AP42 Section:	11.3
Background Chapter	4
Reference:	16
Title:	*Source Sampling Report for Measurement of Particulate Emissions, Glen-Gery Brick, Bigler Facility Sawdust Dryer, Gilbert/Commonwealth, Inc., Reading, PA, October 1988.*

Background Rpt.
Ref 16 (Section 4)

Commonwealth of Pennsylvania
Environmental Resources
January 19, 1989

Subject: Source Test Review

To: Data File
Glen-Gery Corporation
Bradford Township, Clearfield County

From: John S. Pitulski
Air Quality Program Specialist
Division of Technical Services and Monitoring
Bureau of Air Quality Control

Through: Chief, Source Testing and Monitoring Section

Glen-Gery Corporation operates a sawdust drying operation at their brick manufacturing plant in Bigler, Pennsylvania. The dried sawdust is used to fire two brick kilns located at the facility. Emissions from the operation are controlled by a Baker-Pullman cyclone collector and a recently installed Fisher Koterman cyclone, which operate in series.

On October 28, 1988, particulate compliance testing was conducted by Gilbert/Commonwealth in the exhaust duct downstream of the cyclones. The volumetric flow rates stated in the final test report were calculated using an incorrect duct area. Compliance status of the source will not be affected, however, as the allowable standard is based upon concentration of particulate matter.

I have calculated the volumetric flow rate and corresponding mass emission rate using the actual duct area, as shown in Figure 1 of the test report. The corrected results are reflected in the table below. All other aspects of the sampling program appear to have been conducted in accordance with the applicable test methods. The tests are acceptable to the Department.

The following data was extracted from the test report:

Test Run Number	1	2	3
Volumetric Flowrate (dscfm)*	23780	17154	17539
Mass Emission Rate (lb/hr)*	4.51	2.76	3.32
Particulate Concentration (gr/dscf)	0.0222	0.0188	0.0221
Allowable Concentration (gr/dscf)	0.04	0.04	0.04

*Calculated using correct duct area (3.67 sq. ft.)

COMMONWEALTH OF PENNSYLVANIA
November 2, 1988

SUBJECT: Glen-Gery
Bradford Township, Clearfield County
17-309-005C

TO: Files

FROM: Richard L. Maxwell, Jr.
Chief, Engineering Services
Bureau of Air Quality Control
Williamsport Regional Office

To: J. Pitulski

On October 28, 1988 I observed the performance of one particulate stack test on the company's sawdust drying system. The test was the second of three that were to be performed by Gilbert Commonwealth under the supervision of Spotts, Stevens & McCoy. Stan Goglick and Dave Gallup of Glen-Gery were also present during the testing.

I arrived just prior to the conclusion of the first test. Immediately following the test, the filter was weighed and a rough emission value calculated (factoring in a reasonable estimate for nozzle/probe washings and back half). The resultant value appeared to be approximately .034 grains/dry standard cubic foot at a flow approximately 25 percent in excess of the 24,000 CFM design flow.

The company readjusted the first cyclone outlet damper to achieve a flow of approximately 24,000 CFM prior to the second test. The damper position was as depicted in the attached sketch. The fan was operating at approximately 150 amps at this setting.

The second test filter was also weighed and a rough emission value calculated. The resultant emission was approximately .03 grains/dry standard cubic foot. I left the site prior to the third test which the company planned to run at 24,000 CFM.

The sampling port location was in a horizontal section of ductwork located on the silo top prior to the fan. The ports were located approximately 2½-3 diameters upstream of the fan and 5-6 diameters downstream of an 90° elbow. Sampling was occurring at 12 points/port. I did not observe any of the leak checks.

On several occasions during the testing, I confirmed that sawdust was being fired in the dryer. The furnace was cycling between approximately 1425°F and 1595°F. The first cyclone gas outlet temperature was 125°F.

Both of the filters were brown in appearance despite the fact that nothing could be seen escaping the fan exhaust.

The material collected in the second cyclone is a flour-like brown powder.

The first and second cyclone and all ductwork up to the second cyclone exhaust is insulated.

