DETERMINATION OF PARTICULATE AND SULFUR DIOXIDE EMISSIONS FROM THE KILN AND ALKALI BAGHOUSE STACKS SOUTHWESTERN PORTLAND CEMENT COMPANY FAIRBORN, OHIO

for

SOUTHWESTERN PORTLAND CEMENT COMPANY
506 East Xenia Drive
Fairborn, OH 45324

by

POLLUTION CONTROL SCIENCE, INC.
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(513) 866-5908

Franklin Meadows
Senior Project Manager

PN 325.002
June, 1986

Phase I (no hazardous waste fuels)

TABLE OF CONTENTS

Ref 29 Preheater Kiln
Remained as B rating
for PSM & MRI

Contains Good CO_2
data - B rating
(No raw data sheets)

1.0 EXECUTIVE SUMMARY

Pollution Control Science, Inc. (PCS) was retained by the Southwestern Portland Cement Company in Fairborn, Ohio to plan and conduct particulate and sulfur dioxide compliance testing at the cement clinker plant in Bath township. Tests were conducted on the kiln and alkali baghouse exhaust stacks. Results of these tests are as follows:

	PARTICULATE		SULFUR DIOXIDE	
RUN NO.	MEASURED lb/ton[a]	ALLOWED lb/ton[b]	MEASURED lb/ton[c]	ALLOWED lb/ton[d]
1	.101	0.30	2.20	9.0
2	.108	0.30	1.92	9.0
3	.141	0.30	1.98	9.0
AVERAGE	.117	0.30	2.03	9.0

[a] Pounds of particulate per ton of dry kiln feed
[b] NSPS, Subpart F, Standards of Performance for Portland Cement Plants, Pounds per ton of dry kiln feed
[c] Pounds of sulfur dioxide per ton of clinker
[d] OAC 3745-18-35

2.0 INTRODUCTION

On June 10 and 12, 1986 Pollution Control Science, Inc. (PCS) conducted particulate and sulfur dioxide compliance tests at the Southwestern Portland Cement Company's cement clinker plant in Bath Township, Greene County, Ohio. The kiln and alkali baghouse stacks were sampled simultaneously using USEPA Reference Methods 1 - 6 for determination of stack gas velocity and volumetric flow rate, dry molecular weight, moisture content, filterable particulates, and sulfur dioxide. The plant was operated with the raw mill off.

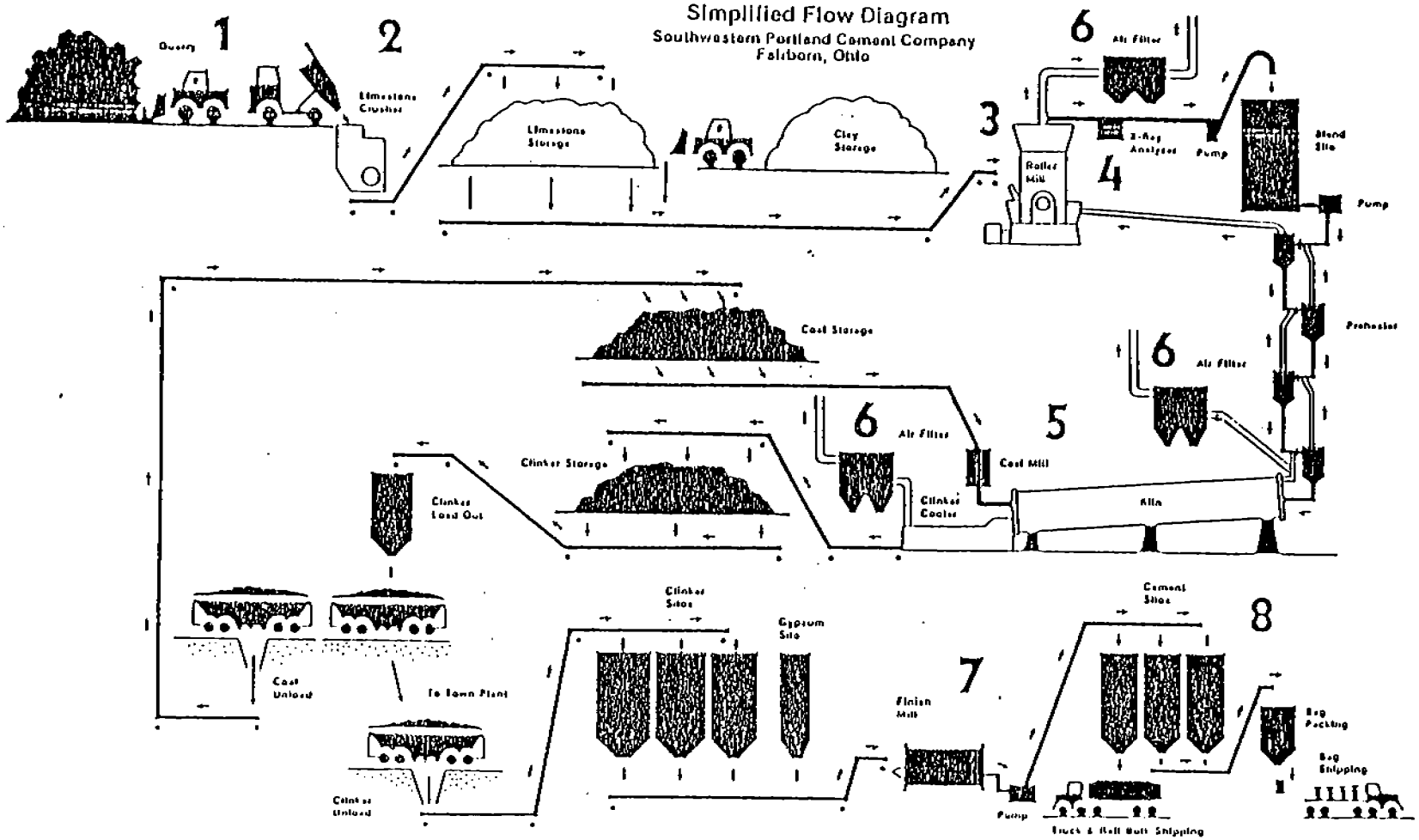
Plant personnel monitored kiln operations during each test period. Mr. Ted Weatherhead coordinated the tests for SWPCCo and supervised collection of coal samples. All sampling was performed under the supervision of Mr. Franklin Meadows, PCS Senior Project Manager. Messrs. Craig Jones, Kevin Payler, and Tim Miller of PCS assisted with the sampling. Personnel from the Regional Air Pollution Control Agency (RAPCA) were on-site to witness test methodology, verify kiln operations, and perform visual determinations of opacity from each stack.

