISSION FACTOR				
Solid Particulate				
Particulate Matter				
Total Sulfate				
SO_2				
NO_x				

TABLE 2-5. SUMMARY OF SOURCE EMISSION TEST DATA

UNIT TESTED: #27-FDC-11 Raw Mill Belt Feed Dust Collector LOCATION: Baghouse Outlet

Test number	1	2		Average
Date	03/22/85	03/22/85		
Test condition	13 TPH	13 TPH		
Barometric pressure (in. Hg)	26.43	26.43		
Stack pressure (in. Hg)	26.43	26.43		
Stack area (ft^2)	1.88	1.88		
Elapsed sampling time (min)	60	60		
Volume gas sampled (dscf)	46.138	37.392		
F-Factor				
GAS DATA				
Average gas velocity (fps)	20.89	17.02		
Average gas temperature (°F)	69	72		
Gas flowrate (dscfm)	2059	1667		
Gas analysis (dry percent basis)				
Carbon Dioxide	0	0		0
Oxygen	20.9	20.9		20.9
Carbon Monoxide (ppm)	---	---		---
Water	0.7	0.8		0.7
EMISSION CONCENTRATION				
Solid Particulate (gr/dscf)	0.0030	0.0020		0.0025
Solid Particulate @ 12% CO_2				
Particulate Matter (gr/dscf)				
Particulate Matter @ 12% CO_2				
Total Sulfate (gr/dscf)				
Total Sulfate @ 12% CO_2				
CO (ppm)				
CO @ 3% O_2				
SO_2 (ppm)				
SO_2 @ 3% O_2				
NO_x (ppm)				
NO_x @ 3% O_2				
EMISSION RATE				
Solid Particulate (lb/hr)	0.05	0.03		0.04
Particulate Matter (lb/hr)				
Total Sulfate (lb/hr)				
CO (lb/hr)				
SO_2 (lb/hr)				
NO_x (lb/hr)				
lb/MMBtu - EMISSION FACTOR				
Solid Particulate				
Particulate Matter				
Total Sulfate				
SO_2				
NO_x				

SECTION 3

SAMPLING EQUIPMENT AND PROCEDURES

This section of the report describes the equipment and procedures used to conduct the particulate gaseous tests on this program.

3.1 PRELIMINARY MEASUREMENTS

Before conducting the stack tests a series of preliminary measurements were made to determine:

- The location of the sampling site and the number and location of the sampling points to be used (EPA Method 1)
- The velocity, temperature, and pressure of the gases in the stack (EPA Method 2)
- The composition of the stack gases (EPA Method 3)
- The moisture content of the stack gases (psychrometric chart)

Using the results of these preliminary measurements and the calibration constants for the sampling train, a series of calculations were made to determine the value of K, a constant, and N_d, ideal nozzle diameter, required to run an isokinetic test according to the equation:

$$\Delta H = \left\{ \frac{60^2 \pi^2 K_p{}^2 C_p{}^2 (1 - B_{wo})^2 P_s MW_d}{576^2 K_o{}^2 MW_s P_m} \right\} (N_d{}^4) \left(\frac{T_m}{T_s} \right) (\Delta P)$$

where

$$K = \left\{\frac{60^2 \pi^2 K_p{}^2 C_p{}^2 (1 - B_{wo})^2 P_s MW_d}{576^2 K_o{}^2 MW_s P_m}\right\}$$

An actual nozzle, whose diameter was as close as possible to the ideal nozzle diameter, was selected for the test. Isokinetic sampling rates for each sampling point in the stack were computed using the equation:

$$\Delta H = (K)(N_d{}^4)\left(\frac{T_m}{T_s}\right)(\Delta P)$$

Since K and N_d are known, and remain constant during a test, the only variables are the meter temperature, the stack temperature and the velocity pressure for each sampling point.

3.2 PREPARATION OF THE PARTICULATE SAMPLING TRAIN

All sampling train components were cleaned in the laboratory (soap and water, tap water rinse, distilled water rinse, and IPA rinse) to eliminate previous contamination. The sampling train components were sealed and transported to the sampling site in a mobile lab. The EPA Method 5 equipment used to measure particulates (filterable) consisted of:

- A calibrated 316 stainless steel nozzle for isokinetic sampling
- A heated Pyrex glass sampling probe equipped with an S-type pitot tube and a thermocouple to measure stack velocity, pressure and temperature

- A heated Pyrex glass filter holder containing a weighed 100-mm Reeve Angel 934 AH glass fiber filter
- A Pyrex glass impinger train in an icebath (impingers 1 and 2 contained 100 ml distilled water; impinger 3 was dry; bubbler 4 contained a weighed amount of silica gel)
- An umbilical to connect the probe and sample box to the control module
- A control module containing a vacuum pump, a calibrated dry gas meter and a calibrated orifice meter to measure the pressure, temperature and flowrate throughout the train.

The sampling train was charged in the mobile lab using freshly prepared reagents. Each impinger and its contents was weighed to the nearest 0.1 gm on a calibrated electronic balance. Blanks of all filters and reagents were retained for subsequent analysis. The sampling point locations were marked on the probe using a high-temperature marker. The sampling train was completely assembled and lifted to the sampling site.

3.3 SAMPLING PROCEDURES FOR PARTICULATE SAMPLING TRAIN

Prior to a test, the sampling train was heated and leak-checked at 15 inches Mercury to insure leakage was less than 0.02 cfm. The S-type pitot tube was also leak-checked. The sampling train was installed on the unirail and the probe was inserted into the stack at the farthest point. An isokinetic sampling rate was calculated using an HP-41CV calculator for each sampling point on the traverse. Each point was sampled for an equal period of time and all pertinent data was recorded on the data sheet for each point. The probe and sample box were maintained at 250^{o}F throughout the traverse. The gases leaving the impinger train were maintained at <70^{o}F. At the end of a traverse, the probe was withdrawn from the stack and the entire sampling train was transferred (intact) to the next sampling port. Another traverse of the stack was completed and the sampling train was withdrawn for the final leak check. This leak check was performed at 15 inches Mercury or at the highest vacuum achieved during the test. The S-type pitot tube was also checked at this time. After the leack check was complete the probe, nozzle, filter holder, and impinger train were sealed with tin foil and lowered to the mobile lab for sample recovery.

3.4 SAMPLE RECOVERY PROCEDURES FOR PARTICULATE SAMPLING TRAIN

Sample recovery occurred in the mobile lab. The nozzle and probe were brushed and rinsed three times using ACS reagent grade acetone into a polyethylene sample bottle. The 100-mm filter was removed from the 4-inch filter holder and sealed in its petri dish. The front half of the 4-inch glass filter holder was brushed and rinsed with acetone. Each impinger was removed from the icebath, wiped dry and weighed to the nearest 0.1 gm. All sample bottles and petri dishes were marked and labeled. A chain-of-custody log was completed and the field data sheet was also labeled with the sample ID numbers. The sampling train was then recharged in preparation for the next test.

3.5 SAMPLING PROCEDURES FOR CONTINUOUS MONITORING

The continuous monitors used in the Pape & Steiner Mobile Monitoring Lab are shown in Table 3-1. Figure 3-1 is a schematic of the continuous

TABLE 3-1 . CONTINUOUS MONITORING LAB

NO_x CHEMILUMINESCENT ANALYZER -- THERMO ELECTRON MODEL 10

Response Time (0-90%)	1.5 sec -- NO mode 1.7 sec -- NO_x mode
Zero Drift	Negligible after 1/2 hour warmup
Linearity	±1% of full scale
Accuracy	Derived from the NO or NO_2 calibration gas, ±1% of full scale
Output	0.100 mV, 0-10 mV, 0-5 V, 0-10 V

O_2 ANALYZER, FUEL TYPE -- TELEDYNE MODEL 326

Response Time (0-90%)	60 seconds
Accuracy	±1% of scale at constant temperatures; ±1% of scale of ±5% of reading, whichever is greater, over the operating temperature range
Output	0-1 V

CO_2/CO INFRARED ANALYZER -- ANARAD MODEL AR-600

Response Time (0-90%)	5 seconds
Zero Drift	±1%
Span Drift	±1%
Linearity	1%
Resolution	Less than 1% of full scale
Output	0-1 V

SO_2 UV ANALYZER -- DUPONT MODEL 400

Response Time (0-90%)	Less than 1 second
Zero Drift	Less than 1% full scale in 24 hours
Linearity	±1% full scale
Accuracy	±2% full scale
Output	0-10 mV
Operating Ranges	0-100 ppm, 0-1000 ppm

STRIP CHART RECORDERS (3) -- LINEAR MODEL 486

Pen Response	20 inches/second
Span -- full scale	1 mV through 10 V
Zero Set	Electronically adjustable full scale with 1 full scale of zero supression
Accuracy Dead Band Linearity Repeatability	Total limit of error ±0.5%

SCOTSMAN TRAILER

Fully Insulated
Air conditioned
8-ft x 14-ft x 11-ft

1. Filter 0.6 μ, 99.9999 percent efficient
2. Duct
3. 316 stainless steel probe
4. 3/8-inch, heated (250°F) Teflon
5. Four-pass conditioner-dryer, 316 stainless steel internals
6. 3/8-inch, unheated Teflon
7. Teflon-lined sample pump
8. 3/8-inch unheated Teflon
9. Rotameter
10. 1/4-inch Teflon tubing
11. Calibration gas manifold
12. Calibration gas selector valve
13. Calibration gas cylinders
14. Backpressure regulator
15. Auxiliary analysis port

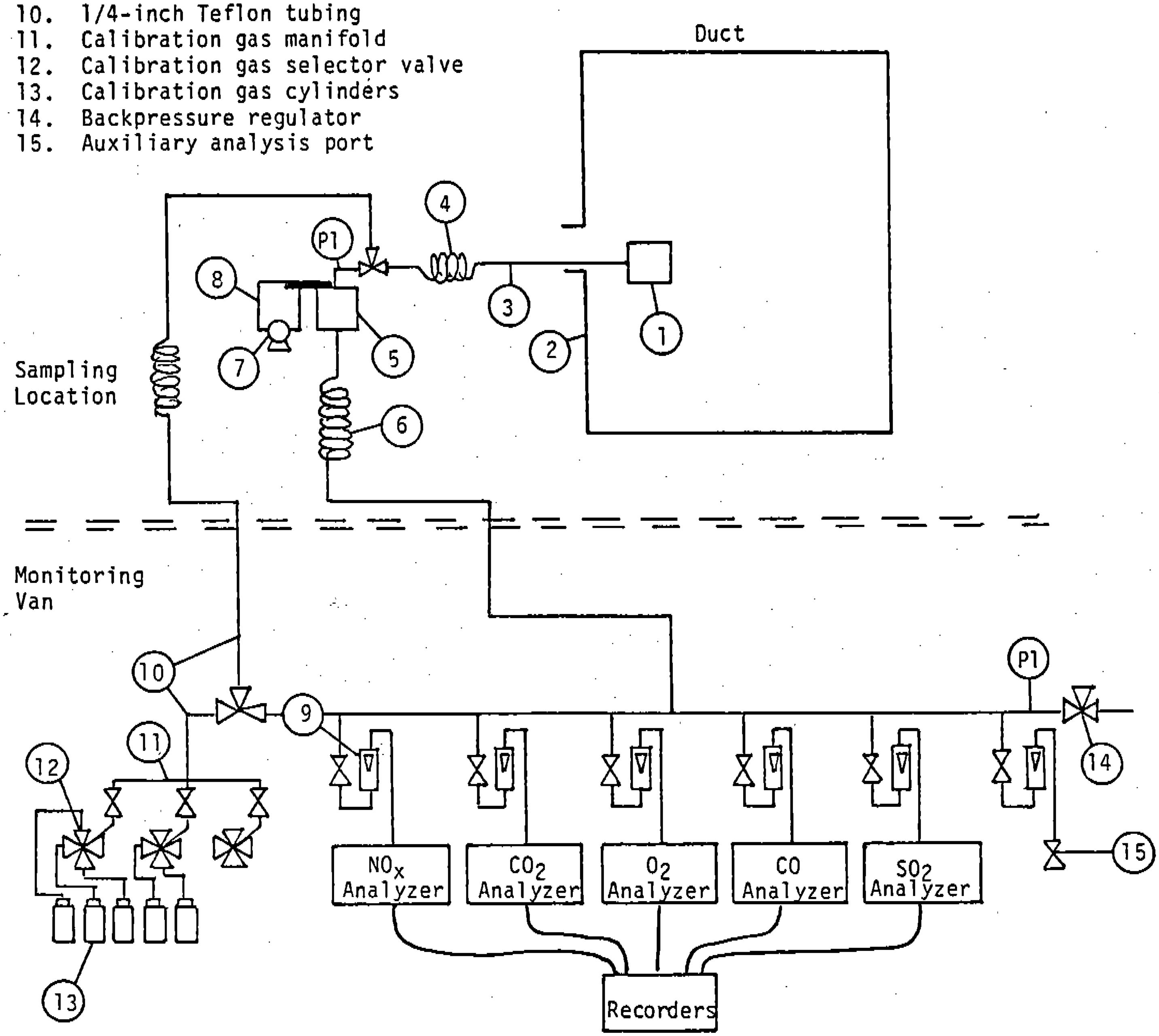

Figure 3-1. Schematic of Continuous Monitoring System.

monitoring system. The procedures used to continuously monitor stack gases for NO_x, SO_2, CO, CO_2, and O_2 strictly follow CARB Method 1-100.

Sample was taken from the stack using a 316 stainless steel probe. A Balston filter holder and fiberglass filter (99.9999 percent efficiency retention of 0.6 micron particles) was connected to the outlet of the probe. Sample gas was transported through heated Teflon sample line (maintained at >250^{o}F) by a Teflon-lined diaphragm pump to a 316 stainless steel refrigeration type conditioner (Hankison Model E-4G-SS). The sample gas was passed through the conditioner two separate times under vacuum before entering the pump, then two additional times under pressure. The clean, dry sample gas ($\sim$ 35^{o}F) was then transported to the continuous analyzer system through an unheated Teflon line. A series of flowmeters, valves, and regulators maintain constant flow through the system at a constant pressure.

Calibrations of the continuous analyzers were performed using EPA Protocol 1 calibration gases ($\pm$ 1 percent) for criteria pollutant analysis (NO_x/SO_2) and certified calibration gases ($\pm$ 1 percent) for fixed gas analysis. Copies of the gas certifications are included in the Appendix of this report. All pertinent data (date, time, test locations, analyzer range, cal gas value) were recorded on both the field data sheets and continuous analyzer strip charts in the field.

At the start of the test, a leak-check was performed. The sample probe was removed from the stack and the end was sealed with a Swagelok cap. A leak-check is successful only if pressure at the analyzer system and flow through the rotameters to the individual analyzers all drop to zero. A mandatory leak-check was performed at the completion of each test.

An initial calibration was performed at the start of the test period by introducing zero and span gases for each analyzer and making the necessary adjustments. Calibration gas values were recorded on the continuous monitor strip charts and field data sheets. A calibration check was completed at the end of the test and adjustments (if necessary) to the analyzers were made in preparation for another test.

Test data was collected by continuously recording data onto strip charts for each test.

3.5 SAMPLING PROCEDURES FOR HYDROCARBONS

The sampling train for hydrocarbons consisted of a probe (short piece of stainless steel), a Teflon sample line, a 500 ml glass sampling bomb; and a squeeze bulb. The entire train was purged with stack gas several times before collecting a sample. After sample collection, the glass bomb was taken to the mobile lab for immediate analysis. One grab sample was collected during each test on the Kiln.

SECTION 4

ANALYSIS PROCEDURES

This section of the report describes the procedures used to analyze the samples collected during the test program. All analyses were performed in the Pape & Steiner climate-controlled laboratory in Bakersfield.

4.1 ANALYSIS OF PARTICULATE SAMPLES

4.1.1 Nozzle, Probe, Filter Holder Wash

The volume of the acetone washings were measured and the washings were transferred to clean, tared, aluminum weighing dishes. The dishes were placed on a hot plate in a fume hood and gently heated to dryness. The dishes with the dry residue were desiccated and weighed repeatedly at 6-hour intervals until a constant weight was achieved (to the nearest 0.01 mg with a tolerance of <0.1 mg between weighings). The ACS reagent grade acetone blank was treated in the same manner.

4.1.2 Filter

The 100 mm filter was removed from its petri dish and transferred to an oven where it was heated for 2 hours at 105^{o}C. The filter was then desiccated and weighed repeatedly at 6-hour intervals until a constant weight was achieved (to nearest 0.01 mg with a tolerance of <0.1 mg between weighings). An unused, tared blank filter was treated in the same manner.

4.2 ANALYSIS OF HYDROCARBON SAMPLES

The grab sample of hydrocarbons was analyzed using Carle Model 211 AGC-FID. After purging the syringe three times, a 1-ml syringe sample was extracted from the syringe port on the glass bomb and injected onto a 6-foot long, 1/8-inch stainless steel column containing 80/100 mesh PoraPac Q, maintained at 150^{o}C. Any C_1 through C_5 hydrocarbons were speciated and the greater than C_5 hydrocarbons were backflushed to the detector for quantitation as a single peak. An HP Model 3390A reporting integrator was used to record and integrate the signal from the GC. A ± 1 percent certified calibration gas (C_1-C_6 HC in N_2) was used to calibrate the GC and to quantitate the C_1 through C_5 and greater than C_5 hydrocarbons.

SECTION 5

QUALITY ASSURANCE

5.1 PARTICULATE SAMPLING EQUIPMENT

A detailed record of repair and maintenance to each sampling train is kept. Preventative maintenance to each system is performed periodically to avoid complete component breakdown during a field test.

A detailed record of sampling system calibrations is also kept. Calibration data for the sampling nozzles, pitot tubes, dry gas meters and orifice meters are available for review. Results of the EPA Quality Assurance Branch biannual audits of the dry gas meter and orifice meter combinations are also logged and verify our in-house calibration data. The calibration data for the equipment used on this program can be found in the Appendix.

5.2 LAB ANALYSIS

All field samples are assigned a label and an ID number. This ID is also affixed to a chain-of-custody log and to the field data sheet to eliminate any chance of sample mixup.

Prior to analysis, all glassware is thoroughly cleaned (soap and water, tap water rinse, distilled water rinse, IPA rinse) to eliminate any contamination. The evaporating dishes used to evaporate the washings are treated the same as a sample (dried in an oven, desiccated and weighed repeatedly at 6-hour intervals until a constant weight is achieved). The glassware used to measure volumes and make transfers and dilutions are all NBS Class A to insure accurate measurements. All weighings are carried out on a Mettler Model H54AR analytical balance supported by a marble table in a separate room from the main analytical laboratory. The balance is calibrated regularly against an NBS Class S-1 weight.

All reagents used in the field and in the laboratory are ACS reagent grade and blanks of these reagents are evaluated for every set of tests. Blanks are taken in the field from the squeeze bottles and not the original container. Records are kept on these blanks to insure consistent quality of the reagents.

A quality control program consisting of duplicate analyses (to measure precision), spikes (to measure recovery efficiency) or analysis of blind standards supplied by EPA's Quality Assurance Branch (to measure accuracy) is implemented for each test program.

5.3 CONTINUOUS MONITORS

Prior to the test program, an internal and external calibration of the sampling system was performed using the calibration gases. There was excellent agreement between the internal and external calibrations (indicating no sample loss in the system) over the test period. The calibration gas certificates for the gases used on this test program appear in the Appendix.

APPENDIX

- Emission Rate Calculations
- Isokinetic Calculations
- Analytical Reports
- Chain-of-Custody Logs
- Continuous Monitor Data
- Continuous Monitor Strip Charts
- Hydrocarbon Chromatograms
- Field Data Sheets
  - -- #2 Kiln
  - -- #2 Raw Mill
  - -- #12 Finish Mill
  - -- #42-FDC-35
  - -- #27-FDC-11
- Equipment Calibration Data
- Calibration Gas Certificates

Pape & Steiner Environmental Services

TEST 1-3

LOCATION #2 Kiln

EMISSION RATE DATA -- $68^{\circ}F$

Standard Temperature, S_t = $68^{\circ}F$; 29.92 inches Hg

XEQ FF

XEQ RAT

		Test 1	Test 2	Test 3	Average
ENTER:	R-17 $V_{m,std}$	41.9716	45.2730	45.7568	
	R-26 Q_s	160,291.65	169115.16	169,636.96	
	R-22 O_2%				

LAB DATA

	Test 1	Test 2	Test 3	Average
Front Half Wash (g)	.02767	.00819	.00633	
Mass Filter (g)	-.00069	-.00019	-.00012	
Back Half Catch (g)				
Front Half Sulfate (mg H_2SO_4)				
Back Half Sulfate (mg H_2SO_4)				
H_2O_2 Catch (mg H_2SO_4)				

RESULTS

		Test 1	Test 2	Test 3	Average
F Factor	1				
Filt. Particulate gr/dscf	6	.0100	.0027	.0022	
Filt. Particulate lb/hr	7	13.73	3.95	3.16	
Total Particulate gr/dscf	8				
Total Particulate lb/hr	10				
Total Sulfate gr/dscf	11				
Total Sulfate lb/hr	13				
SO_3 ppm	14				
SO_3 lb/hr	15				
SO_2 ppm	16				
SO_2 lb/hr	17				
SO_2 @ 3% O_2	18				
SO_2 lb/MMBtu					
S lb/MMBtu					

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TEST # CM

LOCATION #2 Kiln

CM SO_2, NO_x, HC, CO EMISSION RATE DATA

Standard Temperature, S_t 68 (XEQ 60 or 68); 29.92 inches Hg

ENTER		Test 1	Test 2	Test 3	Average
R-22	O_2%	9.8	11.0	10.8	
R-26	Q_s	160,291.65	169,115.16	169,636.96	
R-15	NO_x ppm	680	623	563	622
R-15	SO_2 ppm	10	4	7	7
R-15	CO ppm	121	57	53	77.0
R-15	HC_2/ppm C_3 as C_2/C_3	0 / .9	1.4 / .8	1.5 / .9	
XEQ FF					
XEQ SO2	F Factor		–		

RESULTS:

		Test 1	Test 2	Test 3	Average
MW = 46					
	NO_x lb/hr	780.87	754.79	684.21	739.96
	NO_x ppm @ 3% O_2	1096.6	1126.4	997.8	
	NO_x lb/MMBtu				
	NO_x lb/Bbl				
MW = 64.1					
	SO_2 lb/hr	16.00	6.75	11.85	11.53
	SO_2 ppm @ 3% O_2	16.1	7.2	12.4	11.9
	SO_2 lb/MMBtu				
	SO_2 lb/Bbl				
MW = 28					
	CO lb/hr	84.58	42.04	39.21	55.28
	CO ppm @ 3% O_2	195.1	103.1	93.9	
	CO lb/MMBtu				
	CO lb/Bbl				
MW = ~~16~~ 30/44					
C_2	HC lb/hr	0	1.11	1.19	
C_2	HC ppm @ 3% O_2	0	2.5	2.7	
C_3	HC ~~lb/MMBtu~~ lb/hr	0.99	0.93	1.05	
C_3	HC ~~lb/Bbl~~ ppm@3%	1.5	1.5	1.6	
	lb/hr total NM	0.99	2.04	2.24	1.76

EMISSION RATE CALCULATIONS

1. Fuel factor at $68^{o}F$, 29.92 in. Hg (dscf/mmBtu)

$$\text{F Factor} = \frac{10^6[3.64(\%H) + 1.53(\%C) + 0.57(\%S) + 0.14(\%N) - 0.46(\%O_2)]}{\text{Btu/lb}}$$

2. Fuel factor at $60^{o}F$, 29.92 in. Hg (dscf/mmBtu)

$$\text{F Factor}_{60^o} = \text{F Factor}_{68^o}\left(\frac{60 + 460}{68 + 460}\right)$$

3. Emission concentration wet at standard conditions* (gr/scf)

$$\text{gr/scf} = 15.432\left(\frac{\text{Comp (g)}}{V_{m,std} + V_{w,std}}\right)$$