RLM/bls

SOURCE SAMPLING REPORT FOR MEASUREMENT OF PARTICULATE EMISSIONS

GLEN-GERY BRICK
BIGLER FACILITY
SAW DUST DRYER

G/C, Inc., REPORT R-10-0526-001-1
OCTOBER, 1988

SOURCE SAMPLING REPORT FOR MEASUREMENT OF PARTICULATE EMISSIONS

GLEN-GERY BRICK
BIGLER FACILITY
SAW DUST DRYER

G/C, INC., REPORT R-10-0526-001-1
OCTOBER, 1988

PREPARED BY

GILBERT/COMMONWEALTH, INC.
QUALITY ASSURANCE DIVISION
P.O. BOX 1498
READING, PENNSYLVANIA 19603

DAVID J. HOFMANN
PROJECT COORDINATOR
TESTING SERVICES GROUP

Gilbert/Commonwealth, Inc. engineers and consultants
P.O. Box 1498, Reading, PA 19603-1498/Telephone 215-775-2600, Cable Gilasco/Telex 836-431

December 2, 1988

Glen-Gery Corporation
P.O. Box 1542
Reading, PA 19603

Attention: Mr. Stan Gogick

Re: Submittal of Source Sampling Report for
Measurement of Particulate Emissions
Glen-Gery Brick
Bigler Plant
Saw Dust Dryer
G/C, Inc., Report R-10-0526-001-1

Gentlemen:

We are pleased to submit six copies of our Report R-10-0526-001-1, dated December 2, 1988. This report contains results of source sampling for particulate emissions and determination of flue gas characteristics for the saw dust dryer located at your Bigler facility, as conducted on October 28, 1988.

The source sampling program defined by this report incorporates standard sampling procedures. The results of the sampling program are representative of flue gas emissions at the outlet of the dust collector under referenced normal operating conditions.

Information contained in this report and the accompanying Appendices includes field data, laboratory analyses, and a computer printout of all results developed by the testing program. We have attempted to present this information in a form that is readily discernible and suitable for your continued use.

Gilbert/Commonwealth, Inc., is pleased to have been of service to Glen-Gery Brick and trusts that this report will meet your complete acceptance.

Very truly yours,

David Hofmann
Testing Supervisor
Testing Services Group

DH:mas

FOREWORD

The source sampling program as defined by this report was confined to measurement of particulate emissions and pertinent flue gas characteristics at the saw dust dryer during *referenced operating conditions.*

TABLE OF CONTENTS

TABLES AND FIGURES

Tables

Figures

SECTION I - SUMMARY OF TEST RESULTS

A summary of test results from the source sampling program is presented in Table 1. As such, the results are considered representative of emission characteristics from the saw dust dryer during referenced operating conditions. The results show the particulate emissions are below the limit of 0.04 gr/dscf.

TABLE 1

SUMMARY OF TEST RESULTS
GLEN-GERY BRICK
BIGLER FACILITY

G/C, INC. REPORT E-10-0526-001-1

LOCATION	SAW DUST DRYER EXHAUST		
RUN NO.	G-S-1	G-S-2	G-S-3
DATE	10/28/88	10/28/88	10/28/88
TIME	1025	1236	1430
OPERATING DATA(1)			
Feed Rate	30	30	30
FLUE GAS CHARACTERISTICS			
DSCFM	33,790	37,154	37,539
ACFM	56,499	41,315	42,192
Temperature, °F	125	121	121
Moisture, %	5.3	6.9	5.8
PARTICULATE EMISSIONS			
Gr/DSCF	0.0222	0.0188	0.0221
lbs/hr	8.52	5.53	6.49

(1) Nos. 1 & 2 Kiln operating, Kiln mix (a) Calgary Grey - 100% Buff Clay
(b) Rustic Myrrh - 50% Clay, 50% shale
(c) KNW - 100% shale.

SECTION II - ANALYSIS

1. Introduction

The data presented in this report represents the results of source sampling exhaust emissions at the outlet location of the saw dust dryer during referenced operating conditions.

Specific requirements of this source sampling program include the following:

a. Identification of final particulate emissions from the saw dust dryer.

b. Average flue gas temperature, moisture, and volume of flow at the sampling location.

c. Orsat analysis of flue gas conditions at the point of sampling.

d. Record of pertinent operating conditions during period of the test run.

The sampling program was completed on October 28, 1988 by the Gilbert field test crew, with the assistance of personnel assigned by Glen-Gery, Spotts, Stevens, & McCoy and witnessed by the PADER.

2. Description of the Plant Exhaust System

The exhaust gases from the saw dust rotary dryer are sent to a mechanical collecter followed by the sampling location, then through the fan and exhausted out of the stack.

3. Sampling Program Procedures

To satisfy the objectives established for this project, the sampling program was set-up on a basis of using one test train positioned at the test location and completing three test runs at the location. A test run consisted of a particulate test using EPA Method 5.

The location and number of sampling ports and traverse points are detailed in Figure 1.