3.0 DESCRIPTION OF OPERATIONS

The Southwestern Portland Cement company (SWPCCo) operates a cement plant in Fairborn, Ohio. The plant began operation in 1974. A simplified flow diagram of the plant is shown in Figure 3.1. The plant is a dry process which utilizes a pulverized coal-fired kiln for the production of Portland cement. The kiln operates continuously, 24 hours per day, 7 days per week, except for required maintenance. The kiln feed capacity is approximately 160 tons/hr. Limestone feed to the kiln is crushed by a raw mill which operates approximately 80 percent of the time. The mill has a capacity of 200 tons/hr.

The pulverized materials are pumped to the top of the preheater tower which is 225 feet tall. The feed mixes with hot exhaust gases from the kiln and rises in temperature to almost 1500°F before entering the kiln 30 seconds later. The kiln is 220 feet long and 15 feet in diameter. Pulverized coal fed continuously into the kiln flame heats the material to 2700°F where it is very close to the melting point and converts to clinker. The kiln rotates 100 times per hour and has a slope of 1/2 inch per foot. The hot clinker drops onto a moving perforated grate where it is cooled to 250°F by air blowing up between the hot pieces of clinker. Rail cars transport the clinker to the Town Plant to be ground into cement. The cement is then packaged for shipment.

The sources of interest for this test series included the kiln baghouse and the alkali baghouse stacks. The kiln baghouse



COURTESY OF SWPCCO

FIGURE 3.1 SIMPLIFIED PROCESS FLOW DIAGRAM

handles approximately two-thirds of the total gas stream and has a capacity of 170,000 acfm at 550°F. The alkali baghouse handles approximately one-third of the gas stream from the top of the kiln as the gas exits and has a capacity of 85,500 acfm at 550°F.

During this test series, the plant was operated with the raw mill off. Historical data indicates that maximum emissions are generated during this mode of operation. In this operating mode, the kiln baghouse stack gas flow rate averages about 170,000 acfm at 550°F and the alkali baghouse stack gas flow rate averages about 75,000 at 360°F.

Kiln feed rates and clinker production rates for this test series are summarized in Table 3.1. The raw material had a moisture content of approximately 0.5 percent. The clinker production rate was obtained by multiplying the "as received" kiln feed rate by 0.60.

Table 3.1[a]

Run No.	Kiln Feed Rate		Clinker Production Rate ton/hr
	As Rec'd ton/hr	Dry ton/hr	
1	143.58	142.86	86.15 = 2068 t/d
2	135.41	134.73	81.25
3	144.19	143.47	86.51

[a]Data supplied by plant personnel

4.0 SAMPLING AND ANALYTICAL PROCEDURES

The objective of this test series was to determine the mass rates of particulate and sulfur dioxide emissions from the kiln baghouse and the alkali baghouse stacks. This objective was accomplished by simultaneously sampling each stack in triplicate to determine volumetric flow rate, dry molecular weight, moisture content, filterable particulates, and sulfur dioxide emissions. The kiln was operated with the raw mill off, since historical data from previous tests at this plant indicated that maximum particulate and sulfur dioxide emissions were generated during this mode of operation.

The sampling and analytical procedures used in this test series conformed to the most recent revision of USEPA Reference Methods for stationary sources. These procedures are approved by the Ohio EPA and RAPCA. A brief description of each method follows:

4.1 Measurement Sites

Location of measurement sites and the number of traverse points were determined as specified in USEPA Reference Method 1, "Sample and Velocity Traverses for Stationary Sources."

Kiln Stack

The kiln baghouse measurement site was accessible via an elevator in the preheater tower followed by two (2) caged ladders. The measurement site was located in a 95 inch I.D. stack 37 feet (4.7 stack diameters) downstream and 5 feet (0.6 stack diameters) upstream of the nearest flow disturbances. The stack was accessible through four (4) test ports located at 90° around a circumferential platform. According to revised Method 1 criteria, this site required 24 particulate traverse points (6 in each port). A schematic of the site with traverse point locations is shown in Figure 4.1.