4. Emission concentration dry at standard conditions* (gr/dscf)

$$\text{gr/dscf} = 15.432\left(\frac{\text{Comp (g)}}{V_{m,std}}\right)$$

5. Emission concentration corrected to 12% CO_2

$$C \text{ @ } 12\%\ CO_2 = C_{measured}\left(\frac{12}{\%CO_2 \text{ measured}}\right)$$

6. Emission Rate lb/hr from gr/dscf

$$\text{lb/hr} = 0.00857(\text{gr/dscf})(Q_s)$$

7. Gaseous concentration in ppm

$$\text{ppm} = \frac{1.60864(S_t + 460)^*(\text{mg comp})}{MW(V_{m,std})}$$

8. Emission rate lb/hr from ppm

$$\text{lb/hr} = \frac{8.223 \times 10^{-5}(Q_s)(MW)(\text{ppm})}{(S_t + 460)^*}$$

9. Emission concentration corrected to 3% O_2

$$\text{ppm @ } 3\%\ O_2 = \text{ppm measured}\left(\frac{20.9 - 3}{20.9 - \%O_2 \text{ measured}}\right)$$

---

*Standard temperature to be defined

EMISSION RATE CALCULATIONS
(Concluded)

10. Emission factor, lb/mmBtu at 0% O_2

$$\text{lb/mmBtu} = F(1.4286 \times 10^{-4}) \left(\frac{20.9}{20.9 - \%O_2}\right) (\text{gr/dscf})$$

$$\text{lb/mmBtu} = F(\text{MW})\left(\frac{1.3711 \times 10^{-6}}{S_t + 460^*}\right)\left(\frac{20.9}{20.9 - \%O_2}\right) (\text{ppm})$$

11. Heating value of fuel, mmBtu/bbl

$$\text{mmBtu/bbl} = 349.786 \times 10^{-6}(\text{Btu/lb})(\text{SpGr})$$

12. Emission Factor, lb/bbl

$$\text{lb/bbl} = (\text{lb/mmBtu})(\text{mmBtu/bbl})$$

*Standard temperature to be defined

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TEST 1-3

LOCATION Raw Mill

EMISSION RATE DATA -- 68°F

Standard Temperature, S_t = 68°F; 29.92 inches Hg

XEQ FF

XEQ RAT

	Test 1	Test 2	Test 3	Average
ENTER: R-17 $V_{m,std}$	47.1631	38.7672	35.9050	
R-26 Q_s	61864.63	60906.40	56258.54	
R-22 O_2%				

LAB DATA

	Test 1	Test 2	Test 3	Average
Front Half Wash (g)	.01539	.01022	.00770	
Mass Filter (g)	.00193	.00256	.00174	
Back Half Catch (g)				
Front Half Sulfate (mg H_2SO_4)				
Back Half Sulfate (mg H_2SO_4)				
H_2O_2 Catch (mg H_2SO_4)				

RESULTS

		Test 1	Test 2	Test 3	Average
F Factor	1				
Filt. Particulate gr/dscf	6	.0057	.0051	.0041	
Filt. Particulate lb/hr	7	3.00	2.66	1.96	
Total Particulate gr/dscf	8				
Total Particulate lb/hr	10				
Total Sulfate gr/dscf	11				
Total Sulfate lb/hr	13				
SO_3 ppm	14				
SO_3 lb/hr	15				
SO_2 ppm	16				
SO_2 lb/hr	17				
SO_2 @ 3% O_2	18				
SO_2 lb/MMBtu					
S lb/MMBtu					

Pape & Steiner Environmental Services

TEST 1-3

LOCATION Finish Mill

EMISSION RATE DATA -- 68^oF

Standard Temperature, S_t = 68^oF; 29.92 inches Hg

XEQ FF

XEQ RAT

		Test 1	Test 2	Test 3	Average
ENTER: R-17 $V_{m,std}$		71.3897	66.7987	70.5485	
R-26 Q_s		14321.55	13669.32	15278.23	
R-22 O_2%					

LAB DATA

		Test 1	Test 2	Test 3	Average
Front Half Wash (g)		.01978	.00661	.00857	
Mass Filter (g)		-.00158	-.00059	+.00029	
Back Half Catch (g)					
Front Half Sulfate (mg H_2SO_4)					
Back Half Sulfate (mg H_2SO_4)					
H_2O_2 Catch (mg H_2SO_4)					

RESULTS

		Test 1	Test 2	Test 3	Average
F Factor	1				
Filt. Particulate gr/dscf	6	.0039	.0014	.0019	
Filt. Particulate lb/hr	7	0.48	0.16	0.25	
Total Particulate gr/dscf	8				
Total Particulate lb/hr	10				
Total Sulfate gr/dscf	11				
Total Sulfate lb/hr	13				
SO_3 ppm	14				
SO_3 lb/hr	15				
SO_2 ppm	16				
SO_2 lb/hr	17				
SO_2 @ 3% O_2	18				
SO_2 lb/MMBtu					
S lb/MMBtu					

Pape & Steiner Environmental Services

TEST 1-2

LOCATION 27-FDC-11

EMISSION RATE DATA -- 68^oF

Standard Temperature, S_t = 68^oF; 29.92 inches Hg

XEQ FF

XEQ RAT

	Test 1	Test 2	Test 3	Average
ENTER: R-17 $V_{m,std}$	46.1376	37.3917		
R-26 Q_s	2059.21	1666.92		
R-22 O_2%				

LAB DATA

	Test 1	Test 2	Test 3	Average
Front Half Wash (g)	.00874	.00469		
Mass Filter (g)	.00021	.00005		
Back Half Catch (g)				
Front Half Sulfate (mg H_2SO_4)				
Back Half Sulfate (mg H_2SO_4)				
H_2O_2 Catch (mg H_2SO_4)				

RESULTS

		Test 1	Test 2	Test 3	Average
F Factor	1				
Filt. Particulate gr/dscf	6	.0030	.0020		.0025
Filt. Particulate lb/hr	7	0.05	0.03		0.04
Total Particulate gr/dscf	8				
Total Particulate lb/hr	10				
Total Sulfate gr/dscf	11				
Total Sulfate lb/hr	13				
SO_3 ppm	14				
SO_3 lb/hr	15				
SO_2 ppm	16				
SO_2 lb/hr	17				
SO_2 @ 3% O_2	18				
SO_2 lb/MMBtu					
S lb/MMBtu					

Pape & Steiner Environmental Services

TEST 1-3

LOCATION 42-FDC-35

EMISSION RATE DATA -- $68^{o}F$

Standard Temperature, S_t = $68^{o}F$; 29.92 inches Hg

XEQ FF

XEQ RAT

		Test 1	Test 2	Test 3	Average
ENTER: R-17 $V_{m,std}$		82.4300	66.5455	72.2901	
R-26 Q_s		4161.57	3310.80	3668.43	
R-22 O_2%					

LAB DATA

		Test 1	Test 2	Test 3	Average
Front Half Wash (g)		.02051	.02226	.02491	
Mass Filter (g)		.00517	.00410	.00472	
Back Half Catch (g)					
Front Half Sulfate (mg H_2SO_4)					
Back Half Sulfate (mg H_2SO_4)					
H_2O_2 Catch (mg H_2SO_4)					

RESULTS

		Test 1	Test 2	Test 3	Average
F Factor	1				
Filt. Particulate gr/dscf	6	.0048	.0061	.0063	
Filt. Particulate lb/hr	7	0.17	0.17	0.20	
Total Particulate gr/dscf	8				
Total Particulate lb/hr	10				
Total Sulfate gr/dscf	11				
Total Sulfate lb/hr	13				
SO_3 ppm	14				
SO_3 lb/hr	15				
SO_2 ppm	16				
SO_2 lb/hr	17				
SO_2 @ 3% O_2	18				
SO_2 lb/MMBtu					
S lb/MMBtu					

Pape & Steiner Environmental Services

ISOKINETIC CALCULATIONS

Standard temperature, S_t 68 (XEQ 60 or 68); 29.92 inches Hg

Test 1 Date 3-20-85 Location #2 Kiln

T_m	90.31	V_m	49.700	O_2	9.8	Stack ID "	160
T_s	389.50	γ	.9869	CO_2	18.8	Stack Area Ft^2	139.63
$\sqrt{\Delta P}$	~~1.56~~ .4949	P_b	26.57	Static	-.05	Test Time	72
ΔH	1.56	V_{1c}	39.1	C_p	.84	N_d	.3055

1. Volume of dry gas sampled at standard conditions (dscf)
   (R-17)

$$V_{m,std} = \left(\frac{S_t + 460}{29.92}\right)(\gamma)V_m\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right) = 41.9716$$

2. Stack gas moisture condensed at standard conditions (scf)
   (R-18)
   ($V_{m,std} + V_{w,std}$; R-04)

$$V_{w,std} = 8.9148 \times 10^{-5}(S_t + 460)(V_{1c}) = 1.8404$$

3. Stack gas proportion of water vapor, by volume
   (R-19)

$$B_{wo} = \frac{V_{w,std}}{V_{w,std} + V_{m,std}} = .0420$$

4. Stack gas dry molecular weight (lb/lb mole)
   (R-21)

$$MW_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO) = 31.40$$

5. Stack gas molecular weight (lb/lb mole)
   (R-22)

$$MW_s = MW_d(1 - B_{wo}) + 18(B_{wo}) = 30.84$$

6. Pressure stack, in. Hg
   (R-23)

$$P_s = P_b + \left(\frac{P_{static}}{13.6}\right) = 26.57$$

7. Stack gas velocity, at stack conditions (ft/sec)
   (R-24)

$$V_s = 85.49(C_p)(\sqrt{\Delta P})_{avg}\sqrt{\frac{T_s + 460}{P_s(MW_s)}} = 36.19$$

8. Stack gas volume at standard conditions (dscfm)
   (R-26)
   (ACFM; R-25) /
   303,186.5

$$Q_s = 60(1 - B_{wo})V_sA_s\left(\frac{S_t + 460}{T_s + 460}\right)\left(\frac{P_s}{29.92}\right) = 160,291.65$$

9. Test percent isokinetic
   (R-02)

$$\%I = \frac{9142.88(T_s + 460)(V_{w,std} + V_{m,std})}{(S_t + 460)\ \theta\ V_sP_s(D_n)^2} = 99.83$$

Pape & Steiner Environmental Services

ISOKINETIC CALCULATIONS

Standard temperature, S_t 68 (XEQ 60 or 68); 29.92 inches Hg

Test 2 Date 3-21-85 Location #2 Kiln stack

T_m	67.50	V_m	51.680	O_2	11.0	Stack ID "	160
T_s	376.86	γ	.9469	CO_2	16.7	Stack Area Ft^2	139.63
$\sqrt{\Delta P}$	.5179	P_b	26.41	Static	-.05	Test Time	72
ΔH	1.68	V_{1c}	43.2	C_p	.84	N_d	.3055

1. Volume of dry gas sampled at standard conditions (dscf)
(R-17)

$$V_{m,std} = \left(\frac{S_t + 460}{29.92}\right)(\gamma)V_m\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right) = 45.2730$$

2. Stack gas moisture condensed at standard conditions (scf)
(R-18)
($V_{m,std} + V_{w,std}$; R-04)

$$V_{w,std} = 8.9148 \times 10^{-5}(S_t + 460)(V_{1c}) = 2.0334$$

3. Stack gas proportion of water vapor, by volume
(R-19)

$$B_{wo} = \frac{V_{w,std}}{V_{w,std} + V_{m,std}} = .0430$$

4. Stack gas dry molecular weight (lb/lb mole)
(R-21)

$$MW_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO) = 31.11$$

5. Stack gas molecular weight (lb/lb mole)
(R-22)

$$MW_s = MW_d(1 - B_{wo}) + 18(B_{wo}) = 30.55$$

6. Pressure stack, in. Hg
(R-23)

$$P_s = P_b + \left(\frac{P_{static}}{13.6}\right) = 26.41$$

7. Stack gas velocity, at stack conditions (ft/sec)
(R-24)

$$V_s = 85.49(C_p)(\sqrt{\Delta P})_{avg}\sqrt{\frac{T_s + 460}{P_s(MW_s)}} = 37.88$$

8. Stack gas volume at standard conditions (dscfm)
(R-26)
(ACFM; R-25)
317,349.18

$$Q_s = 60(1 - B_{wo})V_sA_s\left(\frac{S_t + 460}{T_s + 460}\right)\left(\frac{P_s}{29.92}\right) = 169,115.16$$

9. Test percent isokinetic
(R-02)

$$\%I = \frac{9142.88(T_s + 460)(V_{w,std} + V_{m,std})}{(S_t + 460)\ \theta\ V_sP_s(D_n)^2} = 102.07$$

Page & Steiner Environmental Services

ISOKINETIC CALCULATIONS

Standard temperature, S_t 68 (XEQ 60 or 68); 29.92 inches Hg

Test 3 Date 3-21-85 Location #2 Kiln

T_m	81.56	V_m	53.62	O_2	10.8	Stack ID "	160
T_s	386.54	γ	.9869	CO_2	17.5	Stack Area Ft^2	139.63
$\sqrt{\Delta P}$	.5230	P_b	26.41	Static	-.05	Test Time	72
ΔH	1.71	V_{1c}	42.5	C_p	.84	N_d	.3055

1. Volume of dry gas sampled at standard conditions (dscf)
   (R-17)
   $$V_{m,std} = \left(\frac{S_t + 460}{29.92}\right)(\gamma)V_m\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right) = 45.7568$$

2. Stack gas moisture condensed at standard conditions (scf)
   (R-18)
   ($V_{m,std}$ + $V_{w,std}$; R-04)
   $$V_{w,std} = 8.9148 \times 10^{-5}(S_t + 460)(V_{1c}) = 2.0005$$

3. Stack gas proportion of water vapor, by volume
   (R-19)
   $$B_{wo} = \frac{V_{w,std}}{V_{w,std} + V_{m,std}} = .0419$$

4. Stack gas dry molecular weight (lb/lb mole)
   (R-21)
   $$MW_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO) = 31.23$$

5. Stack gas molecular weight (lb/lb mole)
   (R-22)
   $$MW_s = MW_d(1 - B_{wo}) + 18(B_{wo}) = 30.68$$

6. Pressure stack, in. Hg
   (R-23)
   $$P_s = P_b + \left(\frac{P_{static}}{13.6}\right) = 26.41$$

7. Stack gas velocity, at stack conditions (ft/sec)
   (R-24)
   $$V_s = 85.49(C_p)(\sqrt{\Delta P})_{avg}\sqrt{\frac{T_s + 460}{P_s(MW_s)}} = 38.39$$

8. Stack gas volume at standard conditions (dscfm)
   (R-26)
   (ACFM; R-25)
   321,642.21
   $$Q_s = 60(1 - B_{wo})V_sA_s\left(\frac{S_t + 460}{T_s + 460}\right)\left(\frac{P_s}{29.92}\right) = 169,636.96$$

9. Test percent isokinetic
   (R-02)
   $$\%I = \frac{9142.88(T_s + 460)(V_{w,std} + V_{m,std})}{(S_t + 460)\ \theta\ V_sP_s(D_n)^2} = 102.84$$

Pape & Steiner Environmental Services

ISOKINETIC CALCULATIONS

Standard temperature, S_t 68 (XEQ 60 or 68); 29.92 inches Hg

Test 1 Date 3-21-85 Location Raw Mill

T_m	85.25	V_m	54.272	O_2	20.5	Stack ID "	72
T_s	177.75	γ	1.0098	CO_2	0.5	Stack Area Ft^2	28.27
$\sqrt{\Delta P}$	.7866	P_b	26.47	Static	-.78	Test Time	72
ΔH	1.63	V_{1c}	43.0	C_p	.84	N_d	.2356

1. Volume of dry gas sampled at standard conditions (dscf)
   (R-17)

$$V_{m,std} = \left(\frac{S_t + 460}{29.92}\right)(\gamma)V_m\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right) = 47.1631$$

2. Stack gas moisture condensed at standard conditions (scf)
   (R-18)
   ($V_{m,std} + V_{w,std}$; R-04)

$$V_{w,std} = 8.9148 \times 10^{-5}(S_t + 460)(V_{1c}) = 2.0240$$

3. Stack gas proportion of water vapor, by volume
   (R-19)

$$B_{wo} = \frac{V_{w,std}}{V_{w,std} + V_{m,std}} = .0411$$

4. Stack gas dry molecular weight (lb/lb mole)
   (R-21)

$$MW_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO) = 28.90$$

5. Stack gas molecular weight (lb/lb mole)
   (R-22)

$$MW_s = MW_d(1 - B_{wo}) + 18(B_{wo}) = 28.45$$

6. Pressure stack, in. Hg
   (R-23)

$$P_s = P_b + \left(\frac{P_{static}}{13.6}\right) = 26.41$$

7. Stack gas velocity, at stack conditions (ft/sec)
   (R-24)

$$V_s = 85.49(C_p)(\sqrt{\Delta P})_{avg}\sqrt{\frac{T_s + 460}{P_s(MW_s)}} = 52.04$$

8. Stack gas volume at standard conditions (dscfm)
   (R-26)
   (ACFM; R-25) 88,279.34

$$Q_s = 60(1 - B_{wo})V_sA_s\left(\frac{S_t + 460}{T_s + 460}\right)\left(\frac{P_s}{29.92}\right) = 61,864.63$$

9. Test percent isokinetic
   (R-02)

$$\%I = \frac{9142.88(T_s + 460)(V_{w,std} + V_{m,std})}{(S_t + 460)\ \theta\ V_sP_s(D_n)^2} = 98.97$$

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ISOKINETIC CALCULATIONS

Standard temperature, S_t 68 (XEQ 60 or 68); 29.92 inches Hg

Test 2 Date 3-22-85 Location Raw Mill

T_m	78.08	V_m	44.200	O_2	20.5	Stack ID "	72
T_s	161.75	γ	1.0098	CO_2	0.5	Stack Area Ft^2	28.27
$\sqrt{\Delta P}$	.7622	P_b	26.37	Static	-.37	Test Time	60
ΔH	1.55	V_{1c}	30.6	C_p	.84	N_d	.2356

1. Volume of dry gas sampled at standard conditions (dscf)
   (R-17)
   $$V_{m,std} = \left(\frac{S_t + 460}{29.92}\right)(\gamma)V_m\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right) = 38.7672$$

2. Stack gas moisture condensed at standard conditions (scf)
   (R-18)
   ($V_{m,std}$ + $V_{w,std}$; R-04)
   $$V_{w,std} = 8.9148 \times 10^{-5}(S_t + 460)(V_{1c}) = 1.4403$$

3. Stack gas proportion of water vapor, by volume
   (R-19)
   $$B_{wo} = \frac{V_{w,std}}{V_{w,std} + V_{m,std}} = 0.0358$$

4. Stack gas dry molecular weight (lb/lb mole)
   (R-21)
   $$MW_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO) = 28.90$$

5. Stack gas molecular weight (lb/lb mole)
   (R-22)
   $$MW_s = MW_d(1 - B_{wo}) + 18(B_{wo}) = 28.51$$

6. Pressure stack, in. Hg
   (R-23)
   $$P_s = P_b + \left(\frac{P_{static}}{13.6}\right) = 26.34$$

7. Stack gas velocity, at stack conditions (ft/sec)
   (R-24)
   $$V_s = 85.49(C_p)(\sqrt{\Delta P})_{avg}\sqrt{\frac{T_s + 460}{P_s(MW_s)}} = 49.80$$

8. Stack gas volume at standard conditions (dscfm)
   (R-26)
   (ACFM; R-25)
   84,486.85
   $$Q_s = 60(1 - B_{wo})V_sA_s\left(\frac{S_t + 460}{T_s + 460}\right)\left(\frac{P_s}{29.92}\right) = 60,906.40$$

9. Test percent isokinetic
   (R-02)
   $$\%I = \frac{9142.88(T_s + 460)(V_{w,std} + V_{m,std})}{(S_t + 460)\ \theta\ V_sP_s(D_n)^2} = 99.15$$

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ISOKINETIC CALCULATIONS

Standard temperature, S_t 68 (XEQ 60 or 68); 29.92 inches Hg

Test 3 Date 3-22-85 Location Raw Mill

T_m	83.25	V_m	41.353	O_2	20.5	Stack ID "	72
T_s	171.67	γ	1.0098	CO_2	0.5	Stack Area Ft^2	28.27
$\sqrt{\Delta P}$	.7094	P_b	26.37	Static	-.39	Test Time	60
ΔH	1.35	V_{1c}	28.0	C_p	.84	N_d	.2356

1. Volume of dry gas sampled at standard conditions (dscf)
(R-17)
$$V_{m,std} = \left(\frac{S_t + 460}{29.92}\right)(\gamma)V_m\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right) = 35.9050$$

2. Stack gas moisture condensed at standard conditions (scf)
(R-18)
($V_{m,std}$ + $V_{w,std}$; R-04)
$$V_{w,std} = 8.9148 \times 10^{-5}(S_t + 460)(V_{1c}) = 1.3180$$

3. Stack gas proportion of water vapor, by volume
(R-19)
$$B_{wo} = \frac{V_{w,std}}{V_{w,std} + V_{m,std}} = 0.0354$$

4. Stack gas dry molecular weight (lb/lb mole)
(R-21)
$$MW_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO) = 28.90$$

5. Stack gas molecular weight (lb/lb mole)
(R-22)
$$MW_s = MW_d(1 - B_{wo}) + 18(B_{wo}) = 28.51$$

6. Pressure stack, in. Hg
(R-23)
$$P_s = P_b + \left(\frac{P_{static}}{13.6}\right) = 26.34$$

7. Stack gas velocity, at stack conditions (ft/sec)
(R-24)
$$V_s = 85.49(C_p)(\sqrt{\Delta P})_{avg}\sqrt{\frac{T_s + 460}{P_s(MW_s)}} = 46.72$$

8. Stack gas volume at standard conditions (dscfm)
(R-26)
(ACFM; R-25)
79.254.91
$$Q_s = 60(1 - B_{wo})V_sA_s\left(\frac{S_t + 460}{T_s + 460}\right)\left(\frac{P_s}{29.92}\right) = 56.258.54$$

9. Test percent isokinetic
(R-02)
$$\%I = \frac{9142.88(T_s + 460)(V_{w,std} + V_{m,std})}{(S_t + 460)\ \theta\ V_sP_s(D_n)^2} = 99.42$$

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ISOKINETIC CALCULATIONS

Standard temperature, S_t 68 (XEQ 60 or 68); 29.92 inches Hg

Test 1 Date 3-19-85 Location 92 Finish Mill

T_m	79.60	V_m	78.746	O_2	20.9	Stack ID "	57.5
T_s	188.42	γ	1.0093	CO_2	0	Stack Area Ft^2	18.03
$\sqrt{\Delta P}$	.2945	P_b	27.36	Static	-.10	Test Time	120
ΔH	1.25	V_{1c}	146.7	C_p	.84	N_d	.3586

1. Volume of dry gas sampled at standard conditions (dscf)
(R-17)
$$V_{m,std} = \left(\frac{S_t + 460}{29.92}\right)(\gamma)V_m\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right) = 71.3897$$

2. Stack gas moisture condensed at standard conditions (scf)
(R-18)
($V_{m,std} + V_{w,std}$; R-04)
$$V_{w,std} = 8.9148 \times 10^{-5}(S_t + 460)(V_{1c}) = 6.9052$$

3. Stack gas proportion of water vapor, by volume
(R-19)
$$B_{wo} = \frac{V_{w,std}}{V_{w,std} + V_{m,std}} = .0882$$

4. Stack gas dry molecular weight (lb/lb mole)
(R-21)
$$MW_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO) = 28.84$$