4. Operating Conditions

In the execution of this sampling program, an attempt was made to achieve near normal load for the plant. The amount of product generated was recorded by the operator. This record is included in the summary table (see Table 1).

5. Results

Test data developed by each test run, together with analytical results from laboratory analysis of samples generated by the field sampling program, are reproduced in the Appendices included with this report. Information on basic gas characteristics developed by each test run is contained in the printout of the computer program included as Appendix 7.

A summary of pertinent test results and essential information to evaluate test results developed for each test run is included with this report as Table 1.

6. Discussion

6.1 Sampling Conditions

All field sampling work was completed out of doors and subject to prevailing weather conditions; however, there were no interruptions in the operation of individual test trains due to equipment or weather problems.

During the completion of this test program, the plant was maintained near the normal load condition.

6.2 Exhaust Flue Gas Volume and Composition

Test data for measurement of exhaust flue gas volume and related velocities developed by traversing of the stack show that the measured gas volumes between tests were consistent with expected values. For purposes of this report, indicated emissions are based on these measured gas volumes.

6.3 Unit Operating Conditions

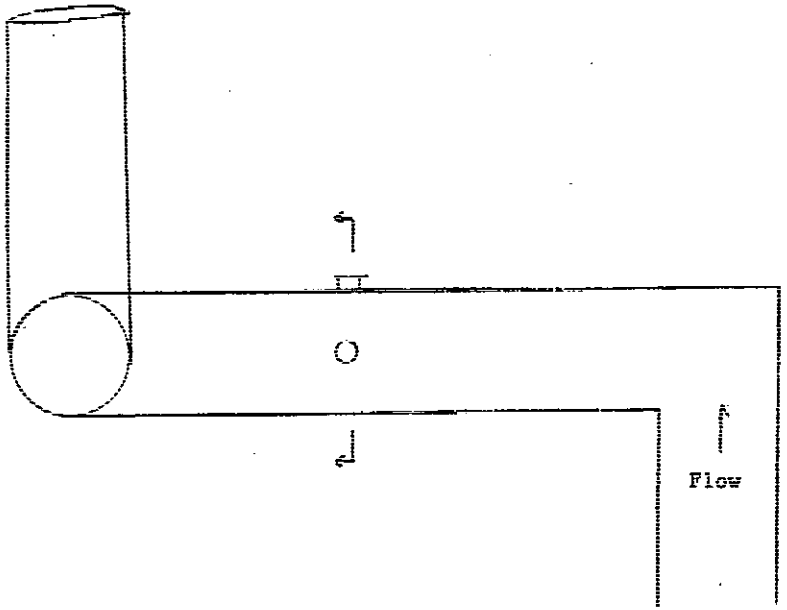
This sampling program was undertaken as a compliance test program for the saw dust dryer representative load operating conditions. In the execution of this program, all applicable operation conditions were referenced.

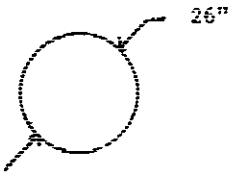
Operating conditions were monitored throughout the duration of the sampling program by Glen-Gery personnel.

6.4 Emissions

6.4.1 Particulate

The reported particulate emissions as summarized in Tables 1 are expressed as a concentration (grains/SCF) and emission rate (lbs/hour) as measured. The particulate emissions for all three runs are within any applicable limitations.





SECTION A-A

Point No.	Distance From Port, Inches
1	0.55
2	1.74
3	3.07
4	4.60
5	6.50
6	9.26
7	16.74
8	19.50
9	21.40
10	22.93
11	24.26
12	25.45

FIGURE 1

SUMMARY OF TEST PORT AND TRAVERSE POINTS

GLEN-GERY

BIGLER FACILITY

SAW DUST DRYER

SECTION III

APPENDICES

SECTION III - APPENDICES

TABLE OF CONTENTS

APPENDIX 1

PROJECT PARTICIPANTS

APPENDIX I
PROJECT PARTICIPANTS

The following members of Gilbert/Commonwealth's staff participated in the planning and execution of this project and preparation of this report.

Field Sampling Crew:

Ed Burger	Engineering Technician
Jerry Hill	Engineering Technician

Laboratory Participants:

Carl J. Wummer	Chemist
Vaughan O'Neill	Laboratory Technician

All field tests were completed with the assistance of technical personnel from Glen-Gery, Spotts, Stevens & McCoy and witnessed by the PADER.