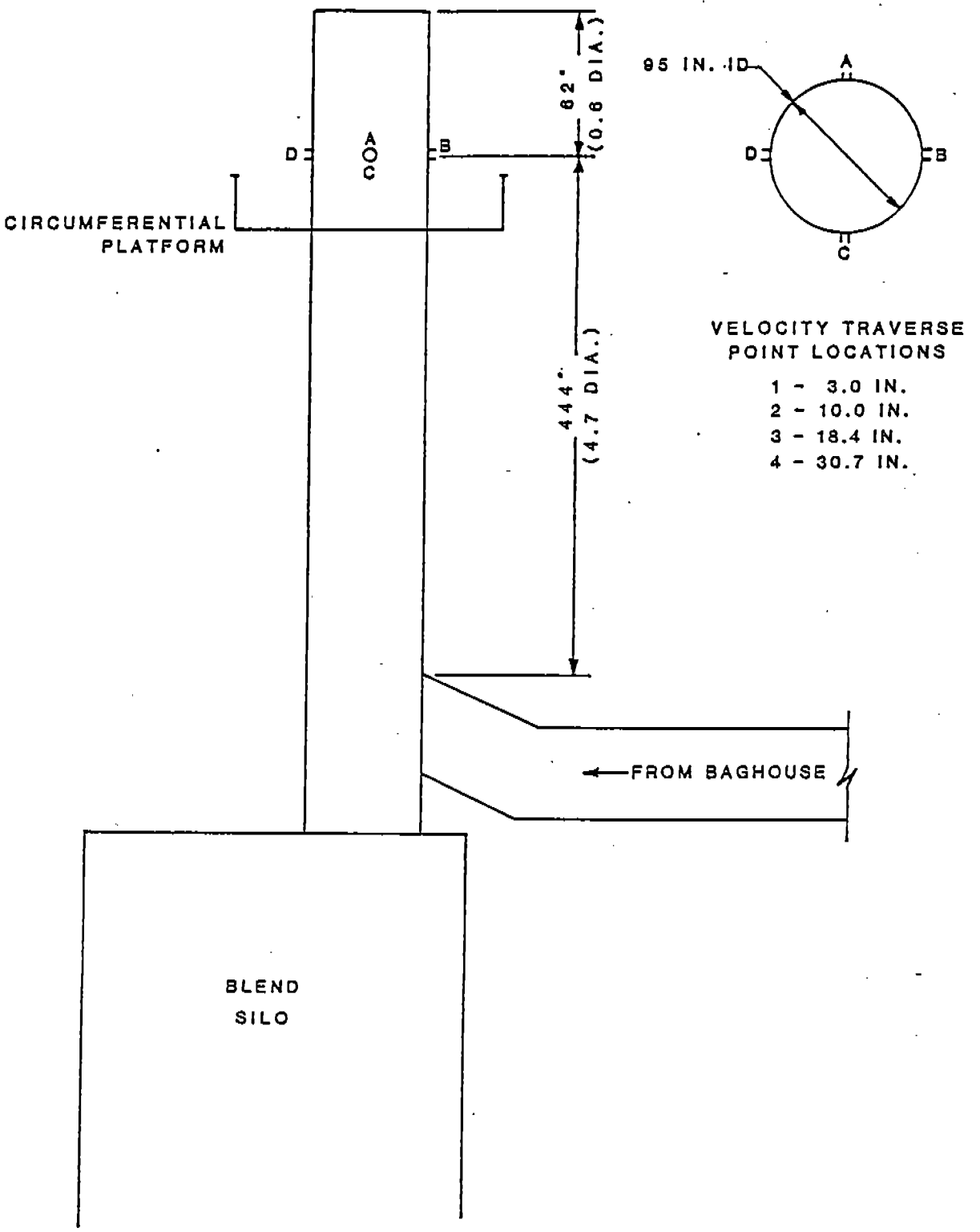


FIGURE 4.1 KILN BAGHOUSE MEASUREMENT SITE

Alkali Stack

The alkali baghouse measurement site was accessible directly from ground level by a caged ladder. The measurement site was located in an 64.5 inch I.D. stack 27 feet (5.0 stack diameters) downstream and 8 feet (1.5 stack diameters) upstream of the nearest flow disturbances. The stack was accessible through four (4) test ports located at 90° around a circumferential platform. Only two (2) ports were used. According to revised Method 1 criteria, this site required 24 particulate traverse points (12 in each port). A schematic of the site with traverse point locations is shown in Figure 4.2.

4.2 Velocity and Temperature

Stack gas velocity and temperature were determined using USEPA Reference Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)." Velocities were measured with Type 'S' pitot tubes and temperatures were measured with calibrated Type K thermocouples.

4.3 Dry Molecular Weight

Dry Molecular Weight was determined using USEPA Reference Method 3, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight." On the kiln stack an integrated bag sample was collected during each sample run. Analysis was performed with an Orsat analyzer due to the expected high CO_2 concentration (>21%). On the alkali stack several grab samples were collected during each test and analyzed directly with Fyrite combustion gas analyzers.

4.4 Moisture

Moisture content was determined using USEPA Reference Method 4, "Determination of Moisture Content in Stack Gases."

4.5 Filterable Particulate

Particulate emissions were determined using USEPA Reference Method 5, "Determination of Particulate Emissions From Stationary Sources." The filter was maintained at 248 $\pm$ 25°F. A schematic of the sampling train is shown in Figure 4.3.

4.6 Sulfur Dioxide

Sulfur dioxide emissions were determined using USEPA Reference Method 6, "Determination of Sulfur Dioxide Emissions From Stationary Sources." Sulfur dioxide (SO_2) was determined simultaneously with particulate matter and moisture determinations by replacing the water in the Method 5 impinger system with 3 percent peroxide solution. Analysis for SO_2 was consistent with the procedure in Method 8.