5. Stack gas molecular weight (lb/lb mole)
(R-22)
$$MW_s = MW_d(1 - B_{wo}) + 18(B_{wo}) = 27.88$$

6. Pressure stack, in. Hg
(R-23)
$$P_s = P_b + \left(\frac{P_{static}}{13.6}\right) = 27.35$$

7. Stack gas velocity, at stack conditions (ft/sec)
(R-24)
$$V_s = 85.49(C_p)(\sqrt{\Delta P})_{avg}\sqrt{\frac{T_s + 460}{P_s(MW_s)}} = 19.50$$

8. Stack gas volume at standard conditions (dscfm)
(R-26)
(ACFM; R-25)
$$Q_s = 60(1 - B_{wo})V_sA_s\left(\frac{S_t + 460}{T_s + 460}\right)\left(\frac{P_s}{29.92}\right) = 14321.55$$

9. Test percent isokinetic
(R-02)
$$\%I = \frac{9142.88(T_s + 460)(V_{w,std} + V_{m,std})}{(S_t + 460)\ \theta\ V_sP_s(D_n)^2} = 106.89$$

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ISOKINETIC CALCULATIONS

Standard temperature, S_t 68 (XEQ 60 or 68); 29.92 inches Hg

Test 2 Date 3-19-85 Location Finish Mill

T_m	86.06	V_m	74.592	O_2	20.9	Stack ID "	57.5
T_s	187.63	γ	1.0098	CO_2	0	Stack Area Ft^2	18.03
$\sqrt{\Delta P}$	.2811	P_b	27.36	Static	-0.1	Test Time	120
ΔH	1.11	V_{1c}	138.5	C_p	.84	N_d	.3586

1. Volume of dry gas sampled at standard conditions (dscf)
(R-17)

$$V_{m,std} = \left(\frac{S_t + 460}{29.92}\right)(\gamma)V_m\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right) = 66.7987$$

2. Stack gas moisture condensed at standard conditions (scf)
(R-18)
($V_{m,std} + V_{w,std}$; R-04)

$$V_{w,std} = 8.9148 \times 10^{-5}(S_t + 460)(V_{1c}) = 6.5192$$

3. Stack gas proportion of water vapor, by volume
(R-19)

$$B_{wo} = \frac{V_{w,std}}{V_{w,std} + V_{m,std}} = 0.0889$$

4. Stack gas dry molecular weight (lb/lb mole)
(R-21)

$$MW_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO) = 28.84$$

5. Stack gas molecular weight (lb/lb mole)
(R-22)

$$MW_s = MW_d(1 - B_{wo}) + 18(B_{wo}) = 27.87$$

6. Pressure stack, in. Hg
(R-23)

$$P_s = P_b + \left(\frac{P_{static}}{13.6}\right) = 27.35$$

7. Stack gas velocity, at stack conditions (ft/sec)
(R-24)

$$V_s = 85.49(C_p)(\sqrt{\Delta P})_{avg}\sqrt{\frac{T_s + 460}{P_s(MW_s)}} = 18.61$$

8. Stack gas volume at standard conditions (dscfm)
(R-26)
(ACFM; R-25)

$$Q_s = 60(1 - B_{wo})V_sA_s\left(\frac{S_t + 460}{T_s + 460}\right)\left(\frac{P_s}{29.92}\right) = 13669.32$$

20,130.09 ACFM

9. Test percent isokinetic
(R-02)

$$\%I = \frac{9142.88(T_s + 460)(V_{w,std} + V_{m,std})}{(S_t + 460)\ \theta\ V_sP_s(D_n)^2} = 104.79$$

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ISOKINETIC CALCULATIONS

Standard temperature, S_t 68 (XEQ 60 or 68); 29.92 inches Hg

Test 3 Date 3-19-85 Location Finish Mill

T_m	89.75	V_m	79.284	O_2	20.9	Stack ID "	57.5
T_s	190.67	γ	1.0098	CO_2	0	Stack Area Ft^2	18.03
$\sqrt{\Delta P}$	.2978	P_b	27.36	Static	-.11	Test Time	120
ΔH	1.24	V_{1c}	137.7	C_p	.84	N_d	.3586

1. Volume of dry gas sampled at standard conditions (dscf)
(R-17)

$$V_{m,std} = \left(\frac{S_t + 460}{29.92}\right)(\gamma)V_m\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right) = 70.5485$$

2. Stack gas moisture condensed at standard conditions (scf)
(R-18)
($V_{m,std}$ + $V_{w,std}$; R-04)

$$V_{w,std} = 8.9148 \times 10^{-5}(S_t + 460)(V_{1c}) = 6.4815$$

3. Stack gas proportion of water vapor, by volume
(R-19)

$$B_{wo} = \frac{V_{w,std}}{V_{w,std} + V_{m,std}} = .0841$$

4. Stack gas dry molecular weight (lb/lb mole)
(R-21)

$$MW_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO) = 28.84$$

5. Stack gas molecular weight (lb/lb mole)
(R-22)

$$MW_s = MW_d(1 - B_{wo}) + 18(B_{wo}) = 27.92$$

6. Pressure stack, in. Hg
(R-23)

$$P_s = P_b + \left(\frac{P_{static}}{13.6}\right) = 27.35$$

7. Stack gas velocity, at stack conditions (ft/sec)
(R-24)

$$V_s = 85.49(C_p)(\sqrt{\Delta P})_{avg}\sqrt{\frac{T_s + 460}{P_s(MW_s)}} = 19.74$$

8. Stack gas volume at standard conditions (dscfm)
(R-26)
(ACFM; R-25)

$$Q_s = 60(1 - B_{wo})V_sA_s\left(\frac{S_t + 460}{T_s + 460}\right)\left(\frac{P_s}{29.92}\right) = 14509.59$$

ACFM 21,356.48

9. Test percent isokinetic
(R-02)

$$\%I = \frac{9142.88(T_s + 460)(V_{w,std} + V_{m,std})}{(S_t + 460)\ \theta\ V_sP_s(D_n)^2} = 104.06$$

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ISOKINETIC CALCULATIONS

Standard temperature, S_t 68 (XEQ 60 or 68); 29.92 inches Hg

Test 1 Date 3-22-85 Location 27-F-11

T_m	80.10	V_m	53.789	O_2	20.9	Stack ID "	-
T_s	68.63	γ	.9869	CO_2	0	Stack Area Ft^2	1.875
$\sqrt{\Delta P}$	.3488	P_b	26.43	Static	-.05	Test Time	60
ΔH	2.32	V_{1c}	6.6	C_p	.84	N_d	.3582

1. Volume of dry gas sampled at standard conditions (dscf)
   (R-17)
   $$V_{m,std} = \left(\frac{S_t + 460}{29.92}\right)(\gamma)V_m\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right) = 46.1376$$

2. Stack gas moisture condensed at standard conditions (scf)
   (R-18)
   ($V_{m,std} + V_{w,std}$; R-04)
   $$V_{w,std} = 8.9148 \times 10^{-5}(S_t + 460)(V_{1c}) = 0.3107$$

3. Stack gas proportion of water vapor, by volume
   (R-19)
   $$B_{wo} = \frac{V_{w,std}}{V_{w,std} + V_{m,std}} = .0067$$

4. Stack gas dry molecular weight (lb/lb mole)
   (R-21)
   $$MW_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO) = 28.84$$

5. Stack gas molecular weight (lb/lb mole)
   (R-22)
   $$MW_s = MW_d(1 - B_{wo}) + 18(B_{wo}) = 28.76$$

6. Pressure stack, in. Hg
   (R-23)
   $$P_s = P_b + \left(\frac{P_{static}}{13.6}\right) = 26.43$$

7. Stack gas velocity, at stack conditions (ft/sec)
   (R-24)
   $$V_s = 85.49(C_p)(\sqrt{\Delta P})_{avg}\sqrt{\frac{T_s + 460}{P_s(MW_s)}} = 20.89$$

8. Stack gas volume at standard conditions (dscfm)
   (R-26)
   (ACFM; R-25)
   2349.96
   $$Q_s = 60(1 - B_{wo})V_sA_s\left(\frac{S_t + 460}{T_s + 460}\right)\left(\frac{P_s}{29.92}\right) = 2059.21$$

9. Test percent isokinetic
   (R-02)
   $$\%I = \frac{9142.88(T_s + 460)(V_{w,std} + V_{m,std})}{(S_t + 460)\ \theta\ V_sP_s(D_n)^2} = 100.13$$

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ISOKINETIC CALCULATIONS

Standard temperature, S_t 68 (XEQ 60 or 68); 29.92 inches Hg

Test 2 Date 3-22-85 Location 27-FDC-11

T_m	79.96	V_m	43.678	O_2	20.9	Stack ID "	0
T_s	71.75	γ	.9869	CO_2	0	Stack Area Ft^2	1.875
$\sqrt{\Delta P}$	.2834	P_b	26.43	Static	-.05	Test Time	60
ΔH	1.52	V_{1c}	6.1	C_p	.84	N_d	.3582

1. Volume of dry gas sampled at standard conditions (dscf)
   (R-17)

$$V_{m,std} = \left(\frac{S_t + 460}{29.92}\right)(\gamma)V_m\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right) = 37.3917$$

2. Stack gas moisture condensed at standard conditions (scf)
   (R-18)
   ($V_{m,std} + V_{w,std}$; R-04)

$$V_{w,std} = 8.9148 \times 10^{-5}(S_t + 460)(V_{1c}) = .2871$$

3. Stack gas proportion of water vapor, by volume
   (R-19)

$$B_{wo} = \frac{V_{w,std}}{V_{w,std} + V_{m,std}} = .0076$$

4. Stack gas dry molecular weight (lb/lb mole)
   (R-21)

$$MW_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO) = 28.84$$

5. Stack gas molecular weight (lb/lb mole)
   (R-22)

$$MW_s = MW_d(1 - B_{wo}) + 18(B_{wo}) = 28.75$$

6. Pressure stack, in. Hg
   (R-23)

$$P_s = P_b + \left(\frac{P_{static}}{13.6}\right) = 26.43$$

7. Stack gas velocity, at stack conditions (ft/sec)
   (R-24)

$$V_s = 85.49(C_p)(\sqrt{\Delta P})_{avg}\sqrt{\frac{T_s + 460}{P_s(MW_s)}} = 17.02$$

8. Stack gas volume at standard conditions (dscfm)
   (R-26)
   (ACFM; R-25)

$$Q_s = 60(1 - B_{wo})V_sA_s\left(\frac{S_t + 460}{T_s + 460}\right)\left(\frac{P_s}{29.92}\right) = 1666.92$$

9. Test percent isokinetic
   (R-02)

$$\%I = \frac{9142.88(T_s + 460)(V_{w,std} + V_{m,std})}{(S_t + 460)\ \theta\ V_sP_s(D_n)^2} = 100.25$$

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ISOKINETIC CALCULATIONS

Standard temperature, S_t 68 (XEQ 60 or 68); 29.92 inches Hg

Test 1 Date 3-19-85 Location 42-FDC-35 Finish mill Belt Feed

T_m	79.6	V_m	92.64	O_2	20.9	Stack ID "	18 x 15
T_s	76.0	γ	.9869	CO_2	0	Stack Area Ft^2	1.875
$\sqrt{\Delta P}$	.697	P_b	27.45	Static	-.25	Test Time	126
ΔH	1.62	V_{1c}	12.8	C_p	.84	N_d	.2319

1. Volume of dry gas sampled at standard conditions (dscf)
(R-17)

$$V_{m,std} = \left(\frac{S_t + 460}{29.92}\right)(\gamma)V_m\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right) = 82.4300$$

2. Stack gas moisture condensed at standard conditions (scf)
(R-18)
($V_{m,std}$ + $V_{w,std}$; R-04)

$$V_{w,std} = 8.9148 \times 10^{-5}(S_t + 460)(V_{1c}) = 0.6025$$

3. Stack gas proportion of water vapor, by volume
(R-19)

$$B_{wo} = \frac{V_{w,std}}{V_{w,std} + V_{m,std}} = .0073$$

4. Stack gas dry molecular weight (lb/lb mole)
(R-21)

$$MW_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO) = 28.84$$

5. Stack gas molecular weight (lb/lb mole)
(R-22)

$$MW_s = MW_d(1 - B_{wo}) + 18(B_{wo}) = 28.76$$

6. Pressure stack, in. Hg
(R-23)

$$P_s = P_b + \left(\frac{P_{static}}{13.6}\right) = 27.43$$

7. Stack gas velocity, at stack conditions (ft/sec)
(R-24)

$$V_s = 85.49(C_p)(\sqrt{\Delta P})_{avg}\sqrt{\frac{T_s + 460}{P_s(MW_s)}} = 41.26$$

8. Stack gas volume at standard conditions (dscfm)
(R-26)
(ACFM; R-25)

$$Q_s = 60(1 - B_{wo})V_s A_s\left(\frac{S_t + 460}{T_s + 460}\right)\left(\frac{P_s}{29.92}\right) = 4161.57$$

ACFM = 4641.54

9. Test percent isokinetic
(R-02)

$$\%I = \frac{9142.88(T_s + 460)(V_{w,std} + V_{m,std})}{(S_t + 460)\ \theta\ V_s P_s (D_n)^2} = 100.57$$

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ISOKINETIC CALCULATIONS

Standard temperature, S_t 68 (XEQ 60 or 68); 29.92 inches Hg

Test 2 Date 3-19-85 Location 42-FDC-35

T_m	90.0	V_m	76.34	O_2	20.9	Stack ID "	18"x15"
T_s	79.4	γ	.9869	CO_2	0	Stack Area Ft^2	1.875
$\sqrt{\Delta P}$	.556	P_b	27.45	Static	-.25	Test Time	126
ΔH	1.07	V_{1c}	9.5	C_p	.84	N_d	.2319

1. Volume of dry gas sampled at standard conditions (dscf)
   (R-17)
   $$V_{m,std} = \left(\frac{S_t + 460}{29.92}\right)(\gamma)V_m\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right) = 66.5455$$

2. Stack gas moisture condensed at standard conditions (scf)
   (R-18)
   ($V_{m,std}$ + $V_{w,std}$; R-04)
   $$V_{w,std} = 8.9148 \times 10^{-5}(S_t + 460)(V_{1c}) = 0.4472$$

3. Stack gas proportion of water vapor, by volume
   (R-19)
   $$B_{wo} = \frac{V_{w,std}}{V_{w,std} + V_{m,std}} = .0067$$

4. Stack gas dry molecular weight (lb/lb mole)
   (R-21)
   $$MW_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO) = 28.84$$

5. Stack gas molecular weight (lb/lb mole)
   (R-22)
   $$MW_s = MW_d(1 - B_{wo}) + 18(B_{wo}) = 28.76$$

6. Pressure stack, in. Hg
   (R-23)
   $$P_s = P_b + \left(\frac{P_{static}}{13.6}\right) = 27.43$$

7. Stack gas velocity, at stack conditions (ft/sec)
   (R-24)
   $$V_s = 85.49(C_p)(\sqrt{\Delta P})_{avg}\sqrt{\frac{T_s + 460}{P_s(MW_s)}} = 33.01$$

8. Stack gas volume at standard conditions (dscfm)
   (R-26)
   (ACFM; R-25)
   $$Q_s = 60(1 - B_{wo})V_sA_s\left(\frac{S_t + 460}{T_s + 460}\right)\left(\frac{P_s}{29.92}\right) = 3310.80$$

9. Test percent isokinetic
   (R-02)
   $$\%I = \frac{9142.88(T_s + 460)(V_{w,std} + V_{m,std})}{(S_t + 460)\ \theta\ V_sP_s(D_n)^2} = 102.06$$

Pape & Steiner Environmental Services

ISOKINETIC CALCULATIONS

Standard temperature, S_t 68 (XEQ 60 or 68); 29.92 inches Hg

Test 3 Date 3-19-85 Location 42-FDC-35

T_m	92.8	V_m	83.31	O_2	20.9	Stack ID "	
T_s	82.2	γ	.9869	CO_2	0	Stack Area Ft^2	1.875
$\sqrt{\Delta P}$	.617	P_b	27.45	Static	-.25	Test Time	126
ΔH	1.26	V_{1c}	8.3	C_p	.84	N_d	.2319

1. Volume of dry gas sampled at standard conditions (dscf)
(R-17)

$$V_{m,std} = \left(\frac{S_t + 460}{29.92}\right)(\gamma)V_m\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right) = 72.2901$$

2. Stack gas moisture condensed at standard conditions (scf)
(R-18)
($V_{m,std}$ + $V_{w,std}$; R-04)

$$V_{w,std} = 8.9148 \times 10^{-5}(S_t + 460)(V_{1c}) = 0.3907$$

3. Stack gas proportion of water vapor, by volume
(R-19)

$$B_{wo} = \frac{V_{w,std}}{V_{w,std} + V_{m,std}} = .0054$$

4. Stack gas dry molecular weight (lb/lb mole)
(R-21)

$$MW_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO) = 28.84$$

5. Stack gas molecular weight (lb/lb mole)
(R-22)

$$MW_s = MW_d(1 - B_{wo}) + 18(B_{wo}) = 28.78$$

6. Pressure stack, in. Hg
(R-23)

$$P_s = P_b + \left(\frac{P_{static}}{13.6}\right) = 27.43$$

7. Stack gas velocity, at stack conditions (ft/sec)
(R-24)

$$V_s = 85.49(C_p)(\sqrt{\Delta P})_{avg}\sqrt{\frac{T_s + 460}{P_s(MW_s)}} = 36.72$$

8. Stack gas volume at standard conditions (dscfm)
(R-26)
(ACFM; R-25)
4131.03

$$Q_s = 60(1 - B_{wo})V_sA_s\left(\frac{S_t + 460}{T_s + 460}\right)\left(\frac{P_s}{29.92}\right) = 3668.43$$

9. Test percent isokinetic
(R-02)

$$\%I = \frac{9142.88(T_s + 460)(V_{w,std} + V_{m,std})}{(S_t + 460)\ \theta\ V_sP_s(D_n)^2} = 100.06$$

Pape & Steiner Environmental Services

ANALYTICAL REPORT

SAMPLE TYPE Front Half Wash

DATE 3/29/85

SAMPLE COMPONENT Acetone

ANALYST SK

REQUESTED BY SWPC

ANALYTICAL METHOD Gravimetric

Sample ID No.	Test No.	Sample Volume	Sample Aliquot	Titer mls or (Absorbance)	Analytical Result (total sample) grams	
					Uncorrected	Blank corrected
FDC-35	1	118	118		0.02108	0.02051
	2	123	123		0.02285	0.02226
	3	158	158		0.02567	0.02491
#2 Finish mill	1	163	163		0.02056	0.01978
	2	162	162		0.00739	0.00661
	3	168	168		0.00938	0.00857
#2 Kiln	1	92	92		0.02831	0.02787
	2	95	95		0.00865	0.00819
	3	95	95		0.00679	0.00633
Raw Mill	1	175	175		0.01623	0.01539
	2	102	102		0.01068	0.01022
	3	140	140		0.00837	0.00770
27 FDC-11	1	110	110		0.00927	0.00874
	2	141	141		0.00537	0.00469
	Blk.	100	100		0.00048	

Pape & Steiner Environmental Services

ANALYTICAL REPORT

SAMPLE TYPE Filterable Particulate

DATE 3/29/85

SAMPLE COMPONENT 100 mm filter

ANALYST SK

REQUESTED BY SWPC

ANALYTICAL METHOD Gravimetric

Sample ID No.	Test No.	Filter No.	Sample Aliquot	Titer mls or (Absorbance)	Analytical Result (total sample) grams	
					Uncorrected	Blank corrected
FDC-35	1	10-404			0.00513	0.00517
	2	10-403			0.00406	0.00410
	3	10-405			0.00468	0.00472
#2 Finish mill	1	10-400			-0.00154	0.00000
	2	10-402			-0.00055	0.00000
	3	10-390			0.00025	0.00029
#2 Kiln	1	10-406			-0.00073	0.00000 -.00069
	2	10-392			-0.00023	0.00000 -.00019
	3	10-408			0.00008	0.00012
Raw Mill	1	10-396			0.00189	0.00193
	2	10-398			0.00252	0.00256
	3	10-407			0.00170	0.00174
27-FDC-11	1	10-409			0.00017	0.00021
	2	10-412			0.00001	0.00005
	Blk.	10-410			-0.00004	

Pape & Steiner Environmental Services

SAMPLE HANDLING/LOG-IN

Date 3-20-84 / 3-21-84 Test Location Clinker Cooler / #2 Kiln

	Sample Type	Volume	Comments
1.	856361 5 Meth FHA Sample 1 Test		Clinker Cooler - Field analysis
2.	856364 5 Meth MF Sample 1Z Test		" "
3.	85 6367 5 Meth FHA Sample 1 Test		#2 Kiln
4.	85 6370 5 Meth MF Sample 1 Test		
5.	856362 Ace Blank Meth Sample Test		
6.	856363 QA100 Blank Meth Sample Test		
7.	856368 5 Meth FHA Sample 2 Test		
8.	856369 5 Meth FHA Sample 3 Test		
9.	856371 5 Meth MF Sample 2 Test		
10.	856372 5 Meth MF Sample 3 Test		
11.			
12.			

CHAIN OF CUSTODY

[signature]

Pape & Steiner Environmental Services

SAMPLE HANDLING/LOG-IN

Date 3/21-22/85 Test Location Raw Mill + feed dust collector

	Sample Type	Volume	Comments
1.	856365 5 Meth FHA Sample 1 Test		Raw Mill
2.	856366 5 Meth MF Sample 1 Test		
3.			
4.			
5.			
6.			
7.			27-F-11 Raw feed dust collector
8.			
9.			
10.			
11.			
12.			

CHAIN OF CUSTODY

[signature]

Pape & Steiner Environmental Services

SAMPLE HANDLING/LOG-IN

Date 3-19-85 Test Location SWPC

	Sample Type	Volume	Comments
1.	85 6349 5 Meth FHA Sample 1 Test		#2 Finish Mill
2.	85 6350 5 Meth FHA Sample 2 Test		
3.	85 6351 5 Meth FHA Sample 3 Test		
4.	856352 5 Meth MF Sample 1 Test		
5.	85 6353 5 Meth MF Sample 2 Test		
6.	85 6354 5 Meth MF Sample 3 Test		
7.	85 6355 5 Meth FHA Sample 1 Test		FDC-35 (Finish mill Fealcyclon Dust Collector)
8.	85 6356 5 Meth FHA Sample 2 Test		
9.	856357 5 Meth FHA Sample 3 Test		
10.	85 6258 5 Meth MF Sample 1 Test		
11.	85 6359 5 Meth MF Sample 2 Test		
12.	85 6360 5 Meth MF Sample 3 Test		

CHAIN OF CUSTODY

[signature] clean up

Pape & Steiner Environmental Services

SAMPLE HANDLING/LOG-IN

Date 3/26/85 Test Location SWPC

	Sample Type	Volume	Comments
1.	856481 5 Meth FHA Sample 1 Test		
2.	856482 5 Meth mF Sample 1 Test		
3.	85 6483 5 Meth FHA Sample 2 Test		
4.	85 6484 5 Meth mF Sample 2 Test		
5.	856485 5 Meth FHA Sample 3 Test		
6.	856486 5 Meth mF Sample 3 Test		
7.	85 6487 5 Meth FHA Sample 1 Test		
8.	856488 5 Meth mF Sample 1 Test		
9.	856489 5 Meth FHA Sample 2 Test		
10.	85 6490 5 Meth MF Sample 2 Test		
11.			
12.			