APPENDIX 2

TESTING AND ANALYTICAL PROCEDURES

2.1 STANDARD EPA TEST METHODS

2.2 ACTUAL SAMPLING PROCEDURES/PARTICULATE

2.3 ANALYTICAL METHODS/PARTICULATE

APPENDIX 2

TESTING AND ANALYTICAL PROCEDURES

2.1 STANDARD EPA TEST METHODS

APPENDIX 2

TESTING AND ANALYTICAL PROCEDURES

2.2 ACTUAL SAMPLING PROCEDURES/PARTICULATE

APPENDIX 2

TESTING AND ANALYTICAL PROCEDURES

2.2 ACTUAL SAMPLING PROCEDURES/PARTICULATE

Particulate matter in the exhaust gas stream at the stack sampling location was sampled according to procedures and type of equipment as basically described in EPA Method 5 (see Appendix 2.1 for a complete description).

In place of the fragile glass material, the in-stack probe liner was constructed of high corrosion resistant Inconel stainless steel, which was enclosed in an outer protective sheath and heat traced to minimize condensation within the probe.

The basic test train consisted of a stainless steel nozzle followed by a heated probe liner, glass fiber filter, and glass impingers with all glass connectors.

The required sampling time for the compliance test, in terms of time per traverse point and overall sampling time per individual test run, was selected on the basis of maintaining a minimum sampling time of 2.5 minutes at each of the traverse points.

The test program was completed with one test train located at the stack. All sampling activities were halted in the event of any test equipment malfunction or at the report of any operational problem. There was no planned interruption or extensive delay during the completion of the test runs.

APPENDIX 2

TESTING AND ANALYTICAL PROCEDURES

2.1 ANALYTICAL METHODS/PARTICULATE

APPENDIX 2

TESTING AND ANALYTICAL PROCEDURES

2.3 ANALYTICAL METHODS/PARTICULATE

The reported particulate emissions included the total particulate catch from the water then acetone wash of the nozzle and probe, plus accumulations on the glass fiber filter. The impinger water was filtered through a .22 micron filter. These results along with the probe wash and glass fiber filter are considered particulate emissions in the Commonwealth of Pennsylvania.

The soluble water from the impingers was dried down and weighed. This particulate weight is only reported and is not counted toward the total particulate weight.

In the clean-up of the front half of the sampling equipment, the nozzle from the front of the probe was removed, brushed out, and washed with water then acetone. The probe liner was also brushed out and washed with water then acetone. The glass fiber filter was removed from the fritted disc of the filter holder and replaced in its petri dish. All adhering filter particles were removed from the silicone rubber gasket and placed in the same petri dish prior to sealing for transport back to the Gilbert assigned laboratory for final analysis. The filter holder was then washed with water then acetone and combined with the probe and nozzle wash.

The clean-up procedure for the back half of the sampling train initially involved removal of the silica gel from the last impinger and replacement in its original container for final weighing to determine moisture pickup. Water collected in the impingers was measured and placed in a sample bottle. The impingers and glass connectors were rinsed with water then acetone. This rinse was also placed in sample bottles to be analyzed.

Laboratory analysis of samples collected during the test run proceeded according to EPA Method 5 (Appendix 2.1).

All critical items of sampling and analytical equipment were certified and/or calibrated for accuracy and results considered within acceptable limits for source sampling operations (see Appendix 6).

APPENDIX 3

OPERATING DATA

(SEE TABLE 1)

APPENDIX 4

ANALYTICAL RESULTS FOR PARTICULATES

(CLEAN-UP SHEETS)

SSM
SPOTTS, STEVENS and McCOY, INC.
ENGINEERS • PLANNERS • SCIENTISTS

CERTIFICATE OF ANALYSIS

CLIENT: GILBERT/COMMONWEALTH, INC.
P. O. BOX 1498
READING, PA. 19603

DATE REPORTED: 11/9/88
REPORT NO: 8821172
DATE SAMPLED: 10/28/88
DATE RECEIVED: 11/01/88
PURCHASE NO.: 51922
ORDER NO.: 13361-001