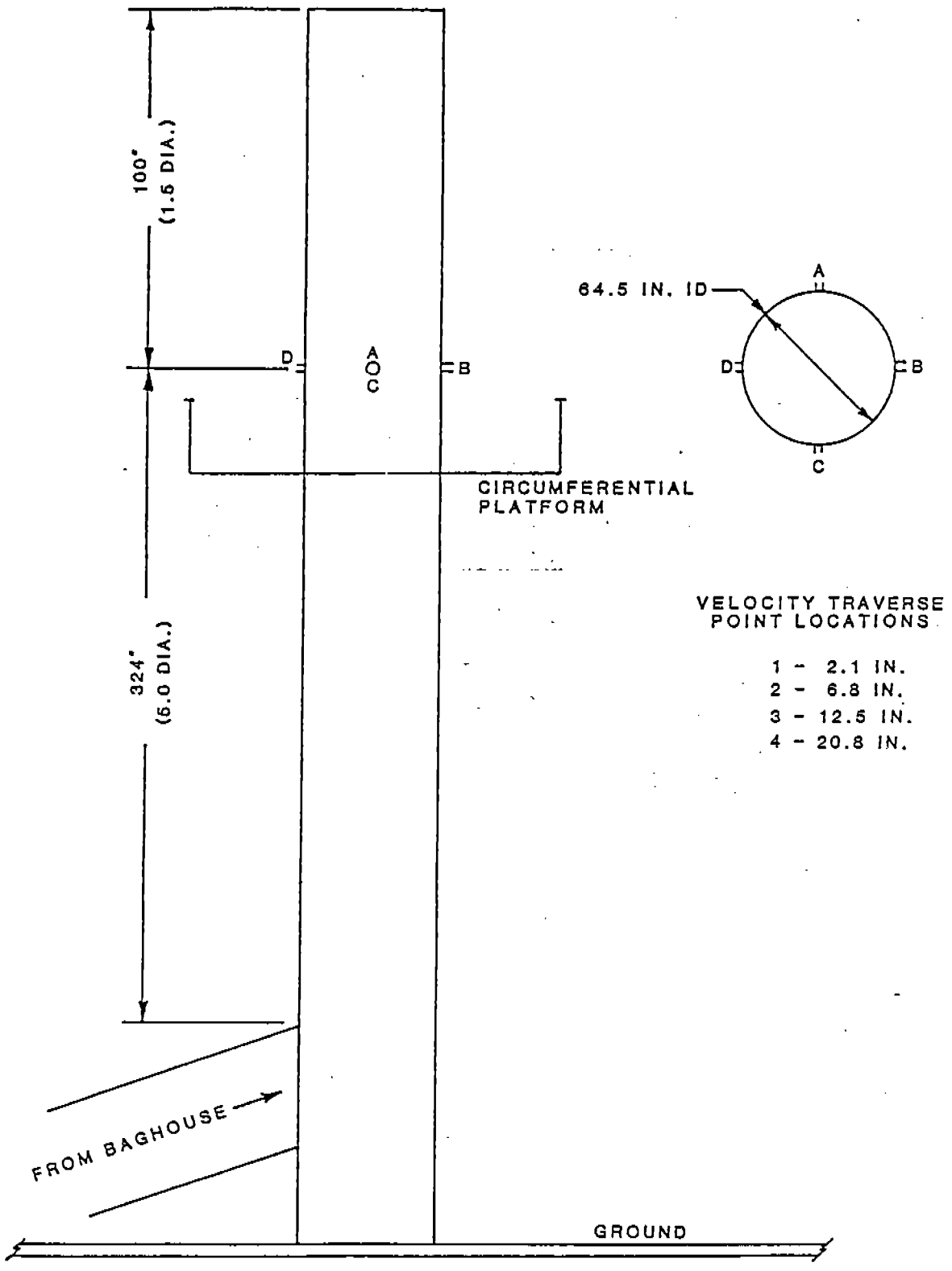


FIGURE 4.2 ALKALI BAGHOUSE MEASUREMENT SITE

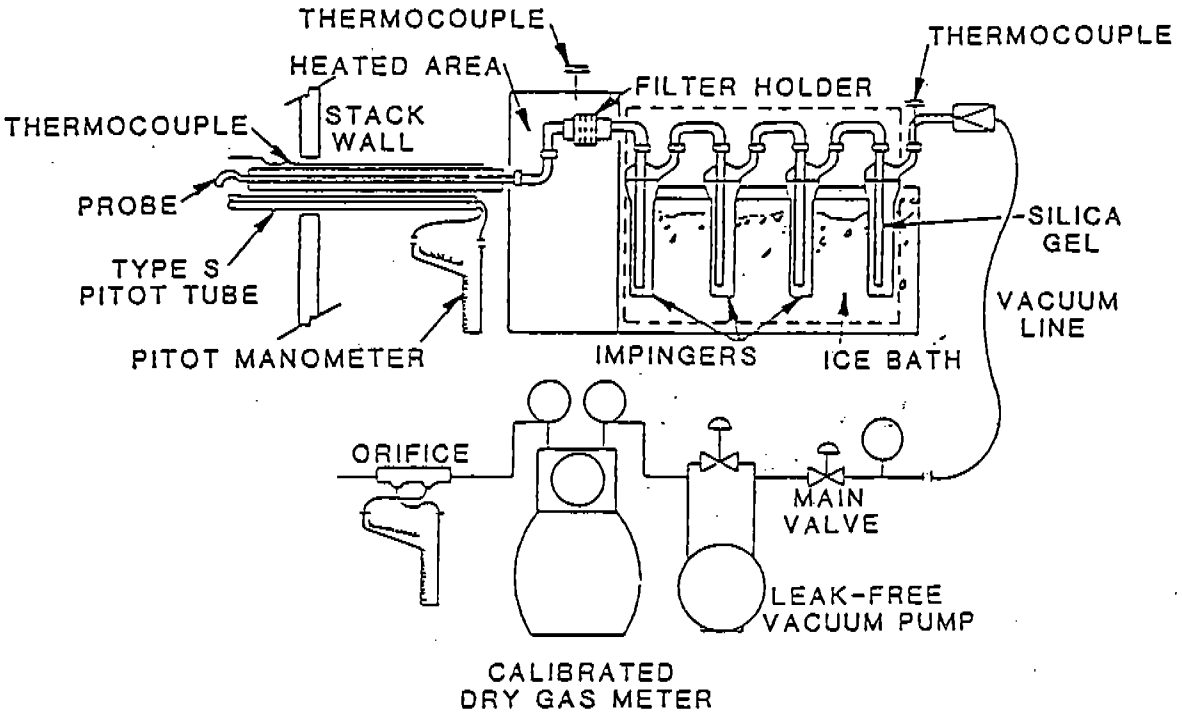


FIGURE 4.3 PARTICULATE SAMPLING TRAIN

4.7 Fuel Sampling and Analysis

Composite fuel samples were collected during each test. The samples were submitted to an independent laboratory for proximate and ultimate analysis using ASTM procedures.

4.8 Process Monitoring

Plant operating data was retrieved using the plants' computer system. Raw data were collected by RAPCA personnel and are not contained in this report.

4.9 Visual Determination of Stack Gas Opacity

Both personnel from RAPCA and SWPCCo performed visual determinations of stack gas opacity during each test. These data are not contained in this report.

4.10 Quality Assurance

The PCS air sampling Quality Assurance program includes procedures for equipment calibration, use of and strict adherence to standard published procedures, sample chain of custody protocol, and traceability protocols for the recording and calculation of data. The field analytical QA program includes use of validated analytical procedures and reference standards, comprehensive operator training and checking, spiked and split samples and independent performance audits. PCS participates in the USEPA's National Source Audit Program for Methods 3, 5, 6 and 7. Pertinent QA/QC procedures and results are included in Appendix B.

5.0 TEST RESULTS

Table 5.1 summarizes ultimate coal analyses. The fuel composition was consistent during all three (3) test runs. As-fired analyses are contained in Appendix A.

Table 5.2 summarizes stack gas conditions. At the kiln stack the average stack gas velocity was 69.7 feet per second (fps). The average flow rate was 205,896 actual cubic feet per minute (acfm) or 102,760 dry standard cubic feet per minute (dscfm). The stack gas had an average temperature of 500°F and was composed of 6.9% moisture, 8.8% oxygen, and 20.0% carbon dioxide. At the alkali stack the average stack gas velocity was 49.3 fps. The average flow rate was 67,140 acfm or 40,853 dscfm. The stack gas had an average temperature of 359°F and was composed of 3.3% moisture, 17.1% oxygen, and 3.9% carbon dioxide.