CHAIN OF CUSTODY

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant SWPC

Date 3-20-85

Test Location #2 Kiln

Run Number 1

Operator RP

Ambient Temperature

Barometric Pressure

Static Pressure Duct

Fuel

Time	Sample Point	Fuel Flow	Dry Uncorrected						3% O_2 Dry		Hydrocarbons						Comments
			O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	ppm	NO_x ppm	THC	CH_4	Non CH_4				
1025			7.52	16.02	40.9	40.9		810.35									Span Gas Value
1035			9.8	18.6	100	11		720									Test 1
1045			10.1	19.2	90	9		605									
1055			9.7	18.6	230	10		685									
1105			9.8	19.2	75	12		670									
1115			9.8	18.8	140	9		680									
1125			9.6	18.9	90	10		720									
1145	cal check		0	0	0	-1		0									Zero reading
			7.52	16.3	401	79		870									Span reading
		Test 1	9.8	18.9	121	10		680									
		2	11.0	16.7	57	4		623									
		3	10.8	17.5	53	7		563									

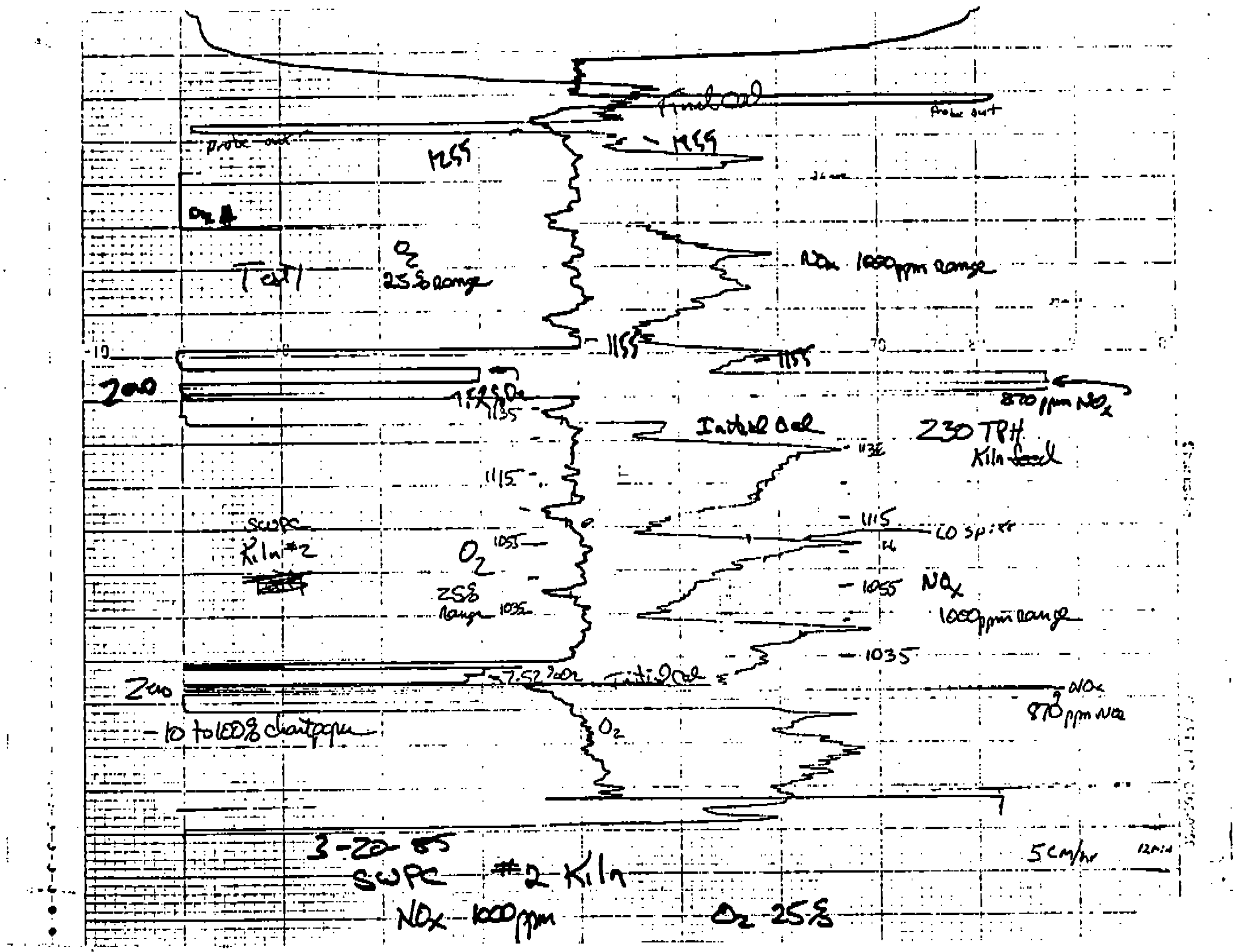
Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

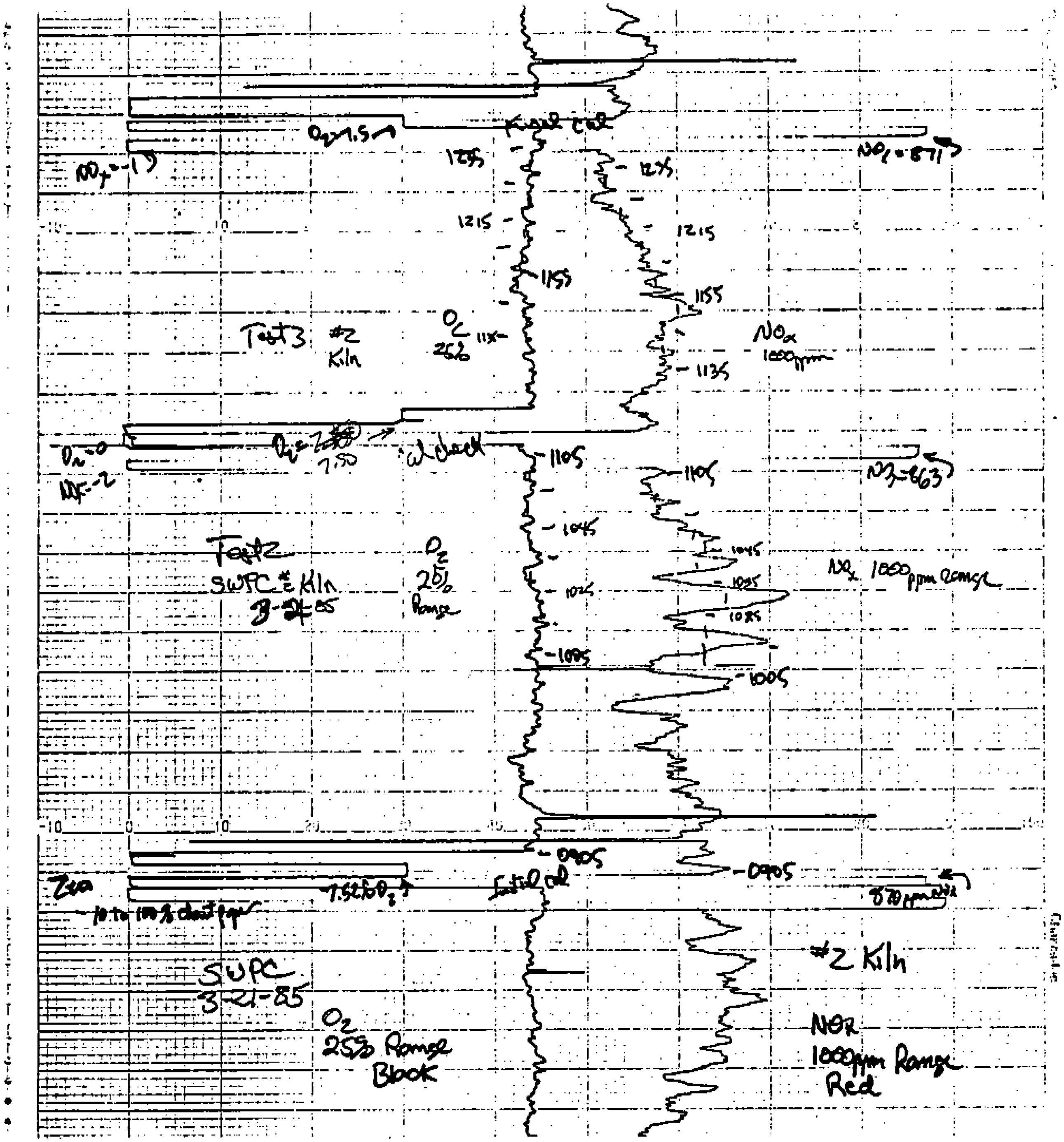
Plant SWPC
Date 3-21-85
Test Location #2 Kiln
Run Number 2-3
Operator RP

Ambient Temperature
Barometric Pressure 26.47 (Test 2)
Static Pressure Duct
Fuel

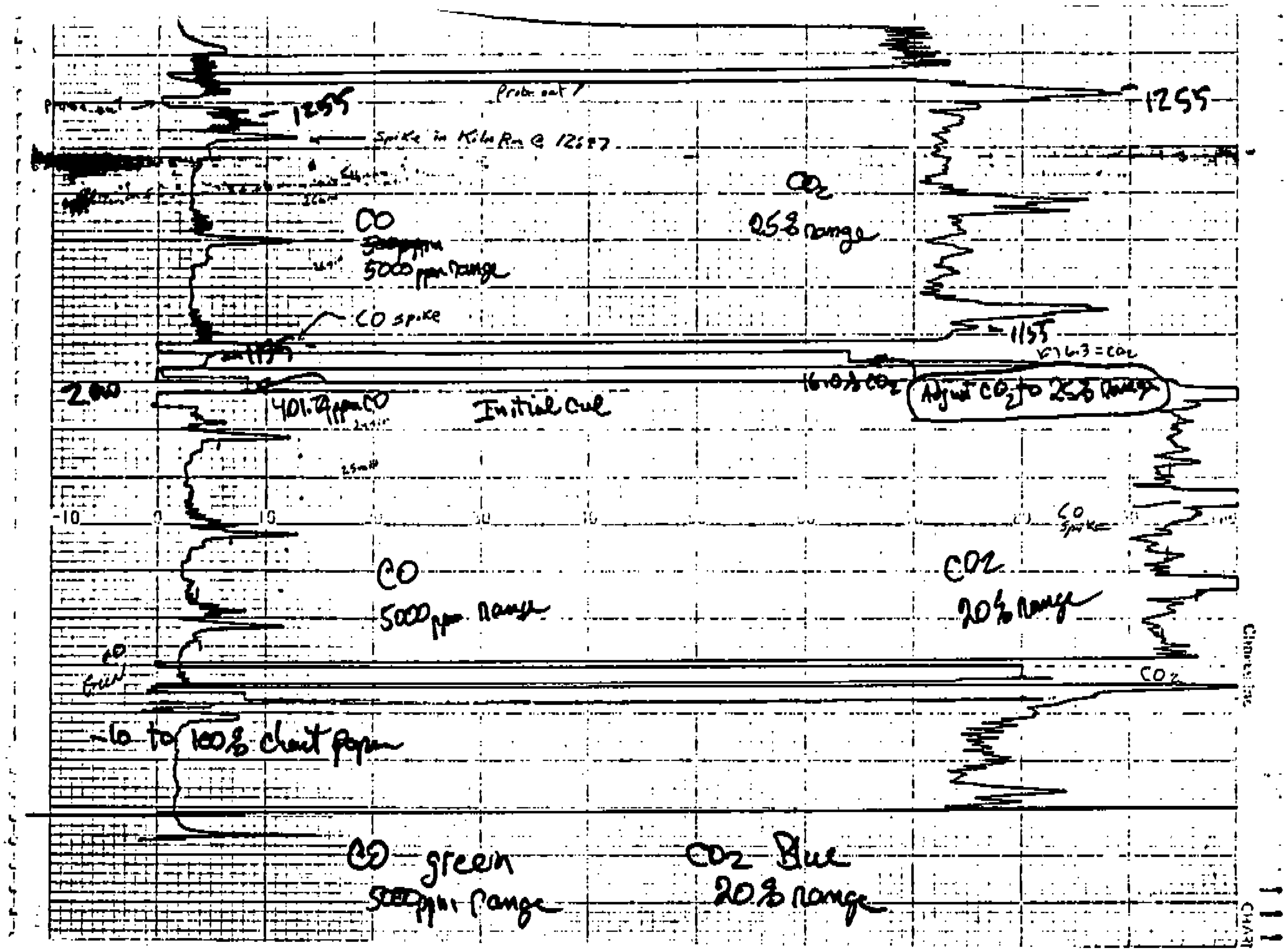
Time	Sample Point	Fuel Flow	Dry Uncorrected						3% O_2 Dry		Hydrocarbons						AAL 7584 O_2/CO_2/CO AAL 8335 H/C AAL 5773 NOx AAL 8513 SO_2 Comments
			O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	ppm	NO_x ppm	THC	CH_4	Non CH_4				
0900	Initial Cal		7.52	16.02	40.9	80.9		520.35									Span Gas Values
																	200 TPD
1010			11.2	16.2	50	3		630	630								
1020			11.2	16.6	50	3		630	630								
1030			11.0	16.7	60	4		652	652								
1040			11.0	16.9	70	4		620									
1050			10.9	16.8	60	5		619									
1100			10.9	16.8	50	4		586									
1110	Final cal check		0	0	0	-1		-2									Zero reading
			7.5	16.1	395	80.5		863									Span reading
1140			10.8	17.3	50	6		584									
1150			10.6	18.0	70	9		600									
1200			10.7	17.9	50	8		576									
1210			10.8	17.4	50	7		560									
1220			10.9	17.3	50	6		540									
1230			11.0	17.2	40	5		520									
1240	Final cal		0	0	0	-1		-1									Zero reading
			7.5	16.2	400	80		871									Span reading
			10.6	17.5													



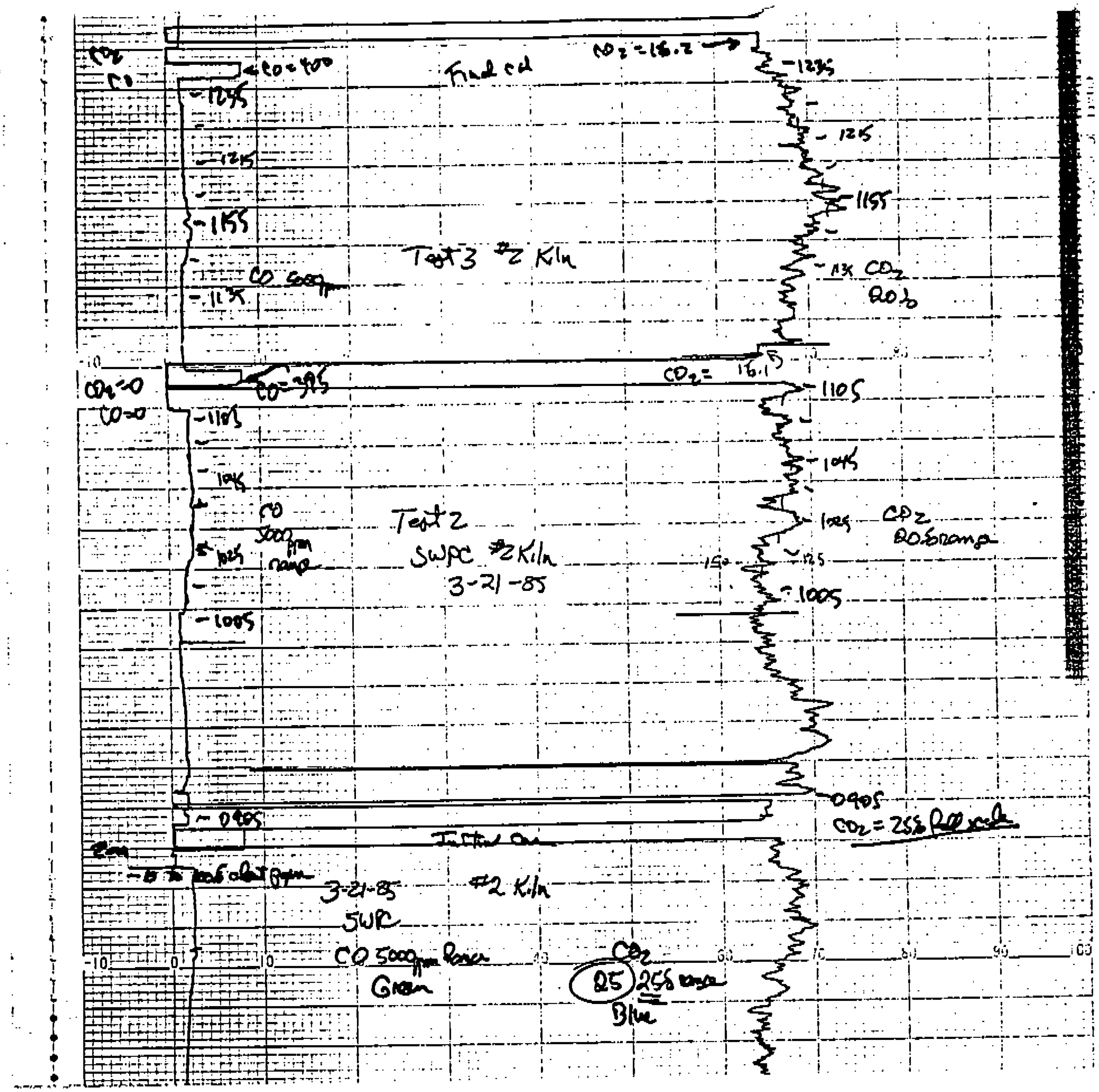
Final Cal
Probe out
probe out
1255
1255
O2
Test
O2
25% range
NOx 1000ppm range
1155
1155
200
1155 O2
1135
870 ppm NOx
Initial Cal
230 TPH
Kiln feed
1135
1115
1115
SWPC
Kiln #2
CO spike
O2
1055
1055
25%
range
1035
NOx
1000ppm range
1035
Zero
7.52% O2
Initial Cal
NOx
870 ppm NOx
10 to 100% chart paper
O2
3-20-85
SWPC #2 Kiln
NOx 1000ppm
O2 25%
5 cm/hr

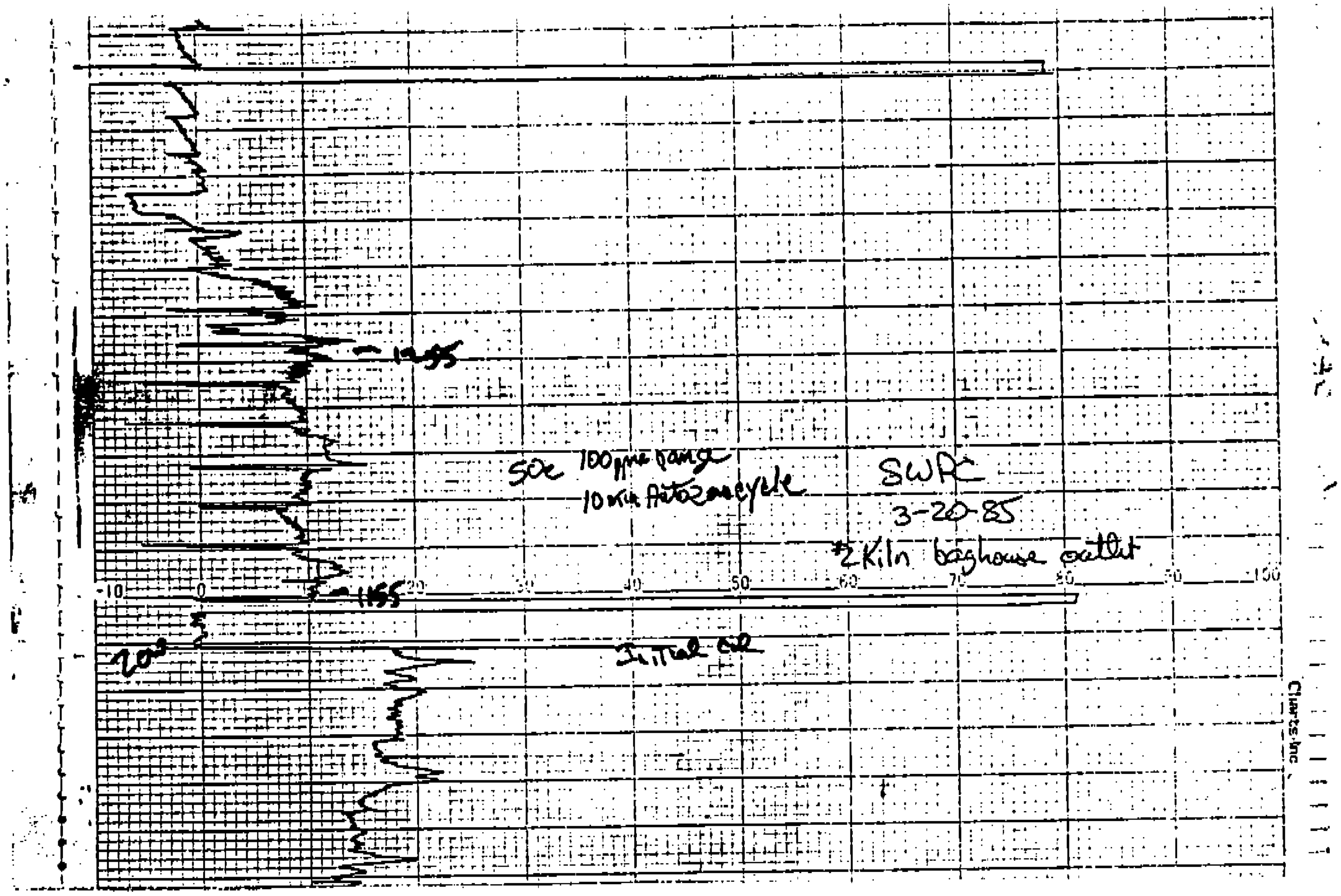


Test 3 #2 Kiln
O_2 25%
NO_x 1000ppm
Test 2
SWPC #2 Kiln
O_2 25% Range
NO_x 1000ppm Range
SWPC
3-21-85
O_2
25% Range
Black
#2 Kiln
NOx
1000ppm Range
Red
Zero

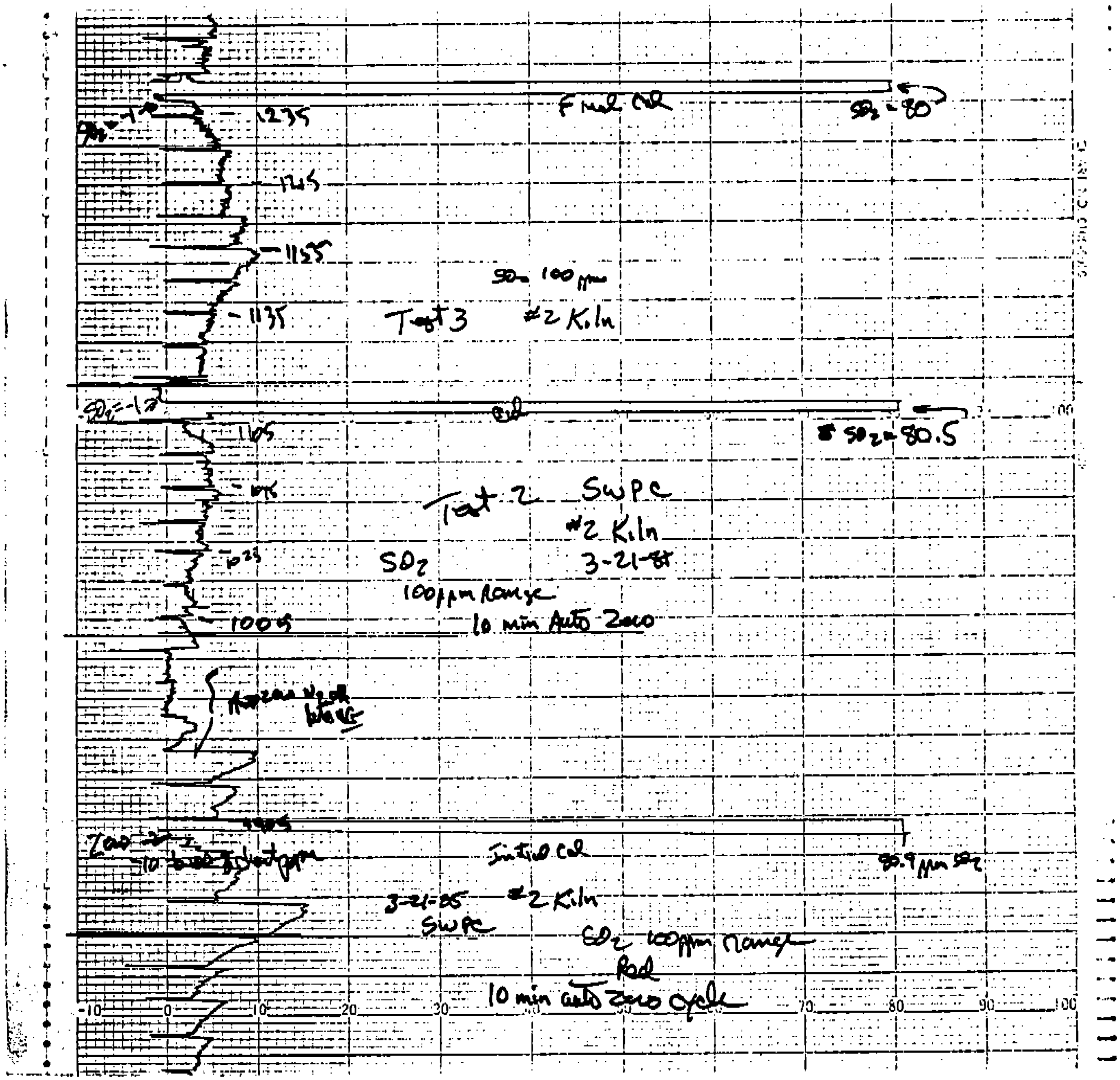


1255
1255
CO
5000 ppm range
CO_2
25% range
CO spike
1155
1155
200
401.7 ppm CO
Initial cal
16.0% CO_2
Adjust CO_2 to 25% range
-10
0
10
CO
5000 ppm range
CO_2
20% range
-10 to 100% chart paper
CO green
5000 ppm range
CO_2 Blue
20% range


CO2
CO
CO = 400
Final cal
CO2 = 16.2
-1235
-1225
-1215
-1155
Test 3 #2 Kiln
CO 5000ppm
-1135
CO2
20%
CO2 = 16.1
CO2=0
CO=0
CO = 395
-1105
-1045
-1025
CO 5000ppm range
Test 2
SWPC #2 Kiln
3-21-85
CO2
-1005
-0905
CO2 = 25% Full scale
Initial Cal
3-21-85
#2 Kiln
SWPC
CO 5000ppm Range
Green
CO2
25
25% range
Blue



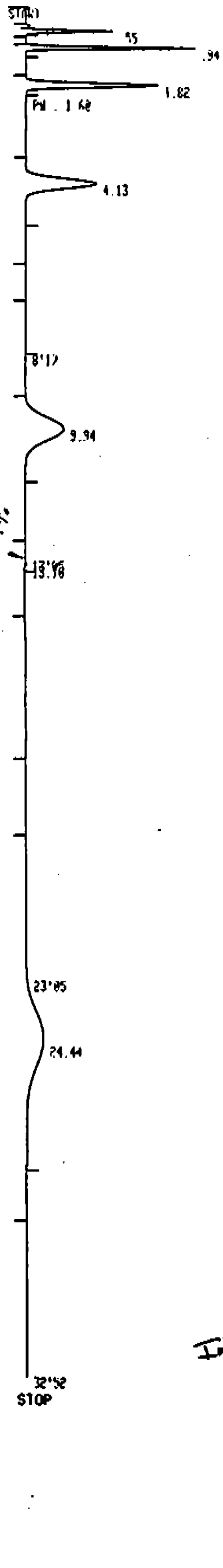
1155
SO_2 100ppm range
10 min Autozero cycle
SWRC
3-20-85
#2 Kiln baghouse outlet
-10
0
20
30
40
50
60
70
80
90
100
1155
1200
Initial cal
Charts Inc.