5.1 Particulate Emissions

Particulate emissions are summarized in Table 5.3. At the kiln stack the average particulate concentration was 0.0089 grains per dry standard cubic foot (gr/dscf) or 1.27×10^{-6} pounds per dry standard cubic foot (lb/dscf). This value corresponded to an average mass emission rate of 7.82 pounds per hour (lb/hr). At the alkali stack the average particulate concentration was 0.0249 gr/dscf or 3.55×10^{-6} lb/dscf. This value corresponded to an average mass emission rate of 8.60 lb/hr.

TABLE 5.1

ULTIMATE FUEL ANALYSES - DRY BASIS[a]

Run No.	FUEL TYPE	HYDROGEN (%)	CARBON (%)	SULFUR (%)	NITROGEN (%)	OXYGEN (%)	ASH (%)	CHLORINE (%)	GCV Btu/lb
1	Coal	4.55	69.57	1.58	1.44	9.45	13.13	0.28	12,490
2	Coal	4.23	70.60	1.40	1.50	9.56	12.46	0.25	12,720
3	Coal	4.07	71.86	1.51	1.43	9.71	11.21	0.21	12,950
AVERAGE		4.28	70.68	1.50	1.46	9.57	12.27	0.25	12,720

[a]For as-fired analyses see Appendix A

high compared to California

TABLE 5.2

SUMMARY OF STACK GAS CONDITIONS

SITE/ RUN#	VELOCITY (fps)[a]	* FLOW RATE (acfm)[b]	(dscfm)[c]	TEMP. (^{o}F)	MOISTURE (%)	O_2 (%)	CO_2 (%)
Kiln							
K-1	68.6	202,500	101,743	500	6.7	8.5	20.9
K-2	71.2	210,223	103,623	518	6.8	9.4	18.6
K-3	69.4	204,965	102,915	482	7.2	8.5	20.5
AVERAGE	69.7	205,896	102,760	500	6.9	8.8	20.0
Alkali							
A-1	49.9	67,887	41,399	364	2.9	17.0	4.0
A-2	50.0	68,114	41,581	355	3.9	17.0	4.0
A-3	48.1	65,419	39,580	357	3.1	17.2	3.8
AVERAGE	49.3	67,140	40,853	359	3.3	17.1	3.9

[a] Feet per second at stack conditions
[b] Actual cubic feet per minute at stack conditions
[c] Dry standard cubic feet per minute at stack conditions

* Based on simulation it appears that the actual amount of bypass is 10% or less!