Final Cal
SO_2 = 80
1235
1155
SO_2 100 ppm
1135
Test 3 #2 Kiln
Cal
SO_2 = 80.5
1105
Test 2 SWPC
#2 Kiln
SO_2
3-21-85
100 ppm Range
10 min Auto Zero
1005
Initial Cal
85.9 ppm SO_2
3-21-85 #2 Kiln
SWPC
SO_2 100 ppm range
10 min auto zero cycle
-10
0
10
20
30
70
80
90
100

ATT 2↑ 1 0
PK WD . 0 4 0
THRSH - 1 0
LIST: LIST
PEAK CAPACITY: 1159

ZERO = 0.-0.1
ATT 2↑ = 1
CHT SP = 1.0
PK WD = 0.04
THRSH = -1
AR REJ = 0



Ref.

Initial Cal

RUN # 4 MAR/25/85 10:18:11

AREA%

RT	AREA	TYPE	AR/HT	AREA%
0.41	870	BV	0.058	0.269
0.55	15134	VB	0.055	4.686
0.94	31839	BB	0.060	9.859
1.82	46622	BB	0.112	14.436
4.13	59940	BB	0.269	18.560
9.94	78047	BB	0.646	24.166
13.10	2935	D BB	0.352	0.909
24.44	87570	PB	1.599	27.115

TOTAL AREA= 322960
MUL FACTOR= 1.0000E+00

CALIB ESTD

REF % RTW: 2 0
% RTW: 2 0

```
CAL#      RT              AMT
  1 : 0 . 5 5          : 5 3 . 5 9
  2 : 0 . 9 4          : 5 4 . 4 0
  3 : 1 . 8 2          : 5 3 . 3 0
  4 : 4 . 1 3          : 5 0 . 6 6
  5 : 9 . 9 4          : 5 3 . 8 6
  6 : 2 4 . 4 4        : 4 7 . 0 4
  7 :
```

REF PK CAL#

LIST: CALIB
ESTD CALIB RUNS 1
REF % RTW: 20.00 % RTW: 20.00

CAL#	RT	AMT	AMT/AREA
1R	0.55	5.3590E+01	3.5410E-03
2	0.94	5.4400E+01	1.7066E-03
3	1.82	5.3300E+01	1.1432E-03
4	4.13	5.0660E+01	8.4518E-04
5	9.94	5.3860E+01	6.9010E-04
6	24.44	4.7040E+01	5.3717E-04

RUN # 4 MAR/25/85 10:18:11

ESTD ppmV

RT	AREA	TYPE	CAL#	AMOUNT
0.41	870	BV		3.090
0.55	15134	VB	1R	53.590
0.94	31839	BB	2	54.400
1.82	46622	BB	3	53.300
4.13	59940	BB	4	50.660
9.94	78047	BB	5	53.860
13.10	2935	D BB		10.424
24.44	87570	PB	6	47.040

$C_1 - C_6$

TOTAL AREA= 322960
MUL FACTOR= 1.0000E+00

OP # 6 0
RPRT UNC PKS YES

OP # 2 0
RF UNC PKS= . 0 0 3 5 4 1 0 0

uncalibrated peaks as CH4

RUN # 4 MAR/25/85 10:18:11

ESTD

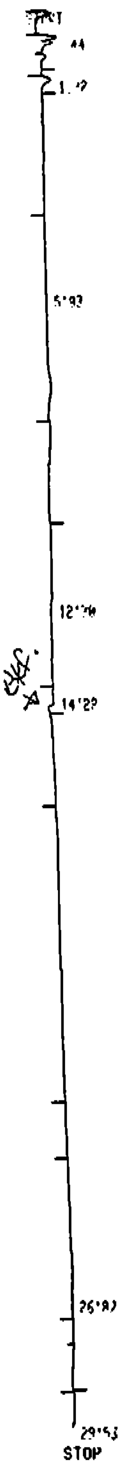
RT	AREA	TYPE	CAL#	AMOUNT
0.41	870	BV		3.081
0.55	15134	VB	1R	53.590
0.94	31839	BB	2	54.400
1.82	46622	BB	3	53.300
4.13	59940	BB	4	50.660
9.94	78047	BB	5	53.860
13.10	2935	D BB		10.393
24.44	87570	PB	6	47.010

TOTAL AREA= 322960
MUL FACTOR= 1.0000E+00

ATT 2↑ - 1 0
PK WD . 1 6 0
THRSH - 1 0
LIST: LIST
PEAK CAPACITY: 1154

ZERO = 0,-0.2
ATT 2↑ = -1
CHT SP = 1.0
PK WD = 0.16
THRSH = -1
AR REJ = 0

Test 1 SWPC #2 Kiln



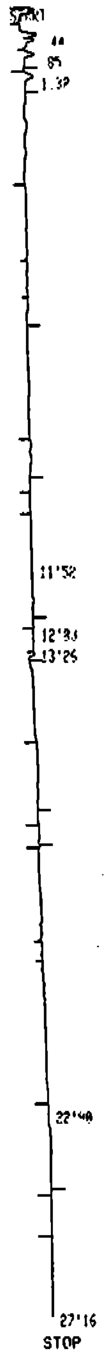
RUN # 7 MAR/25/85 11:09:01

ESTD

RT	AREA	TYPE	CAL#	AMOUNT
0.44	1097	PV	1R	3.885
1.32	767	PB	3	0.877

TOTAL AREA= 1864
MUL FACTOR= 1.0000E+00

Test 2 SWPC #2 Kiln



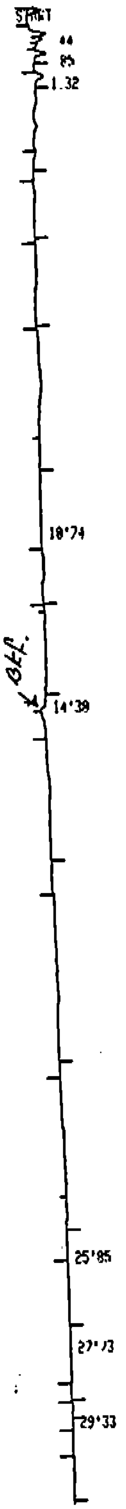
RUN # 9 MAR/25/85 12:16:23

ESTD

RT	AREA	TYPE	CAL#	AMOUNT
0.44	1082	BV	1R	3.831
0.85	853	D VB	2	1.457
1.32	783	PB	3	0.895

TOTAL AREA= 2718
MUL FACTOR= 1.0000E+00

Test 3 SWPC #2 Kiln



RUN # 8 MAR/25/85 11:44:00

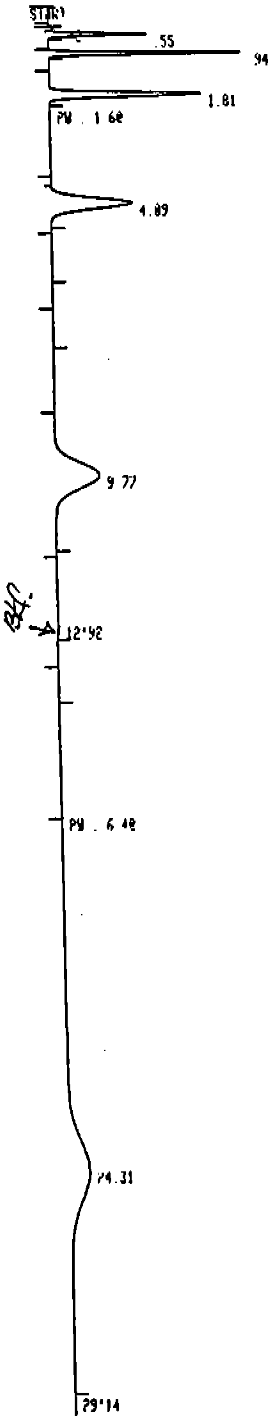
ESTD

RT	AREA	TYPE	CAL#	AMOUNT
0.44	1115	PV	1R	3.948
0.85	833	D VB	2	1.423
1.32	684	BB	3	0.782

TOTAL AREA= 2632
MUL FACTOR= 1.0000E+00

PK WD . 0 4 0
THRSH - 1 0
LIST: LIST
PEAK CAPACITY: 1154

ZERO = 0,-0.2
ATT 2↑ = 1
CHT SP = 1.0
PK WD = 0.04
THRSH = -1
AR REJ = 0



Final Cal

RUN # 11 MAR/25/85 12:50:49

ESTD

RT	AREA	TYPE	CAL#	AMOUNT
0.42	861	BV		3.049
0.55	15154	VB	1R	53.661
0.94	31827	PB	2	54.379
1.81	46694	PB	3	53.332
4.09	59485	VB	4	50.275
9.77	78342	PB	5	54.064
24.31	91642	PB	6	49.227

TOTAL AREA= 324010
MUL FACTOR= 1.0000E+00

Pape & Steiner Environmental Services

PLANT SWPC TEST TYPE F/2 P.M. FIELD TEST DATA SHEET (Page 1 of 2)

Date 3-20-85
Test Location #2 Kiln
Run Number 1
Stack Diameter 160
Operator CUN
Filter No. 406

Barometric Pressure 26.57
Static in. wg. -0.05
Probe Type/Length 4' pyrex
Pitot Coefficient .84
Meter Box No./γ .9869
Nozzle No./Size 0.3055 #1448

Impinger Volumes/Weights			
Contents	Final	Initial	Net
H_2O	579.7	555.6	24.1
H_2O	557.2	551.8	5.4
—	434.0	433.3	0.7
S.G.	663.7	654.8	8.9
-G-		Total	39.1

Gas Composition			
Time	CO_2	O_2	CO

Leak Rate	cfm	"Hg
Initial	0.015	15
Final		

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
A-1	0	.32	1.9	732.53	392	242	245	61	80	78	5		@11:45
2	3	.42	2.5	35.95	393	256	250	61	82	79	6		
3	6	.47	2.7	37.70	390	261	250	60	84	80	6		
4	9	.51	3.0	40.36	390	257	250	61	85	81	7		
5	12	.50	3.0	43.26	388	256	250	59	87	82	7		
6	15	.40	2.4	46.17	380	264	255	58	89	84	6		
STOP	18			48.82									
B-1	0	.18	1.0	48.82	387	242	249	65	88	86	3		This is port "C"
2	3	.18	1.0	50.60	390	259	248	66	90	88	3		
3	6	.17	1.0	52.33	392	268	247	66	91	89	3		
4	9	.17	1.0	54.06	390	272	247	62	92	96	3		856370
5	12	.15	.87	55.80	390	264	248	63	92	90	3		
6	15	.15	.87	57.44	382	260	248	64	92	90	3		856367
STOP	18			59.07									
			1.56										

Pape & Steiner Environmental Services

PLANT SWPC TEST TYPE EPA Method 5 FIELD TEST DATA SHEET (Page 2 of 2)

Date 3-20-85

Test Location #2 Kiln

Run Number 1

Stack Diameter

Operator

Filter No.

Barometric Pressure

Static in. wg.

Probe Type/Length

Pitot Coefficient

Meter Box No./γ

Nozzle No./Size

Impinger Volumes/Weights			
Contents	Final	Initial	Net
S.G.			
		Total	

Gas Composition			
Time	CO_2	O_2	CO

Leak Rate	cfm	"Hg
Initial		
Final	0.010	9

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
C-1	0	.17	1.0	759.07	394	247	243	65	90	89	3		This is
2	3	.17	1.0	760.50	393	269	250	57	93	90	3		port B
3	6	.15	.90	762.38	392	269	248	56	93	91	3		
4	9	.13	.78	764.14	392	265	247	55	94	91	3		
5	12	.10	.60	765.74	391	264	250	55	94	92	2		
6	15	.10	.60	767.11	384	260	250	55	95	92	2		
	18			768.48									
D-1	0	.28	1.7	768.48	382	235	239	62	95	94	4		
2	3	.38	2.3	70.69	390	260	242	60	98	95	5		
3	6	.40	2.4	73.23	395	268	240	58	99	96	5.5		HC
4	9	.44	2.7	75.89	396	267	232	58	99	96	6		HC
5	12	.22	1.3	78.68	391	263	233	57	99	97	4		HC
6	15	.13	.80	80.47	384	261	240	61	98	96	3		
	18			82.23									@ 13:11
			1.56	49.700	389.50			[illegible]	90.31			.4949	

Pape & Steiner Environmental Services

PLANT SWPC Quarry Plant TEST TYPE EPA Method 5 FIELD TEST DATA SHEET (Page 1 of 2)

Date 3-21-84
Test Location #2 Kiln
Run Number 2
Stack Diameter 160"
Operator CMW
Filter No. 392

Barometric Pressure 26.41
Static in. wg. -.05
Probe Type/Length Glass/4'
Pitot Coefficient .84
Meter Box No./γ 1.9869
Nozzle No./Size 1.3055

Impinger Volumes/Weights			
Contents	Final	Initial	Net
100ml H_2O	572.9	550.1	22.8
100ml H_2O	567.3	560.9	6.4
Blank	440.2	439.2	1.0
S.G.	655.5	642.5	13.0
(I)		Total	43.2

Gas Composition			
Time	CO_2	O_2	CO
CM	16.7	11.0	

Leak Rate	cfm	"Hg
Initial	.015	15
Final		

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
D-1	0	.23	1.4	~~782.69~~ 782.69	375	230	235	44	51	51	6		@ 8:58 AM
2	3	.30	1.8	84.88	376	260	236	38	52	51	7		
3	6	.36	2.15	87.21	377	265	240	37	54	52	8		
4	9	.40	2.4	89.65	376	270	235	37	55	52	9		
5	12	.41	2.4	92.20	374	265	230	38	58	54	9		
6	15	.38	2.3	94.83	370	270	225	39	60	56	9		
X	18			97.35									
C-1	0	.18	1.1	97.35	377	240	242	36	61	60	4.5		
2	3	.15	0.90	99.13	370	258	242	39	62	59	4		
3	6	.20	1.2	800.80	372	263	240	40	64	59	4.5		
4	9	.21	1.2	2.62	373	265	240	42	66	61	4.5		
5	12	.20	1.2	4.46	373	265	240	43	68	62	4.5		2 856371 / Blank 85 6363
6	15	.18	1.1	6.27	376	265	239	44	70	64	4.5		
X	18			808.08									2 856368 / Blank 85 6362

Pape & Steiner Environmental Services

PLANT SWPC TEST TYPE EPA Method 5 FIELD TEST DATA SHEET (Page 2 of 2)

Date 3-21-85
Test Location #2 Kiln
Run Number 2
Stack Diameter
Operator CW
Filter No.

Barometric Pressure
Static in. wg.
Probe Type/Length
Pitot Coefficient
Meter Box No./γ
Nozzle No./Size

Impinger Volumes/Weights			
Contents	Final	Initial	Net
S.G.			
		Total	

Gas Composition			
Time	CO_2	O_2	CO
Leak Rate		cfm	"Hg
Initial			
Final		.010	15"

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
B-1	0	.17	1.0	808.08	~~233~~ 371	234	242	47	72	68	4		
2	3	.16	.90	9.81	377	256	247	50	74	70	4		
3	6	.16	.90	11.48	378	263	244	51	76	71	4		
4	9	.16	.90	13.10	378	264	245	52	77	72	4		
5	12	.13	.80	14.77	378	264	246	52	77	73	3.5		
6	15	.11	.65	16.33	374	260	248	52	78	75	3		
X	18			17.78									
A-1	0	.32	1.9	17.78	384	234	239	57	78	77	7		
2	3	.35	2.1	22.50	389	232	241	55	80	77	8		No Vm data
3	6	.49	2.9	25.47	386	235	241	55	81	78	14		
4	9	.47	2.8	28.34	386	242	233	55	81	79	12		
5	12	.55	3.2	31.40	384	261	230	54	82	79	15		
6	15	.54	3.2	834.37	377	264	231	54	83	80	15		HC
END	18												@10:29
			1.68	51.680	376.86				67.50			.5179	

Pape & Steiner Environmental Services

PLANT SWPC TEST TYPE EPA Method 5 FIELD TEST DATA SHEET (Page 1 of 2)

Date 3-21-85
Test Location #2 Kiln
Run Number 3
Stack Diameter 160"
Operator CWC
Filter No. 408

Barometric Pressure 26.41
Static in. wg. -.05
Probe Type/Length Glass/6'
Pitot Coefficient .84
Meter Box No./γ .9869
Nozzle No./Size .3055

Impinger Volumes/Weights			
Contents	Final	Initial	Net
H_2O	607.3	541.5	65.8
H_2O	547.9	585.0	-37.1
Blank	463.8	462.4	1.4
S.G.	613.6	601.2	12.4
0		Total	42.5

Gas Composition			
Time	CO_2	O_2	CO
	17.5	10.8	

Leak Rate	cfm	"Hg
Initial	.010	15
Final		

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
A-1	0	.33	1.9	835.01	389	230	246	57	73	73	6		@ 11:45
2	3	.35	2.0	37.35	385	238	234	51	75	74	6		HC
3	6	.48	2.9	39.83	385	241	232	50	76	74	9		
4	9	.53	3.1	42.70	383	253	230	54	77	74	10		
5	12	.50	3.0	45.65	382	256	229	53	78	74	10		85^3 6369
6	15	.45	2.7	48.58	377	248	231	52	78	75	8		85^3 6372
X	18			51.39									
B-1	0	.16	.95	51.39	383	237	237	51	78	76	3		
2	3	.20	1.2	52.89	383	241	233	50	79	76	4		
3	6	.15	.90	54.88	388	246	238	49	81	78	3		
4	9	.15	.90	56.55	387	251	240	51	83	80	3		
5	12	.14	.85	58.21	386	248	236	53	83	80	3		
6	15	.10	.58	59.82	382	245	230	54	84	81	2.5		
X	18			61.20									

Pape & Steiner Environmental Services

PLANT SWPC TEST TYPE EPA Method 5 FIELD TEST DATA SHEET (Page 2 of 2)

Date 3-21-85
Test Location #2 Kiln
Run Number 3
Stack Diameter
Operator CWW
Filter No.

Barometric Pressure
Static in. wg.
Probe Type/Length
Pitot Coefficient
Meter Box No./γ
Nozzle No./Size

Impinger Volumes/Weights			
Contents	Final	Initial	Net
S.G.			
		Total	

Gas Composition			
Time	CO_2	O_2	CO

Leak Rate	cfm	"Hg
Initial		
Final	.008	10

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
C-1	0	.16	.95	861.20	385	230	234	55	82	82	3		
2	3	.17	1.0	62.86	390	230	231	55	84	82	3		
3	6	.20	1.2	64.64	391	236	233	55	86	83	4		
4	9	.21	1.2	66.56	391	240	235	54	86	83	4		
5	12	.19	1.2	68.46	389	239	237	57	86	84	4		
6	15	.15	.90	870.36	382	256	232	58	87	85	3		
X	18	—	—	872.06	—	—	—	—	—	—	—		
D-1	0	.32	1.9	872.06	390	243	234	61	85	85	6		
2	3	.33	1.9	74.45	392	250	231	56	87	86	6		
3	6	.46	2.7	76.83	392	255	235	55	88	86	8		
4	9	.44	2.6	79.63	390	261	241	54	89	86	8		
5	12	.46	2.7	82.34	390	268	245	55	90	86	8		
6	15	.33	1.9	85.25	385	271	239	54	91	86	6		
END	18	—	—	887.63	—	—	—	—	—	—	—		@13:03
			1.71	53.62	386.54				81.56		.5230		

Pape & Steiner Environmental Services

SAMPLING POINT LOCATION DATA SHEET

Plant #2 Kiln SWPC

Date 3-20-85

Test Location Kiln

Upstream Dist./Dia.

Downstream Dist./Dia.

No. of Sampling Points 24

Stack Dimension 160" I.D.