5.2 Sulfur Dioxide

Sulfur dioxide emissions are summarized in Table 5.4. At the kiln the average sulfur dioxide concentration was 52 parts per million by volume (ppmv) or 0.85×10^{-5} lb/dscf. This value corresponded to an average mass emission rate of 52.0 lb/hr. At the alkali stack the average sulfur dioxide concentration was 300 ppmv or 4.92×10^{-5} lb/dscf. This value corresponded to an average mass emission rate of 20.5 lb/hr.

All raw field data, analytical data, and calculations are contained in Appendices C, D, and E.

TABLE 5.3

SUMMARY OF FILTERABLE PARTICULATE EMISSIONS

SITE/ RUN #	DATE 1986	CONCENTRATION (gr/dscf)[a]	CONCENTRATION (lb/dscf)[b]	MASS RATE (lb/hr)[c]
Kiln				
K-1	6/10	0.0107	1.53×10^{-6}	9.35
K-2	6/10	0.0100	1.43×10^{-6}	8.88
K-3	6/12	0.0059	0.85×10^{-6}	5.24
AVERAGE		0.0089	1.27×10^{-6}	7.82
Alkali				
A-1	6/10	0.0143	2.04×10^{-6}	5.08
A-2	6/10	0.0161	2.29×10^{-6}	5.72
A-3	6/12	0.0442	6.32×10^{-6}	15.00
AVERAGE		0.0249	3.55×10^{-6}	8.60

[a] Grains per dry standard cubic foot at 68°F and 29.92" Hg
[b] Pounds per dry standard dubic foot at 68°F and 29.92" Hg
[c] Pounds per hour

TABLE 5.4

SUMMARY OF SULFUR DIOXIDE EMISSIONS

SITE/ RUN#	DATE 1986	CONCENTRATION (ppmv)[a]	CONCENTRATION (lb/dscf)[b]	MASS RATE (lb/hr)[c]
Kiln				
K-1	6/10	63	1.04×10^{-5}	63.3
K-2	6/10	46	0.75×10^{-5}	46.7
K-3	6/12	46	0.75×10^{-5}	46.1
AVERAGE		52	0.85×10^{-5}	52.0
Alkail				
A-1	6/10	311	5.10×10^{-5}	126.6
A-2	6/10	268	4.39×10^{-5}	109.5
A-3	6/12	322	5.28×10^{-5}	125.3
AVERAGE		300	4.92×10^{-5}	120.5

[a] Parts per million by volume
[b] Pounds per dry standard cubic foot at 68°F and 29.92" Hg
[c] Pounds per hour

6.0 EMISSION REGULATIONS AND CONCLUSIONS

The SWPCCo's Bath Township plant in Greene County is regulated by NSPS for emission of particulate matter and by Ohio Administrative Code (OAC) 3745-18-35(I) for emission of sulfur dioxide.

NSPS, Subpart F - Standards of Performance for Portland Cement Plants, restricts emission of particulate matter to 0.30 lb-particulate/ton of feed (dry basis-except fuel) to the kiln. OAC 3745-18-35(I) restricts emission of sulfur dioxide to 9.0 lb-sulfur dioxide/ton of product. Since the emissions from the kiln and alkali stacks originate in the kiln, the emissions from the individual stacks must be combined in order to assess compliance.

Table 6.1 summarizes particulate emissions as a function of dry kiln feed. The combined measured emissions averaged 0.117 pounds of particulate per ton of dry kiln feed. This value is well below the maximum allowable emissions of 0.30 lb/ton.

Table 6.2 summarizes sulfur dioxide emissions as a function of product rate. The combined measured emissions averaged 2.03 pounds of sulfur dioxide per ton of product. This value is well below the maximum allowable emissions of 9.0 lb/ton.

TABLE 6.1

SUMMARY OF PARTICULATE EMISSIONS
AS A FUNCTION OF DRY KILN FEED

RUN NO.	SOURCE	DRY KILN FEED RATE (ton/hr)[a]	MEASURED EMISSIONS (lb/hr)[b]	MEASURED EMISSIONS (lb/ton)[c]	ALLOWABLE EMISSIONS (lb/ton)[d]
K-1	Kiln	142.86	9.4	0.066	-
A-1	Alkali	142.86	5.1	0.036	-
	Total	142.86	14.5	0.101	0.30
K-2	Kiln	134.73	8.9	0.066	-
A-2	Alkali	134.73	5.7	0.042	-
	Total	134.73	14.6	0.108	0.30
K-3	Kiln	143.47	5.2	0.036	-
A-3	Alkali	143.47	15.0	0.105	-
	Total	143.47	20.2	0.141	0.30
	Kiln	140.35	7.8	0.056	-
AVERAGE	Alkali	140.35	8.6	0.061	-
	Total	140.35	16.4	0.117	0.30

[a] Tons of dry kiln feed per hour excluding fuel
[b] Pounds per hour
[c] Pounds of pollutant per dry ton of kiln feed
[d] NSPS, Subpart F