Coupling Length 5 3/4 including rail assembly

note transmissometer in 2 of 4 remaining ports

(1) existing ports are 3" male pipe thread
(2) use plate with one-sided female pipe thread
(3) overhead supports are 2" welded plate-holes

Sample Point	Dist	Sample Point	Dist	Sample Point	Dist	Sample Point	Dist
1	9.2						
2	16.5						
3	24.6						
4	34.1						
5	45.8						
6	62.7						
7	108.8						
8	125.8						
9	137.4						
10	146.9						
11	155.0						
12	162.3						

SAMPLING POINT RELOCATION:

#2 Kiln
3-20-85

K FACTOR/NOZZLE CALCULATION

$$K = \frac{782.687(C_p)^2(1 - B_{wo})^2 P_s MW_d}{K_o^2 MW_s P_m}$$

XEQ KC

CP	.84	O_2	9.0	MWd =	31.3
Bwo	.05	CO_2	18.5	K(R10) =	1055
Ps H_2O"	0	Ko	.693		
Pb	26.57				

$$N_d = \left(\frac{\Delta H \ T_s}{K \ T_m \Delta P}\right)^{.25}$$

XEQ ND

ΔP		Ideal Nozzle @ 1.1 ΔH =	
Ts		Ideal Nozzle @ 1.8 ΔH =	
Tm			

$$\Delta H = K(N_d)^4\left(\frac{T_m}{T_s}\right)(\Delta P)$$

XEQ KND

(1) Actual Nozzle I.D. .3055 (2) Actual Nozzle I.D. ______

$K(Nd)^4$ (R09) = 9.191 $K(Nd)^4$ (R09) = ______

XEQ DH

	Nozzle 1 High	Nozzle 1 Low	Nozzle 2 High	Nozzle 2 Low
Tm in	110	80		
Tm out	100	75		
Ts	385			
ΔP	.30			
ΔH	1.8			

CLΣ

Pape & Steiner Environmental Services

PLANT SWPC TEST TYPE M 5 FIELD TEST DATA SHEET (Page 1 of 1)

Date 03-22-85
Test Location Raw Mill
Run Number 02
Stack Diameter 72
Operator RKC
Filter No. 398

Barometric Pressure 26.37
Static in. wg. -0.37
Probe Type/Length Glass 6'
Pitot Coefficient 0.84
Meter Box No./Y 635/1.0098
Nozzle No./Size 1437/0.2356

Impinger Volumes/Weights			
Contents	Final	Initial	Net
H2O	584.4	566.2	18.2
H2O	526.7	523.4	3.3
Blank	444.8	444.2	0.6
S.G.	673.5	665.0	8.5
(L)		Total	30.6

Gas Composition			
Time	CO_2	O_2	CO
	2.0.5	20.5	

Leak Rate	cfm	"Hg
Initial	0.014	13
Final	0.013	7

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
1	0	0.46	1.21	064.504	153		235	40	69	66	3.0	0.675	0953 Begin test
2		0.59	1.55	067.82	156		232	43	69	66	3.0	0.768	Pitot ok
3	10	0.55	1.44	071.43	159		236	44	74	66	3.0	0.742	85 6483
4		0.49	1.29	074.94	161		229	46	78	68	3.0	0.700	
5	20	0.50	1.32	078.30	162		231	47	80	69	3.0	0.707	856484
6		0.46	1.22	081.68	161		237	50	83	71	3.0	0.675	
1	30	0.65	1.73	085.6?	158		241	55	78	77	3.5	0.806	1023 port change
2		0.68	1.81	088.84	164		240	45	84	77	3.5	0.825	1031 resume
3	40	0.67	1.79	092.86	165		244	47	90	79	3.5	0.819	
4		0.68	1.82	096.80	166		239	48	92	81	3.5	0.825	
5	50	0.67	1.79	100.82	168		236	52	93	82	3.5	0.819	
6		0.61	1.63	104.84	168		240	54	93	84	3.0	0.781	
	60			108.704									1101 end test
			1.55	44.200	161.74				78.08			0.7622	

Pape & Steiner Environmental Services

PLANT Swfc TEST TYPE M 5 FIELD TEST DATA SHEET (Page 1 of 1)

Date 03-22-85
Test Location Raw Mill
Run Number 03
Stack Diameter 72
Operator RKL
Filter No. 407

Barometric Pressure 26.37
Static in. wg. -0.39
Probe Type/Length 6/in 6'
Pitot Coefficient 0.84
Meter Box No./γ 135/1.0048
Nozzle No./Size 1477/0.2356

Impinger Volumes/Weights			
Contents	Final	Initial	Net
H_2O	554.3	539.4	14.9
H_2O	556.0	550.4	5.6
Blank	452.6	452.2	0.4
S.G.	694.8	687.7	7.1
N		Total	28.0

Gas Composition			
Time	CO_2	O_2	CO
	0.5	20.5	

Leak Rate	cfm	"Hg
Initial	0.007	14
Final	0.007	8

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
1	0	0.60	1.57	109.027	167		254	41	76	73	4.0	0.775	1143 Begin test
2		0.58	1.52	112.55	169		258	37	79	75	4.0	0.762	
3	10	0.28	0.74	116.20	167		254	38	83	75	2.0	0.529	856485
4		0.35	0.93	119.02	165		261	39	85	76	2.5	0.592	
5	20	0.37	0.98	121.75	164		257	39	86	77	2.5	0.608	856486
6		0.43	1.15	124.74	164		270	38	88	78	3.0	0.656	
1	30	0.62	1.66	127.975	163		246	42	84	81	4.0	0.787	1113 Port change
2		0.63	1.66	131.78	176		241	34	92	81	4.0	0.794	1217 Resume
3	40	0.60	1.57	135.64	180		252	32	92	82	4.0	0.775	
4		0.60	1.57	139.43	182		251	33	93	84	4.0	0.775	
5	50	0.58	1.52	143.20	182		255	34	94	84	4.0	0.762	
6		0.49	1.29	146.94	181		259	35	95	85	3.0	0.700	
	60			150.356									1247 end test
			1.35	41.353	171.67			5	83.25			0.7044	

Pape & Steiner Environmental Services

Raw Mill

SAMPLING POINT LOCATION DATA SHEET

Plant SWPC

Date 03-21-85

Test Location Raw Mill

Upstream Dist./Dia. 2

Downstream Dist./Dia. 8

No. of Sampling Points 6

Stack Dimension 72

Coupling Length 13

4" Flange on stack

NO power on platform, power at base of stack

Sample Point	Dist	Sample Point	ΔP Dist	Ts Sample Point	Dist	Sample Point	Dist
1	16.1	1	1.05(.79)	155	Ps: -0.78	0.61	
2	23.5	2	1.12(.79)	159		0.86	
3	37.3	3	1.10(.78)	161		0.85	
4	63.7	4	0.65(.71)	162		0.76	
5	74.5	5	0.62(.71)	161		0.78	
6	81.9	6	0.62(.71)	161		0.70	
				VEL. TRAV →	ΔP 1 0.64	Ts 166	
					2 0.69	169	
					3 0.66	169	
					4 0.63	170	
					5 0.62	169	
					6 0.57	168	

SAMPLING POINT RELOCATION:

Raw Mill

Pape & Steiner Environmental Services

K FACTOR/NOZZLE CALCULATION

$$K = \frac{782.687(C_p)^2(1 - B_{wo})^2 P_s MW_d}{K_o^2 MW_s P_m}$$

XEQ KC

CP 0.84

Bwo 0.05

Ps H_2O" -0.79

Pb 26.47

O_2 20.5

CO_2 0.5

Ko 0.7115

MWd = 28.9

K(R10) = 995.441

$$N_d = \left(\frac{\Delta H \; T_s}{K \; T_m \Delta P}\right)^{.25}$$

XEQ ND

ΔP 0.69

Ts 169

Tm 85

Ideal Nozzle @ 1.1 ΔH = 0.207

Ideal Nozzle @ 1.8 ΔH = 0.235

$$\Delta H = K(N_d)^4\left(\frac{T_m}{T_s}\right)(\Delta P)$$

XEQ KND

#1437

(1) Actual Nozzle I.D. 0.2356

$K(Nd)^4$ (R09) = 3.067

(2) Actual Nozzle I.D. ______

$K(Nd)^4$ (R09) = ______

XEQ DH

	Nozzle 1 High	Nozzle 1 Low	Nozzle 2 High	Nozzle 2 Low
Tm in	85			
Tm out	85			
Ts	169			
ΔP	0.69			
ΔH	1.83			

CLΣ

HP 41CV Program 3/82
ND Revised 11/83

Pape & Steiner Environmental Services

PLANT SWPC TEST TYPE M 5 FIELD TEST DATA SHEET (Page 1 of 2)

Date 03-14-85
Test Location #2 finishing mill
Run Number 01
Stack Diameter 57.5
Operator RKC
Filter No. 400

Barometric Pressure 27.36
Static in. wg. -0.10
Probe Type/Length Glass 6'
Pitot Coefficient 0.84
Meter Box No./Y 635/1.0098
Nozzle No./Size 271/0.7581

Impinger Volumes/Weights			
Contents	Final	Initial	Net
H_2O	662.2	576.6	85.6
H_2O	587.6	556.6	31.0
—	450.6	443.5	7.1
S.G.	708.8	685.8	23.0
-A-		Total	146.7

Gas Composition			
Time	CO_2	O_2	CO
	0	20.9	

Leak Rate	cfm	"Hg
Initial	0.012	15
Final		

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
1	0	0.09	1.31	725.938	166	294	231	38	67	66	3.0	0.300	0903 Begin test
2		0.09	1.27	729.22	186	295	242	37	69	63	3.0	0.300	
3	10	0.095	1.34	732.45	188	288	253	34	73	64	3.0	0.308	
4		0.095	1.35	735.81	189	280	253	35	75	64	3.5	0.308	
5	20	0.095	1.35	739.17	189	262	252	34	78	66	3.5	0.305	
6		0.095	1.35	742.54	190	274	251	34	80	68	3.5	0.308	
7	30	0.095	1.36	745.93	191	288	240	35	82	70	3.5	0.308	
8		0.09	1.29	749.34	192	256	253	35	84	73	3.5	0.300	
9	40	.085	1.22	752.71	192	249	240	38	85	75	3.0	0.242	
10		0.08	1.15	755.90	192	255	255	37	86	76	3.0	0.283	
11	50	0.075	1.08	759.18	192	264	249	39	87	77	3.0	0.274	
12		0.065	0.94	762.25	189	266	256	41	87	78	2.5	0.255	
													1003 changing ports
	60												

Pape & Steiner Environmental Services

PLANT SWPC TEST TYPE M 5 FIELD TEST DATA SHEET (Page 2 of 2)

Date 03-19-85
Test Location #2 finishing mill
Run Number 01
Stack Diameter 57.5
Operator RKC
Filter No. 400

Barometric Pressure 27.36
Static in. wg. -0.10
Probe Type/Length Glass 6'
Pitot Coefficient 0.84
Meter Box No./γ 635/1.0048
Nozzle No./Size 271/0.3586

Impinger Volumes/Weights			
Contents	Final	Initial	Net
S.G.			
		Total	

Gas Composition			
Time	CO_2	O_2	CO

Leak Rate	cfm	"Hg
Initial		
Final		

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
1	0	0.085	1.23	765.157	186	240	240	44	79	79	3.0	0.292	1013 Resumed test
2		0.085	1.23	768.42	189	245	245	42	86	79	3.0	0.292	
3	10	0.085	1.23	771.69	190	250	236	41	88	79	3.0	0.292	
4		0.085	1.24	774.97	190	255	240	43	89	80	3.0	0.292	
5	20	0.09	1.31	778.15	191	266	258	41	89	80	3.0	0.300	856349
6		0.09	1.31	781.44	190	266	239	42	89	80	3.0	0.300	856352
7	30	0.095	1.38	784.82	191	277	251	43	90	81	3.5	0.308	
8		0.09	1.31	788.28	191	272	238	46	90	81	3.0	0.300	
9	40	0.09	1.31	791.58	190	264	242	46	91	82	3.0	0.300	
10		0.085	1.24	794.95	189	256	237	47	90	82	3.0	0.292	
11	50	0.08	1.17	798.30	188	255	245	46	90	82	3.0	0.283	
12		0.075	1.11	801.51	181	253	246	46	90	82		0.277	1113 end test
	60			804.684									
			1.25	78.746	188.42				79.60			0.2945	

Pape & Steiner Environmental Services

PLANT SWPC TEST TYPE M 5 FIELD TEST DATA SHEET (Page 1 of 2)

Date 03-19-85
Test Location #2 fin mill
Run Number 02
Stack Diameter 57.5
Operator RKC
Filter No. 402

Barometric Pressure 27.36
Static in. wg. -0.10
Probe Type/Length Glass 6'
Pitot Coefficient 0.84
Meter Box No. 18635/1.0098
Nozzle No./Size 1271/0.3582

Impinger Volumes/Weights			
Contents	Final	Initial	Net
H_2O	626.9	530.0	96.9
H_2O	602.5	580.1	22.4
—	472.4	469.4	3.0
S.G.	710.1	693.9	16.2
-C-		Total	138.5

Gas Composition			
Time	CO_2	O_2	CO
1255	0	20.9	

Leak Rate	cfm	"Hg
Initial	0.017	15
Final	0.004	5

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
1	0	0.08	1.17	804.474	176	260	241	53	74	75	3.0	0.283	1205 Begin test
2		0.075	1.08	808.04	184	252	245	48	74	73	3.0	0.274	Pitot OK
3	10	0.075	1.02	811.04	187	265	234	47	79	73	3.0	0.274	
4		0.08	1.10	813.98	187	272	238	45	82	73	3.0	0.283	
5	20	0.075	1.03	817.01	188	273	251	44	85	75	3.0	0.274	
6		0.08	1.10	819.98	189	254	245	46	88	76	3.0	0.283	
7	30	0.085	1.18	823.07	189	261	256	46	90	78	3.0	0.292	
8		0.08	1.11	826.25	189	268	248	47	91	80	3.0	0.283	
9	40	0.07	0.97	829.38	189	262	235	45	92	81	3.0	0.265	
10		0.07	0.98	832.32	188	256	242	44	92	83	3.0	0.265	
11	50	0.07	0.98	835.30	188	258	241	44	93	83	3.0	0.265	
12		0.05	0.70	838.24	188	260	242	46	93	84		0.224	1305 changing port
	60												

Pape & Steiner Environmental Services

PLANT SWPC TEST TYPE M 5 FIELD TEST DATA SHEET (Page 2 of 2)

Date 03-19-85
Test Location #2 Fin mill
Run Number 02
Stack Diameter 57.5
Operator RKC
Filter No. 702

Barometric Pressure 27.36
Static in. wg. -0.1
Probe Type/Length Glass 6'
Pitot Coefficient 0.84
Meter Box No./γ 635/1.0048
Nozzle No./Size 1271/0.3556

Impinger Volumes/Weights			
Contents	Final	Initial	Net
S.G.			
		Total	

Gas Composition			
Time	CO_2	O_2	CO

Leak Rate	cfm	"Hg
Initial		
Final		

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
1	0	0.075	1.00	840.805	180	242	234	50	86	86	3.0	0.274	1310 Resumed
2		0.085	1.19	843.81	186	247	241	47	93	86	3.0	0.292	
3	10	0.09	1.26	846.97	188	265	238	45	95	86	3.0	0.300	
4		0.09	1.26	850.27	188	262	229	43	95	86	3.0	0.300	
5	20	0.09	1.26	853.56	189	262	241	43	95	86	3.0	0.300	
6		0.09	1.26	856.88	190	267	237	44	95	86	3.0	0.300	
7	30	0.095	1.33	860.19	190	262	233	43	95	86	3.0	0.308	
8		0.09	1.26	863.58	191	267	243	44	95	86	3.0	0.300	
9	40	0.09	1.26	866.93	191	267	240	45	95	86	3.0	0.300	
10		0.08	1.12	870.30	190	272	236	44	95	86	3.0	0.283	
11	50	0.07	0.98	873.52	190	272	247	46	95	87	3.0	0.265	
12		0.07	0.98	876.53	188	269	231	45	96	87	3.0	0.265	
	60			879.521									1410 End test
			1.11	74.5920	187.63				86.06			0.2811	

Pape & Steiner Environmental Services

PLANT SWPC TEST TYPE MS FIELD TEST DATA SHEET (Page 1 of 2)

Date 07-19-85
Test Location #2 Finmill
Run Number 03
Stack Diameter 57.5
Operator RKS
Filter No. - 390

Barometric Pressure 27.36
Static in. wg. -0.11
Probe Type/Length Glass 6'
Pitot Coefficient 0.84
Meter Box No./Y 635/1.0048
Nozzle No./Size 121/0.3586

Impinger Volumes/Weights			
Contents	Final	Initial	Net
H_2O	666.9	576.6	90.3
H_2O	585.1	561.3	23.8
—	462.4	458.9	3.5
S.G.	658.2	638.1	20.1
-E-		Total	137.7

Gas Composition			
Time	CO_2	O_2	CO
	0	20.9	

Leak Rate	cfm	"Hg
Initial	0.011	14
Final	0.013	10

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
1	0	0.085	1.18	879.732	180	267	232	45	77	78	3.0	0.242	1445 Begin test
2		0.08	1.10	882.90	185	280	227	42	80	80	3.0	0.283	
3	10	0.075	1.04	886.02	187	275	225	43	84	80	3.0	0.274	
4		0.075	1.04	889.03	189	241	226	42	89	80	3.0	0.274	
5	20	0.08	1.10	892.03	191	248	224	42	90	80	3.0	0.283	
6		0.075	1.04	895.16	191	260	219	44	92	82	3.0	0.274	
7	30	0.065	0.90	898.18	192	260	215	43	93	84	3.0	0.255	
8		0.095	1.32	901.05	191	263	210	43	94	85	3.5	0.308	
9	40	0.085	1.19	904.42	191	261	218	42	96	86	3.0	0.292	
10		0.085	1.19	907.65	191	264	228	42	96	86	3.0	0.292	
11	50	0.075	1.05	910.92	191	276	232	43	97	87	3.0	0.274	
12		0.075	1.05	914.00	188	261	226	42	96	87	3.0	0.274	
	60	—	—	917.065	—	—	—	—	—	—	—	—	1545 changing port

3 85 6351

3 85 6354

Pape & Steiner Environmental Services

PLANT SWPC TEST TYPE M5 FIELD TEST DATA SHEET (Page 2 of 2)

Date 03-19-85
Test Location #2 Fin mill
Run Number 03
Stack Diameter 57.5
Operator RKC
Filter No. 346

Barometric Pressure 27.36
Static in. wg. -0.11
Probe Type/Length Glass 6'
Pitot Coefficient 0.84
Meter Box No./γ 635/1.0098
Nozzle No./Size 1271/0.3586

Impinger Volumes/Weights			
Contents	Final	Initial	Net
S.G.			
		Total	

Gas Composition			
Time	CO_2	O_2	CO

Leak Rate	cfm	"Hg
Initial		
Final		

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
1	0	0.085	1.20	917.065	180	238	228	44	87	87	3.0	0.292	1549 Resume
2		0.095	1.34	920.28	185	240	227	45	94	88	4.0	0.308	
3	10	0.085	1.19	923.72	191	252	232	47	97	88	3.5	0.292	
4		0.095	1.33	926.98	192	248	233	48	97	89	4.0	0.308	
5	20	0.10	1.40	930.38	193	250	235	49	98	89	4.0	0.316	
6		0.10	1.40	933.91	195	254	236	51	98	90	4.0	0.316	
7	30	0.105	1.46	937.37	196	266	234	50	98	90	4.0	0.324	
8		0.105	1.46	940.94	197	275	242	52	98	90	4.0	0.324	
9	40	0.10	1.39	944.53	197	272	237	51	98	90	4.0	0.316	
10		0.11	1.53	948.06	195	261	235	48	98	90	4.0	0.332	
11	50	0.115	1.60	951.75	195	254	232	48	98	90	4.5	0.339	
12		0.095	1.33	955.50	193	252	230	48	97	90		0.305	
	60	—	—	959.016	—	—	—	—			—	—	1649 End test
			1.24	79.284	190.67				89.75			0.2475	

Pape & Steiner Environmental Services

SAMPLING POINT LOCATION DATA SHEET

Plant SWPC

Date 03-19-85

Test Location SWPC #2 finishing mill

Upstream Dist./Dia. ~10'/2 Dia

Downstream Dist./Dia. ~40'/5 Dia

No. of Sampling Points 12

Stack Dimension 57.5

Coupling Length 15"

4" Flang adp.
50' cord/twist adap.

72.5
- 15
57.5

Sample Point	Dist	Sample Point	Dist	Sample Point	Dist	Sample Point	Dist
1	16.2						
2	18.9						
3	21.8						
4	25.2						
5	29.4						
6	35.5						
7	52.0						
8	58.1						
9	62.3						
10	65.7						
11	68.6						
12	71.3						

SAMPLING POINT RELOCATION:

ape & Steiner Environmental Services

=2 Finishing Mill
– SWPC

K FACTOR/NOZZLE CALCULATION

$$K = \frac{782.687(Cp)^2(1 - B_{wo})^2 P_s MW_d}{K_o^2 MW_s P_m}$$

XEQ KC

CP	0.84	O_2	20.9	MWd =	28.8 (28.836)
Bwo	0.02 (.05)	CO_2	0	K(R10) =	1049.419 (997.476)
Ps H_2O"	-0.10	Ko	0.7118		
Pb	27.36				

Ts 179
ΔP #5 = 0.10
156
#6 = 0.105
187
#7 = 0.10

$$N_d = \left(\frac{\Delta H \ T_s}{K \ T_m \Delta P}\right)^{.25}$$

XEQ ND

ΔP	0.10	Ideal Nozzle @ 1.1 ΔH =	0.335 .339
Ts	185	Ideal Nozzle @ 1.8 ΔH =	0.378 .383
Tm	80		

$$\Delta H = K(N_d)^4\left(\frac{T_m}{T_s}\right)(\Delta P)$$

XEQ KND #1271

(1) Actual Nozzle I.D. 0.3586 (2) Actual Nozzle I.D. ______

$K(Nd)^4$ (R09) = 17.353 / 16.495 $K(Nd)^4$ (R09) = ______

XEQ DH

	Nozzle 1 High	Nozzle 1 Low	Nozzle 2 High	Nozzle 2 Low
Tm in	50			
Tm out	80			
Ts	185			
ΔP	0.1			
ΔH	1.45			

CLΣ

Pape & Steiner Environmental Services

PLANT SWPC Quary TEST TYPE M5 FIELD TEST DATA SHEET (Page 1 of 2)

Date	3-22-85
Test Location	27-F-11
Run Number	1
Stack Diameter	15×18
Operator	DPP
Filter No.	409

Barometric Pressure	26.43
Static in. wg.	-.05
Probe Type/Length	Glass/4'
Pitot Coefficient	.84
Meter Box No./γ	644/.989
Nozzle No./Size	.3582

Impinger Volumes/Weights			
Contents	Final	Initial	Net
H_2O	524.2	533.7	-9.5
H_2O	558.6	555.2	3.4
Blank	434.6	433.4	1.2
S.G.	669.9	658.4	11.5
P		Total	6.6

Gas Composition			
Time	CO_2	O_2	CO
	0	20.9	

Leak Rate	cfm	"Hg
Initial	.012	15
Final		

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
A-1	1007 0	.09	1.72	88.866	68	234	244	54	84	82	6	.300	
2	2.5	.09	1.70	90.92	69	236	245	46	81	77	6	.300	856487
3	5	.09	1.70	92.90	69	237	245	45	81	77	6	.300	
4		.10	1.88	94.78	69	235	237	46	80	76	6	.316	856488
5	10	.10	1.86	96.80	69	238	237	48	81	75	6	.316	
6		.10	1.89	98.70	69	230	237	48	81	76	6	.316	
7	15	.11	2.07	100.65	69	240	235	48	81	75	7	.332	
8		.10	1.89	102.73	68	250	237	48	81	75	6	.316	
END	20	—		105.100									
B-1	1030 0	.14	2.65	5.100	68	265	236	55	81	76	9	.374	
2	2.5	.14	2.65	7.54	68	274	241	48	81	76	9	.374	
3	5	.14	2.66	9.87	67	268	234	50	82	77	10	.374	
4		.13	2.47	12.24	67	262	237	49	82	78	11	.361	
5	10	.14	2.66	14.60	67	259	240	48	82	78	12	.374	
6		.14	2.66	16.97	67	256	233	49	82	78	11	.374	

Pape & Steiner Environmental Services

PLANT SWPC Quarry TEST TYPE M5 Fabric Dust Collector FIELD TEST DATA SHEET (Page 2 of 2)