TABLE 6.2

SUMMARY OF SULFUR DIOXIDE EMISSIONS
AS A FUNCTION OF PRODUCT RATE

RUN NO.	SOURCE	PRODUCT RATE (ton/hr)[a]	MEASURED EMISSIONS (lb/hr)[b]	MEASURED EMISSIONS (lb/ton)[c]	ALLOWABLE EMISSIONS (lb/ton)[d]
K-1	Kiln	86.15	63.3	0.74	-
A-1	Alkali	86.15	126.6	1.47	-
	Total	86.15	189.9	2.20	9.0
K-2	Kiln	81.25	46.7	0.57	-
A-2	Alkali	81.25	109.5	1.35	-
	Total	81.25	156.2	1.92	9.0
K-3	Kiln	86.51	46.1	0.53	-
A-3	Alkali	86.51	125.3	1.45	-
	Total	86.51	171.4	1.98	9.0
	Kiln	84.64	52.0	0.61	-
AVERAGE	Alkali	84.64	120.5	1.42	-
	Total	84.64	172.5	2.03	9.0

[a] Tons of clinker per hour
[b] Pounds per hour
[c] Pounds of particulate/ton of clinker
[d] OAC 3745-18-35(I)

STATEMENT OF PROCESS RATE

Project Number 325.002 Test Number 1 Date 6-10-86

Firm Name SWPCCo

Address 306 EAST XENIA DRIVE FAIRBORN, OH 45324

DATA ON OPERATING CYCLE TIME

Start of Operation, Time 11:08 Idle Time During Cycle, Minutes 0

End of Operation, Time 12:17

Elapsed Time, Minutes 69 min Net Time of Cycle, Minutes 69 min

DATA ON MATERIAL CHARGED TO PROCESS DURING OPERATING CYCLE

I. FOR FUEL BURNING OPERATION ONLY:

Weight _____ Attach Analysis Maximum Design BTU Input _____

% Excess Air _____ Actual BTU Input for Test _____

Gas Flow _____ ACFM

Total BTU input for all fuel burning equipment on a plant or premises which are united physically or operationally (based on permit submissions). _____

NOTE: Include stream flow chart with proper identification of scale, etc.

II. FOR INCINERATOR ONLY:

Total weight charged during test _____ Weight per charge _____

Number of charges _____ Type Waste _____

III. OTHER SOURCE OPERATIONS

Material	Dry Kiln Feed	Weight	142.86 Ton/hr
Material	Cement Clinker	Weight	86.15 Ton/hr
Material		Weight	
Material		Weight	

NOTE: Include any pertinent charts or other operational data.

I CERTIFY THAT THE ABOVE STATEMENT IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF:

Signature /s/ Ted E. State

Title Plant Manager

KILN FEED RATE CALCULATIONS

RUN NO. 1

		TON/HR	
START TEST	11:08	$144.29\left(\frac{2}{15}\right)$	= 19.24
	11:10	$144.29\left(\frac{15}{15}\right)$	= 144.29
	11:25	$144.21\left(\frac{15}{15}\right)$	= 144.21
	11:40	$144.20\left(\frac{15}{15}\right)$	= 144.20
	11:55	$144.12\left(\frac{15}{15}\right)$	= 144.12
	12:10	$141.81\left(\frac{15}{15}\right)$	= 141.81
STOP TEST	12:17	$141.81\left(\frac{7}{15}\right)$	= 66.18
	69 min	TOTAL	804.05

$$\frac{804.05}{84} \times 1.5 = 143.58 \text{ TON/HR}$$

$$143.58 \times \frac{69}{60} = 165.12 \text{ ton/test}$$

% moisture in feed = .5 %

Dry kiln feed = 143.58 x .995 = 142.86 TON/HR

F. C. Broeman & Co., Inc.

Analytical and Consulting Chemists

AMPLE OF: COAL - SAMPLE #1 - PN 325.002 REPORT DATE June 19, 1986

ENT: POLLUTION CONTROL SCIENCE DATE SAMPLE REC'D June 13, 1986

REPORT OF ANALYSIS

P O # 500-86-054
CUST SAMPLE: CLIENT: SWPCCO-FAIRBORN OHIO

	AS RECEIVED	DRY BASIS
MOISTURE	1.4%	
VOLATILE MATTER	34.21%	34.70%
FIXED CARBON	51.44%	52.17%
ASH	12.95%	13.13%
SULFUR	1.56%	1.58%
BTU/LB	12,320	12,490
CARBON		69.57%
HYDROGEN		4.55%
NITROGEN		1.44%
CHLORINE		.28%
OXYGEN		9.45%

FIB/JAF:tm
BR3310

STATEMENT OF PROCESS RATE

Project Number 325.002 Test Number 2 Date 6-10-86

Firm Name SWPCCo

Address 306 EAST XENIA DRIVE FAIRBORN, OH 45324

DATA ON OPERATING CYCLE TIME

Start of Operation, Time 14:42 Idle Time During Cycle, Minutes 53

End of Operation, Time 16:41

Elapsed Time, Minutes 119 Net Time of Cycle, Minutes 66

DATA ON MATERIAL CHARGED TO PROCESS DURING OPERATING CYCLE

I. FOR FUEL BURNING OPERATION ONLY:

Weight _____ Attach Analysis Maximum Design BTU Input _____

% Excess Air _____ Actual BTU Input for Test _____

Gas Flow _____ ACFM

Total BTU input for all fuel burning equipment on a plant or premises which are united physically or operationally (based on permit submissions). _____

NOTE: Include stream flow chart with proper identification of scale, etc.