27-FDC-11

Date 3-22-85
Test Location ~~27-F-11~~
Run Number 1
Stack Diameter 15x18
Operator AP
Filter No. 409

Barometric Pressure ______
Static in. wg. ______
Probe Type/Length ______
Pitot Coefficient ______
Meter Box No./γ ______
Nozzle No./Size ______

Impinger Volumes/Weights			
Contents	Final	Initial	Net
S.G.			
Total			

Gas Composition			
Time	CO_2	O_2	CO

Leak Rate	cfm	"Hg
Initial		
Final	.010	10

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
B-7	15	.12	2.27	19.37	68	250	239	49	82	78	8	.346	
8		.11	2.08	21.61	69	249	237	50	83	78	8	.332	
END	20	—		23.649									
C-1	1055	.14	2.66	123.649	67	238	239	59	82	80	9	.374	
2	25	.14	2.65	126.11	69	239	239	51	83	79	9	.374	
3	5	.14	2.65	128.40	70	236	239	50	84	80	10	.374	
4		.14	2.65	130.78	70	235	236	51	84	80	10	.374	
5	10	.14	2.65	133.19	70	244	233	51	84	80	10	.374	
6		.14	2.65	135.61	70	251	236	50	83	81	10	.374	
7	15	.13	2.46	138.06	70	261	239	51	84	80	10	.361	
8		.13	2.46	140.34	70	276	239	51	83	81	9	.361	
END	20	—		142.655									
	60		2.32	53.789	68.63				80.10			.3488	

Pape & Steiner Environmental Services

PLANT SWPC Quarry TEST TYPE M5 FIELD TEST DATA SHEET (Page 1 of 2)

Date 3-22-85
Test Location 27-FDC-11
Run Number 2
Stack Diameter 15x18
Operator AP
Filter No. 412

Barometric Pressure 26.43
Static in. wg. -.05
Probe Type/Length Glass 4'
Pitot Coefficient .84
Meter Box No./γ 644/.9869
Nozzle No./Size 1376/.3582

Impinger Volumes/Weights			
Contents	Final	Initial	Net
H_2O	600.4	607.3	-6.9
H_2O	550.5	547.9	2.6
Blank	464.8	463.8	1.0
S.G.	617.5	608.1	9.4
		Total	6.1

Gas Composition			
Time	CO_2	O_2	CO
	0	20.9	

Leak Rate	cfm	"Hg
Initial	.010	15
Final		

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Stack °F	Probe °F	Oven °F	Imp. °F	Gas Meter In °F	Gas Meter Out °F	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
A-1	1159 0	.07	1.30	44.180	72	265	230	54	74	75	4	.265	
2	2.5	.08	1.49	45.88	~~72~~ 72	263	234	52	75	75	4	.283	856489
3	5	.07	1.30	47.71	73	267	236	50	77	75	4	.265	
4		.07	1.30	49.34	73	263	248	51	77	75	4	.265	85 6490
5	10	.07	1.31	51.05	~~73~~ 73	263	245	53	78	75	4	.265	
6		.06	1.12	52.74	72	262	238	53	78	75	3	.245	
7	15	.07	1.31	64.35	72	258	250	51	79	76	4	.265	
8		.07	1.31	55.99	72	260	247	51	79	76	4	.265	
END	20	—		57.677									
B-1	1223 0	.11	2.06	57.677	72	264	253	55	77	76	5	.332	
2		.10	1.87	59.80	73	265	263	51	80	77	5	.316	
3	5	.09	1.69	61.80	72	264	263	49	80	77	5	.300	
4		.09	1.69	63.67	72	273	254	48	80	77	5	.300	
5	10	.09	1.69	65.57	72	271	256	48	80	77	5	.300	
6		.08	1.50	67.48	72	269	260	47	82	78	4	.283	

Pape & Steiner Environmental Services

PLANT SWPC Quarry TEST TYPE M5 FIELD TEST DATA SHEET (Page 2 of 2)

Date 3-22-85
Test Location 27-FDC-11
Run Number 2
Stack Diameter 15x18
Operator AP
Filter No. 412

Barometric Pressure
Static in. wg.
Probe Type/Length
Pitot Coefficient
Meter Box No./γ
Nozzle No./Size

Impinger Volumes/Weights			
Contents	Final	Initial	Net
S.G.			
		Total	

Gas Composition			
Time	CO_2	O_2	CO

Leak Rate	cfm	"Hg
Initial		
Final	.010	10

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
B-7	15	.07	1.32	69.83	71	268	253	46	82	78	4	.265	
8		.06	1.13	71.00	70	269	251	47	83	78	4	.245	
END	20	—		72.616									
C-1	1246 0	.10	1.89	72.616	70	269	251	54	83	81	5	.316	
2		.09	1.70	74.68	71	268	251	52	84	81	5	.300	
3	5	.09	1.71	76.65	71	273	253	52	87	82	5	.300	
4		.09	1.71	78.52	72	272	254	52	87	82	5	.300	
5	10	.09	1.71	80.42	72	270	252	52	88	83	5	.300	
6		.08	1.52	82.42	72	272	251	51	89	84	4	.283	
7	15	.07	1.33	84.19	71	272	251	51	89	84	4	.265	
8		.08	1.53	85.88	70	274	252	49	89	85	4	.283	
END	20	—		87.858									
			1.52	43.678	71.75				79.96			.2834	

Pape & Steiner Environmental Services

Feed mill dust collector
3-22-85
27-F-11

K FACTOR/NOZZLE CALCULATION

$$K = \frac{782.687(Cp)^2(1 - B_{wo})^2 P_s MW_d}{K_o^{\,2} MW_s P_m}$$

XEQ KC

CP	.84	O_2	20.9	MWd =	28.8
Bwo	.01	CO_2	0	K(R10) =	1125.525
Ps H_2O"	-.05	Ko	.693		
Pb	26.43				

$$N_d = \left(\frac{\Delta H\ T_s}{K\ T_m \Delta P}\right)^{.25}$$

XEQ ND

ΔP	.1	Ideal Nozzle @ 1.1 ΔH =	.313
Ts	70	Ideal Nozzle @ 1.8 ΔH =	.354
Tm	80		

$$\Delta H = K(N_d)^4\left(\frac{T_m}{T_s}\right)(\Delta P)$$

XEQ KND

#1376

(1) Actual Nozzle I.D. .3562 (2) Actual Nozzle I.D. ______

$K(Nd)^4$ (R09) = 18.529 $K(Nd)^4$ (R09) = ______

XEQ DH

	Nozzle 1 High	Nozzle 1 Low	Nozzle 2 High	Nozzle 2 Low
Tm in				
Tm out				
Ts				
ΔP				
ΔH				

CLΣ

Pape & Steiner Environmental Services

SAMPLING POINT LOCATION DATA SHEET

Feed mill dust collector

Plant SWPC

Date 3-22-85

Test Location 27-F-11

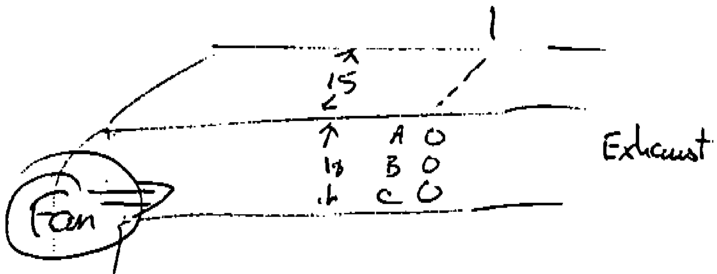
Upstream Dist./Dia. 69 / 4.0

Downstream Dist./Dia. 38 / 2.2

No. of Sampling Points

Stack Dimension 15 x 18 (17 equiv

Coupling Length 3



- 3 3" nipples on duct - Verticle side can't use unirail adapter because it blocks port #2
- Power on platform - need 50' cord NOTE! = Lights must be on for power, same circuit - If all else fails go down tunnel up 1 level to left ~ 50' 2nd circuit available there.
- Use chain to support port side of unirail from eye hook. Make high enough to reach top port with horizontal oven support in place.

Sample Point	Dist	Sample Point	Dist	Sample Point	Dist	Sample Point	Dist
1	3.4 → 4.0+						
2	5.8						
3	7.7						
4	9.6						
5	11.4						
6	13.3						
7	15.2						
8	17.0+						

SAMPLING POINT RELOCATION: #1, #8 to 1" from wall

Pape & Steiner Environmental Services

PLANT SWPC-River Plant TEST TYPE F/2 P.M. FIELD TEST DATA SHEET (Page 1 of 2)

Date 3-19-85
Test Location 42-FDC-35
Run Number 1
Stack Diameter 18"×15"
Operator CWW
Filter No. 404

Barometric Pressure 27.45
Static in. wg. -0.25
Probe Type/Length pyrex, 48"
Pitot Coefficient 0.84
Meter Box No./γ 0.98693
Nozzle No./Size 1458=.2319

Impinger Volumes/Weights			
Contents	Final	Initial	Net
H_2O	550.1	566.2	-16.1
H_2O	560.9	551.9	9.0
—	439.2	436.7	2.5
S.G.	687.0	669.6	17.4
		Total	12.8

Gas Composition			
Time	CO_2	O_2	CO
	0	20.9	

Leak Rate	cfm	"Hg
Initial	0.012	15.0
Final		

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	ΔH≅ΔP×3.3 Comments
A-1	0	.35	1.10	475.44	77	235	237	45	61	61	4	.592	@09:10-AM
2	6	.35	1.10	79.11	81	242	236	39	64	62	4	.592	(traverse
3	12	.34	1.10	82.67	81	246	241	39	68	65	4	.583	moving
4	18	.32	1.00	86.30	81	248	236	41	72	68	4	.566	outward)
5	24	.32	1.00	89.84	81	247	236	44	75	71	4	.566	(bottom port)
6	30	.34	1.10	93.36	81	249	240	44	77	73	4	.583	
7	36	.31	1.00	97.06	81	248	238	43	80	76	4	.557	
STOP	42	—	—	500.61		2							85 6358
B-1	0	.42	1.40	500.61	75	253	236	44	78	78	5	.648	
2	6	.58	1.90	4.70	75	257	235	42	82	79	6	.762	85 6355
3	12	.61	2.00	9.43	73	252	236	41	84	81	7	.781	
4	18	.63	2.10	14.36	73	244	238	41	85	82	7	.794	
5	24	.59	1.95	19.40	72	246	237	43	86	83	7	.768	
6	30	.60	2.00	24.25	74	246	237	43	86	83	7	.775	
7	36	.60	2.00	29.15	74	247	233	44	87	85	7	.775	

Pape & Steiner Environmental Services

PLANT SWPC-River TEST TYPE F/2 P.M. FIELD TEST DATA SHEET (Page 2 of 2)

Date	3-19-85	Barometric Pressure	27.45
Test Location	42-FDC-35	Static in. wg.	-0.25
Run Number	1	Probe Type/Length	4' pyrex
Stack Diameter	18"x15"	Pitot Coefficient	0.84
Operator	CMN	Meter Box No./γ	0.9869
Filter No.	404	Nozzle No./Size	0.2319

Impinger Volumes/Weights			
Contents	Final	Initial	Net
S.G.			
		Total	

Gas Composition			
Time	CO_2	O_2	CO

Leak Rate	cfm	"Hg
Initial		
Final	.005	8

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
STOP	42			34.20									
C-1	0	.57	1.90	34.20	71	260	237	42	85	85	6.5	.755	
2	6	.57	1.90	39.10	72	255	236	41	87	85	6.5	.755	
3	12	.55	1.80	44.00	72	248	241	41	87	85	6	.742	
4	18	.54	1.80	48.65	74	251	234	43	88	85	6	.735	
5	24	.61	2.00	53.36	75	247	238	41	89	86	7	.781	
6	30	.63	2.10	58.27	77	251	234	42	89	86	7	.794	
7	36	.54	1.80	63.35	77	247	237	41	89	87	6	.735	
END	42			568.08									@ 11:25 AM
			ΔVm=	$\boxed{92.64}$									
			3405	Σ	1597				1699	1646		14.635	
			$\boxed{1.62}$	$\bar{X}$	$\boxed{76.0}$				80.9	78.4		$\boxed{0.697}$	
									$\boxed{79.6}$				

Pape & Steiner Environmental Services

PLANT SWPC-River TEST TYPE F/2 P.M. FIELD TEST DATA SHEET (Page 1 of 2)

Date 3-19-85
Test Location 42-FDC-35
Run Number 2
Stack Diameter 18" x 15"
Operator CWW
Filter No. 403

Barometric Pressure 27.45
Static in. wg. -0.25
Probe Type/Length 4' pyrex
Pitot Coefficient 0.84
Meter Box No./γ 0.9869
Nozzle No./Size 0.2319

Impinger Volumes/Weights			
Contents	Final	Initial	Net
H_2O	524.2	536.0	-11.8
H_2O	548.2	542.9	5.3
—	451.5	450.3	1.2
S.G.	696.3	681.5	14.8
-D-		Total	9.5

Gas Composition			
Time	CO_2	O_2	CO

Leak Rate	cfm	"Hg
Initial	0.01	15
Final		

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
A-1	6	.33	1.10	570.11	70	234	253	43	81	81	4	.574	@12:08
2	6	.27	0.89	573.74	80	243	256	41	83	82	3	.520	
3	12	.26	0.86	77.15	80	248	256	41	85	83	3	.510	windy
4	18	.26	.86	80.49	80	243	265	38	86	84	3	.510	
5	24	.25	.83	83.83	80	248	256	41	88	85	3	.500	
6	30	.25	.83	87.11	79	247	255	42	89	87	3	.500	2 856356
7	36	.14	.46	90.40	76	250	255	42	90	88	2	.374	
STOP	42			92.94									2 85 6359
B-1	0	.12	.40	92.94	81	260	255	43	89	88	2	.346	
2	6	.16	.53	95.32	80	259	256	43	90	89	2	.400	
3	12	.18	.59	97.99	80	260	255	43	90	89	2.5	.424	
4	18	.18	.59	600.83	80	256	256	43	91	90	2.5	.424	
5	24	.38	1.25	603.70	79	253	256	44	93	91	4	.616	
6	30	.36	1.20	7.59	79	248	256	42	94	91	4	.600	
7	36	.35	1.20	11.49	77	249	256	43	94	92	4	.392	

Pape & Steiner Environmental Services

PLANT SWPC-River TEST TYPE F/2 P.M. FIELD TEST DATA SHEET (Page 2 of 2)

Date 3-19-85
Test Location 42-FDC-35
Run Number 2
Stack Diameter 18"x15"
Operator CM
Filter No. 403

Barometric Pressure 27.45 ~~[illegible]~~
Static in. wg. -0.25
Probe Type/Length 4' pyrex
Pitot Coefficient 0.84
Meter Box No./γ 0.9869
Nozzle No./Size 0.2319

Impinger Volumes/Weights			
Contents	Final	Initial	Net
S.G.			
		Total	

Gas Composition			
Time	CO_2	O_2	CO
Leak Rate	cfm	"Hg	
Initial			
Final	.005	7	

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
STOP	42			615.38									
C-1	0	.45	1.50	615.38	78	250	254	46	91	91	4.5	.671	
2	6	.48	1.60	19.80	82	254	257	42	94	92	5	.693	
3	12	.48	1.60	24.27	82	251	260	42	95	92	5	.693	
4	18	.47	1.60	28.73	81	250	256	43	96	93	5	.686	
5	24	.47	1.60	33.19	81	249	258	41	97	93	5	.686	
6	30	.46	1.55	37.63	82	248	256	44	97	94	5	.678	
7	36	.45	1.50	42.07	80	245	255	44	97	94	5	.671	@14:20
END	42			646.45									
			22.54		1166.7				1910	1869		11.668	
			1.67	76.34	79.4				90.95	89.0		.556	
									90.0				

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PLANT SWPC-River TEST TYPE F/2 P.M. FIELD TEST DATA SHEET (Page 1 of 2)

Date 3-19-85
Test Location 42-FDC-35
Run Number 3
Stack Diameter 18"x15"
Operator CMW
Filter No. 405

Barometric Pressure 27.45
Static in. wg. -0.25
Probe Type/Length 4' pyrex
Pitot Coefficient 0.84
Meter Box No./γ .9869
Nozzle No./Size .2319

Impinger Volumes/Weights			
Contents	Final	Initial	Net
H_2O	522.2	535.0	-12.8
H_2O	555.2	549.2	6.0
—	433.4	432.4	1.0
S.G.	672.8	658.7	14.1
-F-		Total	8.3

Gas Composition			
Time	CO_2	O_2	CO
	0	20.9	

Leak Rate	cfm	"Hg
Initial	.015	15
Final		

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
A-1	0	.33	1.10	646.58	78	229	241	53	81	81	4	.574	@14:50
2	6	.34	1.10	50.24	80	239	237	48	85	84	4	.583	
3	12	.36	1.26	53.93	79	245	235	47	88	86	5	.600	
4	18	.35	1.15	57.71	80	248	238	47	90	86	5	.592	
5	24	.34	1.10	61.49	81	254	235	46	91	88	5	.583	
6	30	.36	1.20	65.24	81	250	236	46	93	90	5	.600	
7	36	.34	1.10	69.09	79	257	240	46	94	91	5	.583	
STOP	42			72.81									
B-1	0	.38	1.25	72.81	81	264	237	49	92	92	5	.616	
2	6	.41	1.35	76.78	83	257	243	46	94	92	5	.640	
3	12	.37	1.25	80.87	83	256	238	47	95	93	5	.608	
4	18	.36	1.20	84.84	84	262	235	48	96	93	5	.600	
5	24	.36	1.20	88.74	84	262	239	47	96	94	5	.600	
6	30	.38	1.25	92.62	85	261	240	48	97	94	5	.616	
7	36	.36	1.20	96.60	82	261	239	48	97	95	5	.600	

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PLANT Swift-River TEST TYPE F/2 P.M. FIELD TEST DATA SHEET (Page 2 of 2)

Date 3-19-85
Test Location 42-FOC-35
Run Number 18"x15" 5
Stack Diameter 3 2
Operator AWN
Filter No. 465

Barometric Pressure 27.45
Static in. wg. -0.125
Probe Type/Length 4' glass
Pitot Coefficient 0.84
Meter Box No./γ .9869
Nozzle No./Size .2319

Impinger Volumes/Weights			
Contents	Final	Initial	Net
S.G.			
		Total	

Gas Composition			
Time	CO_2	O_2	CO
Leak Rate	cfm	"Hg	
Initial			
Final	.01	8	

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Temperature °F Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out	Pump Vacuum in. Hg	$\sqrt{\Delta P}$	Comments
STOP	42	—	—	700.49	—							—	
C-1	0	.44	1.45	00.49	82	264	237	48	94	94	5.5	.663	
2	6	.44	1.45	4.70	85	261	236	48	97	95	5.5	.663	3 85 6357
3	12	.45	1.45	8.93	85	260	239	48	98	95	5.5	.671	
4	18	.42	1.40	13.19	83	263	238	48	98	96	5.5	.648	3 856360
5	24	.42	1.40	17.36	84	264	239	49	98	96	5.5	.648	
6	30	.41	1.40	21.57	84	262	239	49	98	96	5.5	.640	
7	36	.39	1.35	25.74	83	263	239	49	99	96	5	.624	
END	42	—	—	729.89	—								@17:02
			16.65	$\boxed{729.89}$	1140				1289	1259		8.397	Σ pg#1
			9.90		586				682	668		4.558	Σ pg#2
				$\boxed{83.31}$									total
			$\boxed{1.26}$		$\boxed{82.2}$				93.86	91.76			mean

$\boxed{92.8}$ $\boxed{.617}$

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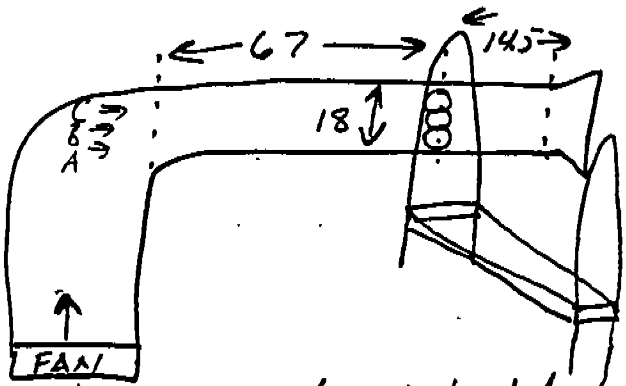
SAMPLING POINT LOCATION DATA SHEET

Plant SWPC - River Plant
Date 3-19-85
Test Location
Upstream Dist./Dia. 67"   4
Downstream Dist./Dia. 14.5"   1
No. of Sampling Points
Stack Dimension 18 x 15"
Coupling Length 3 1/4"

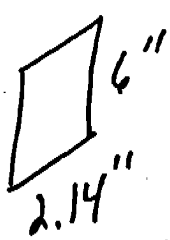
Eq. Dia. = 16.4"



1. 1-2x10 plank w/ 2-10' ropes to slide box
2. 110 VAC w/in 10' of source test ports.

	Sample Point	Dist	Sample Point	ΔP ~~Dist~~ A	Sample Point	ΔP ~~Dist~~ B	Sample Point	ΔP ~~Dist~~ C
1/14	1	4.32		.44	75°F	.46	~~.60~~	.60
3/14	2	6.46		.46	↓	.48	~~.6~~	.62
5/14	3	8.61		.48		.52		.62
7/14	4	10.75		.48		.52		.62
9/14	5	12.89		.48		.52		.62
11/14	6	15.04		.48		.52		.62
13/14	7	17.18		.48		.52		.62

SAMPLING POINT RELOCATION:



2.8 ratio

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Finish mill
feed belt

K FACTOR/NOZZLE CALCULATION

$$K = \frac{782.687(Cp)^2(1 - B_{wo})^2 P_s MW_d}{K_o^2 MW_s P_m}$$

XEQ KC

CP	.84	O_2	21	MWd =	28.85
Bwo	.005	CO_2	0	K(R10) =	1135
Ps H_2O"	6	Ko	.693		
Pb	27.45				

$$N_d = \left(\frac{\Delta H\ T_s}{K\ T_m \Delta P}\right)^{.25}$$

XEQ ND

ΔP	.60	Ideal Nozzle @ 1.1 ΔH =	0.200
Ts	75	Ideal Nozzle @ 1.8 ΔH =	0.227
Tm	75		

$$\Delta H = K(N_d)^4\left(\frac{T_m}{T_s}\right)(\Delta P)$$

XEQ KND #1458

(1) Actual Nozzle I.D. .2319 (2) Actual Nozzle I.D. ______
$K(Nd)^4$ (R09) = 3.283 $K(Nd)^4$ (R09) = ______

XEQ DH

	Nozzle 1 High	Nozzle 1 Low	Nozzle 2 High	Nozzle 2 Low
Tm in				
Tm out				
Ts				
ΔP				
ΔH				

CLΣ

HP 41CV Program 3/82
ND Revised 11/83

Pape & Steiner Environmental Services

DRY GAS METER/ORIFICE METER CALIBRATION DATA

Date 10/20/84 Dry Gas Meter No. 1008455

Barometric Pressure, in. Hg 29.44 Standard Test Meter No. 69279

Meter Box No. 644 Operator JG 68°F - 72°F

	Standard Test Meter			Meter Box				Time	γ	K_o
	Pres. ΔH_s ("Wg)	Temp. T_s (^oF)	Volume Vs (Ft^3)	Pres. ΔH ("Wg)	Temp. T_{d_i} (^oF)	Temp. T_{d_o} (^oF)	Volume V_d (Ft^3)	(min)		
		64	853.002		96	94	583.984			
	-1.2	62	835.584	0.5	87	86	564.437	45.0	0.9848	0.7141
		63	17.418		90.75		18.547			
		64	877.168		101	98	608.873			
	-2.0	63	856.256	1.0	97	95	586.471	39.0	0.9871	0.7011
		63.5	20.912		97.75		22.402			
		66	902.759		104	100	636.329			
29.43	-2.7	64	880.892	1.5	101	99	612.865	34.0	0.9854	0.6848
		65	21.867		101.0		23.464			
		67	924.898		106	101	660.006			
29.43	-3.3	65	908.572	2.0	105	102	642.546	22.0	0.9885	0.6827
		66	16.326		103.5		17.460			
		66	953.132		107	101	690.053			
29.43	-4.7	66	931.237	3.0	106	103	666.746	24.0	0.9885	0.6823
		66	21.895		104.25		23.307			
				4.0						

	γ	K_o
Average	0.9869	0.6930
Std.Dev.	0.0017 (0.2%)	0.0141 (2%)

$$\gamma = \frac{V_s \left(P_{bar} + \frac{\Delta H_s}{13.6}\right)\left(\frac{T_{d_i} + T_{d_o}}{2} + 460\right)}{V_d \left(P_{bar} + \frac{\Delta H}{13.6}\right)\left(T_s + 460\right)}$$

$$K_o = \frac{\left(\frac{V_s}{t}\right)\left(\frac{T_{d_o}}{T_s}\right)\left(\frac{P_{bar} + \frac{\Delta H_s}{13.6}}{P_{bar} + \frac{\Delta H}{13.6}}\right)}{\left(\frac{T_{d_o}\,\Delta H}{\left(P_{bar} + \frac{\Delta H}{13.6}\right)\left(M_m\right)}\right)^{0.5}}$$

where

ΔH_s = Standard meter pressure drop

T_s = Standard meter temperature

V_s = Standard test meter dry gas volume

ΔH = Meter box orifice meter pressure drop

T_{d_i} = Meter box inlet temperature

T_{d_o} = Meter box outlet temperature

V_d = Meter box dry gas volume

γ = Meter box correction factor

K_o = Orifice meter calibration constant

t = Calibration time in minutes

M_m = Molecular weight of air (28.96 lb/lb-mole)

P_{bar} = Barometric pressure

Pape & Steiner Environmental Services

DRY GAS METER/ORIFICE METER CALIBRATION DATA

Date 1/29/85 Dry Gas Meter No. 1032723

Barometric Pressure, in. Hg 29.355 Standard Test Meter No. 69279

Meter Box No. 635 Operator NAPP (FK)

Standard Test Meter			Meter Box						
Pres. ΔH_s ("Wg)	Temp. T_s (^oF)	Volume Vs (Ft^3)	Pres. ΔH ("Wg)	Temp. T_{d_i} (^oF)	Temp. T_{d_o} (^oF)	Volume V_d (Ft^3)	Time (min)	γ	K_o
	73	2	0.2	77	74	2.016	7.72	1.001	0.7335
				76					
	73	3	0.8	79	75	3.020	5.90	1.003	0.7199
				77					
	73	5	1.8	84	76	5.015	6.63	1.009	0.7129
				80					
	73	5	3.4	85	76	5.005	4.92	1.011	0.6983
				81					
	73	5	5.0	88	77	4.974	4.08	1.015	0.6943
				83					
	73	5	8.0	77	76	4.903	3.30	1.020	
				77					
							Average	1.0098	0.7118
							Std.Dev.	0.0072 (0.7%)	0.0160 (2.2%)

$$\gamma = \frac{V_s \left(P_{bar} + \frac{\Delta H_s}{13.6}\right)\left(\frac{T_{d_i} + T_{d_o}}{2} + 460\right)}{V_d \left(P_{bar} + \frac{\Delta H}{13.6}\right)\left(T_s + 460\right)}$$

$$K_o = \frac{\left(\frac{V_s}{t}\right)\left(\frac{T_{d_o}}{T_s}\right)\left(\frac{P_{bar} + \frac{\Delta H_s}{13.6}}{P_{bar} + \frac{\Delta H}{13.6}}\right)}{\left(\frac{T_{d_o}\,\Delta H}{\left(P_{bar} + \frac{\Delta H}{13.6}\right)\left(M_m\right)}\right)^{0.5}}$$

where

ΔH_s = Standard meter pressure drop

T_s = Standard meter temperature

V_s = Standard test meter dry gas volume

ΔH = Meter box orifice meter pressure drop

T_{d_i} = Meter box inlet temperature

T_{d_o} = Meter box outlet temperature

V_d = Meter box dry gas volume

γ = Meter box correction factor

K_o = Orifice meter calibration constant

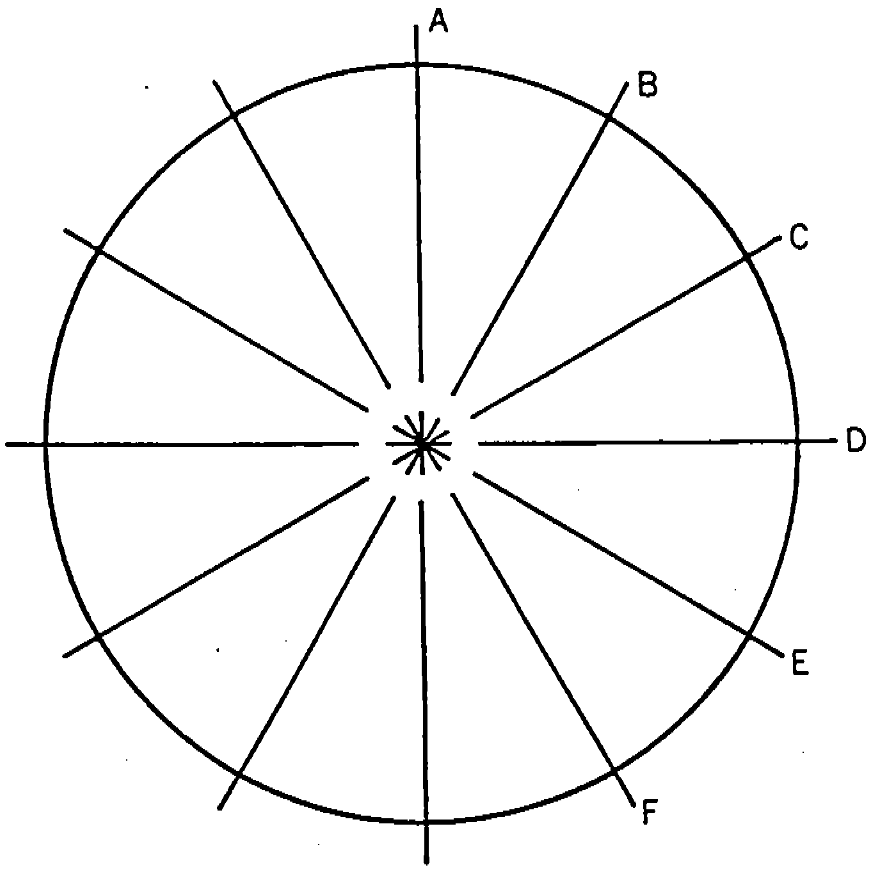
t = Calibration time in minutes

M_m = Molecular weight of air (28.96 lb/lb-mole)

P_{bar} = Barometric pressure

Pape & Steiner Environmental Services

NOZZLE CALIBRATION DATA



DIAMETER (in.)

A 0.3055

B 0.3055

C 0.3058

D 0.3053

E ______

F ______

AVG. 0.3055

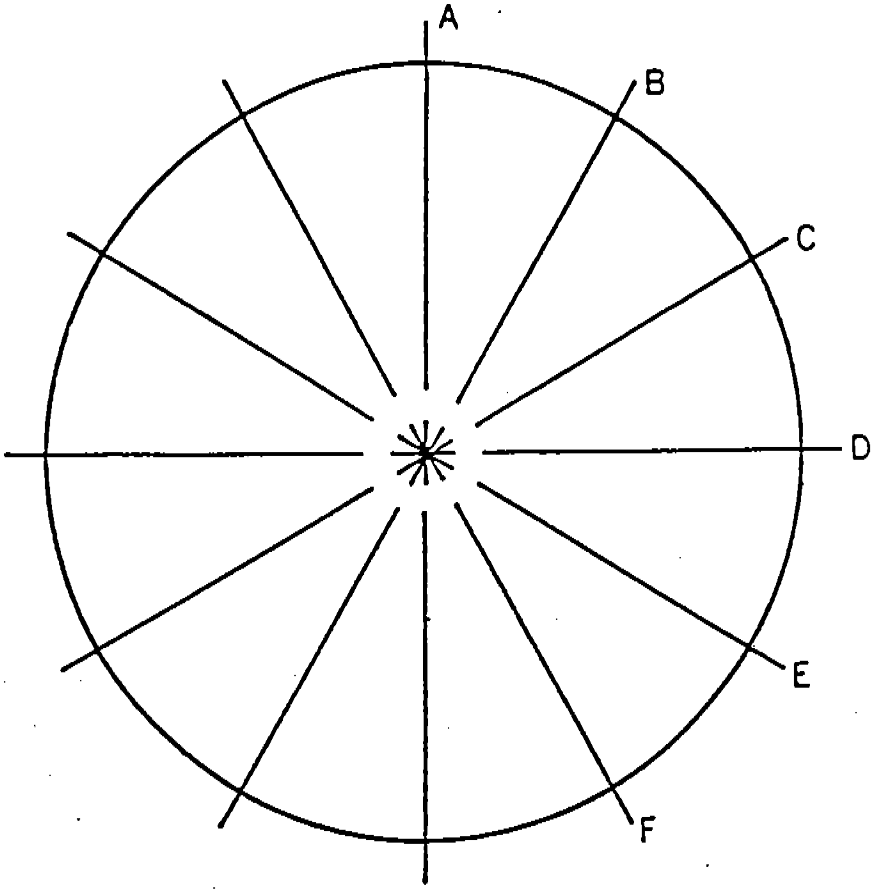
DATE 01-02-85

NOZZLE NO. 1448

OPERATOR RKC

Pape & Steiner Environmental Services

NOZZLE CALIBRATION DATA



DIAMETER (in.)

A 0.2370

B 0.2373

C 0.2339

D 0.2342

E ______

F ______

AVG. 0.2356

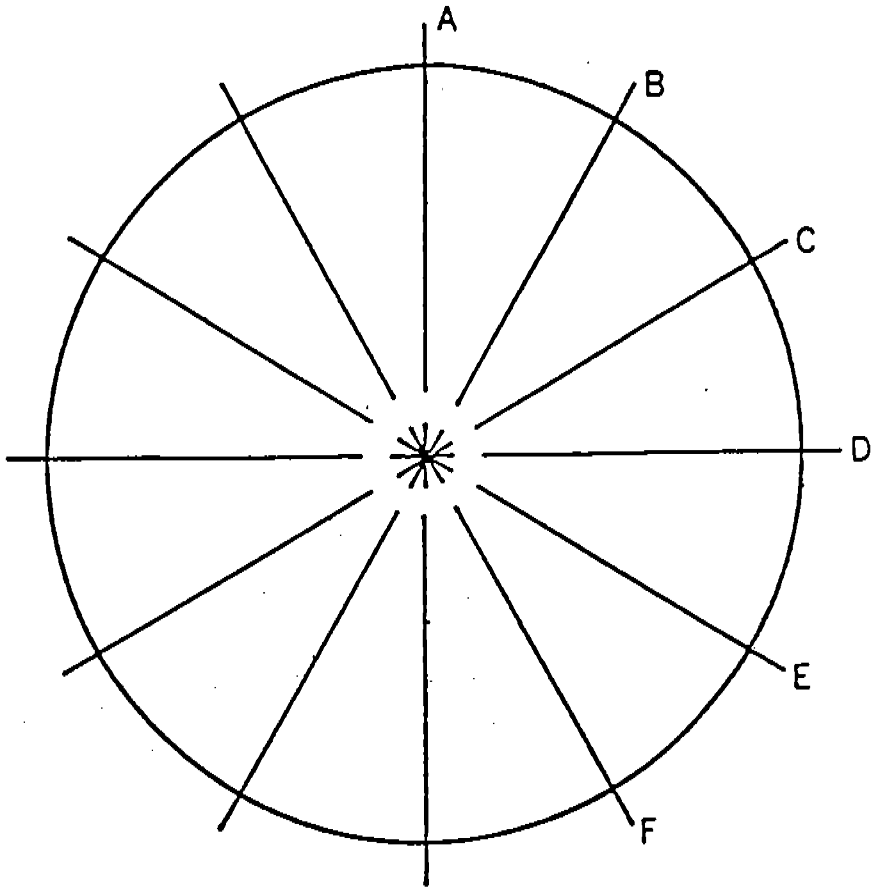
DATE 01/08/85

NOZZLE NO. 1437

OPERATOR RKC

Pape & Steiner Environmental Services

NOZZLE CALIBRATION DATA



DIAMETER (in.)

A .3563

B .3579

C .3602

D .3600

E

F

AVG. .3586

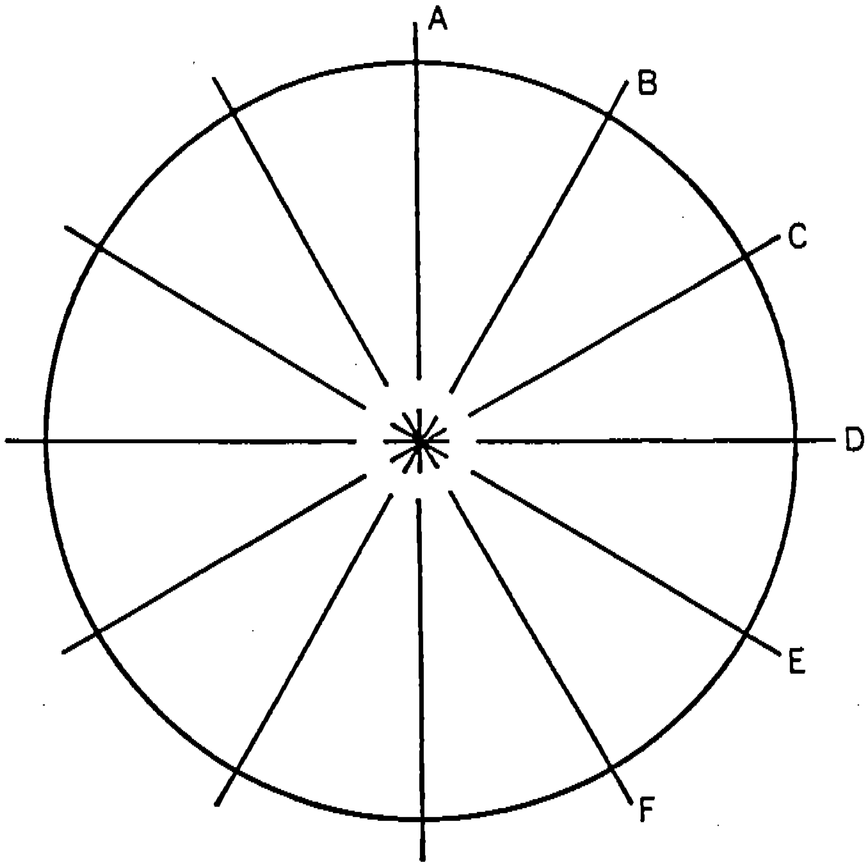
DATE 12-28-84

NOZZLE NO. 1271

OPERATOR JEO

Pape & Steiner Environmental Services

NOZZLE CALIBRATION DATA



DIAMETER (in.)

A 0.3589

B 0.3585

C 0.3570

D 0.3582

E

F

AVG. 0.3582

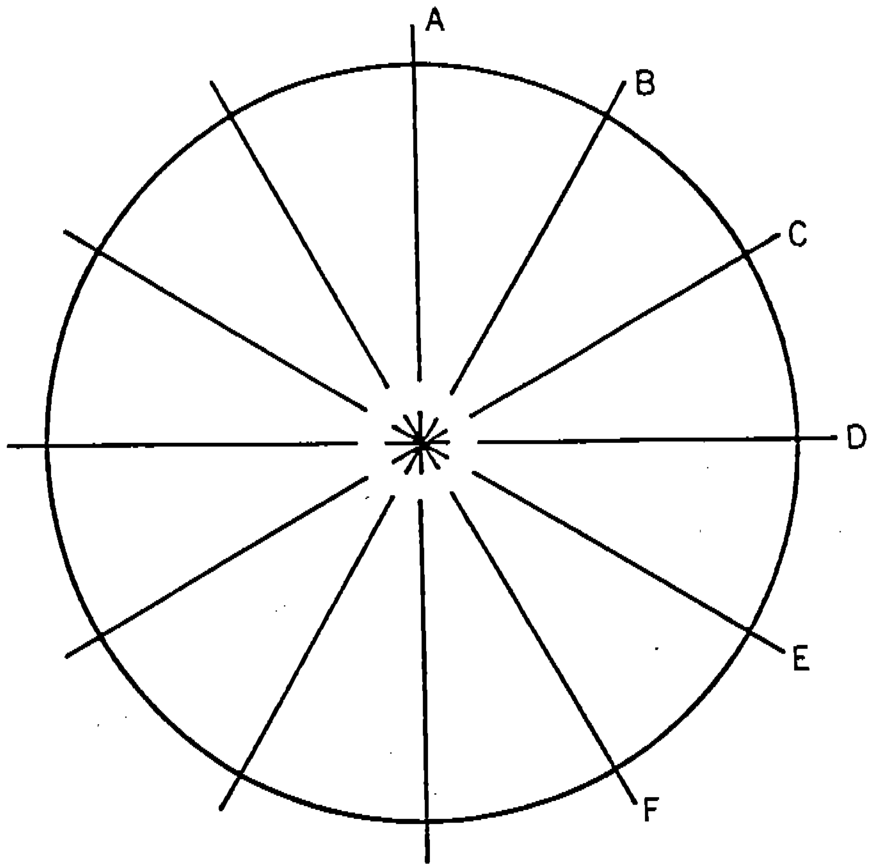
DATE 01-02-84

NOZZLE NO. 1376

OPERATOR RKC

Pape & Steiner Environmental Services

NOZZLE CALIBRATION DATA



DIAMETER (in.)

A 0.2325

B 0.2321

C 0.2310

D 0.2318

E

F

AVG. 0.2319

DATE 01-02-85

NOZZLE NO. 1458

OPERATOR RKC

Scott Specialty Gases

a division of Scott Environmental Technology, Inc.

PLUMSTEADVILLE, PA. 18949 PHONE: (215) 766-8861 TWX: 510-665-9344

PAPE & STEINER
5801 NORRIS ROAD
BAKERSFIELD, CA 93308

Date: NOVEMBER 15, 1984
Our Project No.: 46356
Your P.O. No.: LT 7297

Gentlemen:

Thank you for choosing Scott for your Specialty Gas needs. The analyses for the gases ordered, as reported by our laboratory, are listed below. Results are in volume percent, unless otherwise indicated.

ANALYTICAL REPORT

Cyl. No. AAL7584 Analytical Accuracy ±1%

Component	Concentration
Carbon Monoxide	401.9PPM
Carbon Dioxide	16.02%
Oxygen	7.52%
Nitrogen	Balance

Cyl. No. ______ Analytical Accuracy ______

Component	Concentration

Cyl. No. ______ Analytical Accuracy ______

Component	Concentration

Cyl. No. ______ Analytical Accuracy ______

Component	Concentration

Analyst ______

Approved By Ron

The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

Scott Specialty Gases
a division of Scott Environmental Technology, Inc.
PLUMSTEADVILLE, PA. 18949 PHONE: (215) 766-8861 TWX: 510-665-9344

Date: October 23, 1984
Our Project No.: 46123
Your P.O. No.: SP 7290

PAPE & STEINER
5801 Norris Road
Bakersfield CA 93308

Gentlemen:

Thank you for choosing Scott for your Specialty Gas needs. The analyses for the gases ordered, as reported by our laboratory, are listed below. Results are in volume percent, unless otherwise indicated.

ANALYTICAL REPORT

Cyl. No. AAL 8335 Analytical Accuracy ±2%

Component	Concentration
Methane	53.59 PPM
Ethane	54.4 PPM
Propane	53.30 PPM
Butane	50.66 PPM
Pentane	53.86 PPM
Hexane	47.04 PPM
Nitrogen	Balance

Cyl. No. Analytical Accuracy

Component	Concentration

Cyl. No. Analytical Accuracy

Component	Concentration

Cyl. No. Analytical Accuracy

Component	Concentration

Analyst ______

Approved By Wayne McGowan

The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

,cott Specialty Gases Scott Env ıental Technology, Inc. a division of
2600 CAJON BLVD. SAN BERNARDINO, CA 92411 PHONE (714) 887-2571

PAPE & STEINER
5801 NORRIS RD
BAKERSFIELD, CA 93308

Date Shipped 2-4-85
Our Project No: 47253
Your P.O. No: SP736
Page 1 of 1

CERTIFICATE OF ANALYSIS – EPA PROTOCOL GASES*
(Concentrations are in mole % or ppm)

Cylinder Number AAL5773 Certified Accuracy ±1 % NBS Traceable Analysis Dates: First 5-11-84 Last 2-1-85

COMPONENTS	CERTIFIED CONC	EXPIRATION DATE	ANALYTICAL PRINCIPLE	PRIMARY STANDARD NBS/SRM's	REPLICATE CONCENTRATIONS FIRST	REPLICATE CONCENTRATIONS SECOND
NITRIC OXIDE	868.6PPM	8-1-85	CHEMI.	SRM1687B	869.9PPM	867.3PPM
NOX	870.35PPM				870.9PPM	869.8PPM
NITROGEN	BALANCE					

Cylinder Number ______ Certified Accuracy ______ % NBS Traceable Analysis Dates: First ______ Last ______

COMPONENTS	CERTIFIED CONC	EXPIRATION DATE	ANALYTICAL PRINCIPLE	PRIMARY STANDARD NBS/SRM's	REPLICATE CONCENTRATIONS FIRST	REPLICATE CONCENTRATIONS SECOND

*We hereby certify the cylinder gas has been analyzed according to EPA Protocol No: I

Analyst ______ Approved By Wayne McGowan

The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

cott Specialty Gases Scott En nental Technology, Inc. a division of
2600 CAJON BLVD. SAN BERNARDINO, CA 92411 PHONE (714) 887-2571

Date Shipped NOVEMBER 16-84
Our Project No: 46386
Your P.O. No: SP7301
Page 1 of 1

PAPE & STEINER

5801 NORRIS ROAD
BAKERSFIELD, CA 93308

CERTIFICATE OF ANALYSIS – EPA PROTOCOL GASES*

(Concentrations are in mole % or ppm)

Cylinder Number AAL8513 Certified Accuracy ±1% % NBS Traceable Analysis Dates: First 10-31-84 Last 11-8-84

COMPONENTS	CERTIFIED CONC	EXPIRATION DATE	ANALYTICAL PRINCIPLE	PRIMARY STANDARD NBS/SRM's	REPLICATE CONCENTRATIONS FIRST	REPLICATE CONCENTRATIONS SECOND
SULFUR DIOXIDE	80.9PPM	5-16-85	U.V.	SRM1694A	80.8PPM	81.0PPM
NITROGEN	BALANCE					

Cylinder Number AAL1600 Certified Accuracy ±1% % NBS Traceable Analysis Dates: First 10-31-84 Last

COMPONENTS	CERTIFIED CONC	EXPIRATION DATE	ANALYTICAL PRINCIPLE	PRIMARY STANDARD NBS/SRM's	REPLICATE CONCENTRATIONS FIRST	REPLICATE CONCENTRATIONS SECOND
SULFUR DIOXIDE	80.9PPM	5-16-85	U.V.	SRM1694A	80.9PPM	80.9PPM
NITROGEN	BALANCE					

*We hereby certify the cylinder gas has been analyzed according to EPA Protocol No: I

Analyst ______________ Approved By Wayne McGowan

For GBF Sample

1 Dessicate - 24 Hrs - drierite or silica gel - weigh
2 " - 4 more hrs - weigh. -
Repeat until w/in $\frac{1}{2}$ mg.

Probe washings - Evap. in tared beakers -
Do as above - - Beakers should be pre-dessicated.

Wash - Samples from probe - Acetone -
impinger water
Acetone rinse of impinger } Combine weights after evap.

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