II. FOR INCINERATOR ONLY:

Total weight charged during test _____ Weight per charge _____

Number of charges _____ Type Waste _____

III. OTHER SOURCE OPERATIONS

Material Dry Kiln Feed Weight 134.73 Ton/hr

Material Cement Clinker Weight 81.25 Ton/hr

Material _____ Weight _____

Material _____ Weight _____

NOTE: Include any pertinent charts or other operational data.

I CERTIFY THAT THE ABOVE STATEMENT IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF:

Signature /s/ Ted E Stutz

Title Plant Manager

RUN NO. 2

		TON/HR
START TEST	14:42	
STOP TEST	15:02	$135.38\left(\frac{20}{15}\right) = 180.51$
"	15:10	135.38 =
	15:25	135.47 =
	15:40	135.29 =
RESTART TEST	15:55	$135.37\left(\frac{15}{15}\right) = 135.37$
	16:10	$135.45\left(\frac{15}{15}\right) = 135.45$
	16:25	$135.41\left(\frac{15}{15}\right) = 135.41$
	16:40	$135.42\left(\frac{15}{15}\right) = 135.42$
STOP TEST	16:41	$135.42\left(\frac{1}{15}\right) = 9.03$
	66 min-net	TOTAL 731.19

$$\frac{731.19}{81} \times 15 = 135.41 \text{ TON/HR}$$

$$\text{TOTAL TON/TEST} = \frac{135.41 \times 66}{60} + 135.38 + 135.47 + 135.29$$

$$= 555.09 \text{ TON/TEST}$$

TOTAL TIME = 119 min

NET TIME = 66 min

IDLE TIME = 53 min

% MOISTURE IN FEED = 0.5 %

DRY KILN FEED = $135.41 \times 0.995 = 134.73$ TON/HR

F. C. Broeman & Co., Inc.

Analytical and Consulting Chemists

AMPLE OF: COAL SAMPLE #2 - P/N #325.002 REPORT DATE June 19, 1986

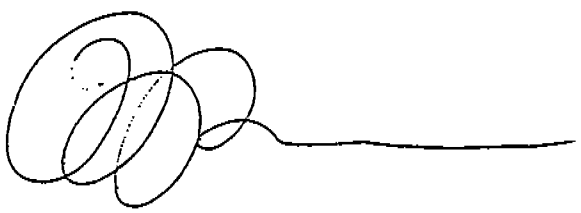
IENT: POLLUTION CONTROL SCIENCE DATE SAMPLE REC'D June 13, 1986

REPORT OF ANALYSIS

P O # 500-86-054
CUST SAMPLE: CLIENT: SWPCCO-FAIRBORN OHIO

	AS RECEIVED	DRY BASIS
MOISTURE	1.3%	
VOLATILE MATTER	33.70%	34.14%
FIXED CARBON	52.71%	53.40%
ASH	12.30%	12.46%
SULFUR	1.38%	1.40%
BTU/LB	12,550	12,720
CARBON		70.60%
HYDROGEN		4.23%
NITROGEN		1.50%
CHLORINE		.25%
OXYGEN		9.56%

FIB/JAF:tm
BR3311



STATEMENT OF PROCESS RATE

Project Number 325.002 Test Number 3 Date 6-12-86

Firm Name SWPCCo

Address 306 EAST XENIA DRIVE FAIRBORN, OH 45324

DATA ON OPERATING CYCLE TIME

Start of Operation, Time 11:20 Idle Time During Cycle, Minutes 0

End of Operation, Time 12:32

Elapsed Time, Minutes 72 min Net Time of Cycle, Minutes 72

DATA ON MATERIAL CHARGED TO PROCESS DURING OPERATING CYCLE

I. FOR FUEL BURNING OPERATION ONLY:

Weight _____ Attach Analysis Maximum Design BTU Input _____

% Excess Air _____ Actual BTU Input for Test _____

Gas Flow _____ ACFM

Total BTU input for all fuel burning equipment on a plant or premises which are united physically or operationally (based on permit submissions). _____

NOTE: Include stream flow chart with proper identification of scale, etc.

II. FOR INCINERATOR ONLY:

Total weight charged during test _____ Weight per charge _____

Number of charges _____ Type Waste _____

III. OTHER SOURCE OPERATIONS

Material Dry Kiln Feed Weight 143.47 Ton/hr

Material Cement Clinker Weight 86.51 Ton/hr

Material _____ Weight _____

Material _____ Weight _____

NOTE: Include any pertinent charts or other operational data.

I CERTIFY THAT THE ABOVE STATEMENT IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF:

Signature By Ted E. Stuta

Title Plant Manager

RUN NO. 3

	11:10	144.18	
START TEST	11:20	144.28 $\left(\frac{5}{15}\right)$ =	48.09
	11:25	144.28 $\left(\frac{15}{15}\right)$	144.28
	11:40	144.34 $\left(\frac{15}{15}\right)$	144.34
	11:55	144.12 $\left(\frac{15}{15}\right)$	144.12
	12:10	144.13 $\left(\frac{15}{15}\right)$	144.13
	12:25	144.11 $\left(\frac{15}{15}\right)$	144.11
STOP TEST	12:32	144.11 $\left(\frac{7}{15}\right)$	67.25
	12:40	144.25	
		TOTAL	836.32

$$\frac{836.32}{87} \times 15 = 144.19 \text{ TON/HR}$$

% MOISTURE IN FEED = 0.5 %

DRY KILN FEED RATE = (144.19)(.995) = 143.47 TON/HR