SAMPLE TYPE: STACK

SAMPLED BY: CLIENT

SAMPLE IDENTIFICATION: GLEN GERY
W.O. #10-0526-001

LAB. NO.	RUN	PARTICULATE SOURCE	PARTICULATE WT. (mg)
8821172-1	G-S-1	Impinger Water	3.9
8821172-1	G-S-1	Impinger Water (>0.22 um Filter)	0.9
8821172-1	G-S-1	Impinger Acetone	6.9
8821172-1	G-S-1	-Probe Acetone	12.7
8821172-1	G-S-1	-Probe Water	4.7
8821172-1	G-S-1	-Filter	50.1
8821172-2	G-S-2	Impinger Water	2.5
8821172-2	G-S-2	Impinger Water (>0.22 um Filter)	1.0
8821172-2	G-S-2	Impinger Acetone	3.9
8821172-2	G-S-2	Probe Acetone	14.5
8821172-2	G-S-2	Probe Water	4.4
8821172-2	G-S-2	Filter	50.1
8821172-3	G-S-3	Impinger Water	1.6
8821172-3	G-S-3	Impinger Water (>0.22 um Filter)	3.5
8821172-3	G-S-3	Impinger Acetone	3.5
8821172-3	G-S-3	Probe Acetone	19.7
8821172-3	G-S-3	Probe Water	5.7
8821172-3	G-S-3	Filter	55.8

Respectfully submitted,

Carl J. Nummer

CARL J. NUMMER - GROUP LEADER
LABORATORY SERVICES

cc: Steve Brockel

REPLY TO:
☐ HOME OFFICE
345 N. Wyomissing Blvd.
P.O. Box 6307
Reading PA 19610-0307
(215) 670-8401
Fax # (215) 670-8850

☐ ANALYTICAL LABORATORIES
30 Nicole Drive
P.O. Box 4257
Reading PA 19611-0257
(215) 374-8401
Fax # (215) 374-8439

☐ LEHIGH VALLEY OFFICE
MacArthur Office Plaza Suite 451
3722 Lehigh Street
Allentown PA 18103-3439
(215) 433-4140

☐ BALTIMORE OFFICE
606 Fairmount Avenue
Suite 105
Baltimore MD 21204-3819
(301) 494-2000

APPENDIX 5

RAW FIELD DATA

Sheet 1 of 2

Client GLEN GERY

P. O. NO. 10052660/

Plant BIGLER

Run No. G-S-1

Location OUTLET

Date 10/28/98

Operator BURGESS

Sample Box No. 37

Meter Box No. 2793

Meter ΔH 2.01

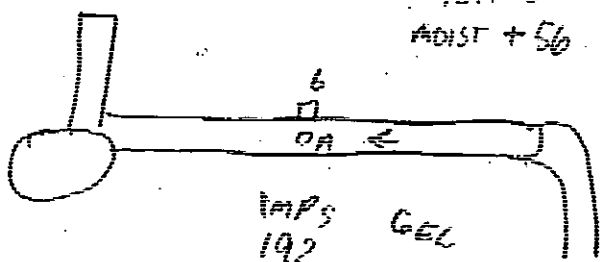
C Factor

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point

STATION



Pitot Calibration

Thimble No.

Filter No.

Ambient Temp. °F 45

Bar. Press. "Hg 29.30

Assumed Moisture % 7

Heater Box Setting, °F

Probe Tip Dia., In. .150

Probe Length

Probe Heater Setting

Avg. ΔP Avg. ΔH

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	CLOCK TIME RUN	DRY GAS METER, CF	PITOT IN. H2O ΔP	ORIFICE ΔH IN. H2O DESIRED	ORIFICE ΔH IN. H2O ACTUAL	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	O2	STACK TEMP. °F
A-1		0842.	0.0	693.970	2.4	1.549	1.15	52.	52.	3	245.			122.
2			2.5	695.2	2.5	1.58	1.18	54.	52.	3	250.		19.8	124.
3			5.0	696.6	2.2	1.485	1.05	56.	52.	3	255.			125.
4			7.5	698.6	1.5	1.225	0.71	61.	52.	3	245.			125.
5			10.0	699.5	1.1	1.049	0.52	62.	52.	2	240.		19.1	126.
6			12.5	700.6	0.60	.7746	0.28	64.	54.	1	240.			125.
7			15.0	701.3	4.50	2.18	2.15	65.	54.	4	245.		19.5	125.
8			17.5	703.2	6.0	2.45	2.85	72.	56.	4.	252.			125.
9			20.0	705.3	6.0	2.45	2.85	78.	57.	4	260.			124.
10			22.5	707.7	7.2	2.68	2.35	80.	58.	4	252.			123.
11			25.0	710.1	7.5	2.739	3.60	82.	60.	5.	260.			123.
12			27.5	712.7	7.9	2.811	3.80	85.	61.	5.	260.			
Stop		0911.	30.0	716.0										

STACK - C = 29.3

COMMENTS:

Client GLEN GERY — PARTICULATE FIELD DATA (continued) — Sheet 2 of 2

W.O. NO. 10032600

Plant BIGLER — Location OUTLET

Run No. G-S-1 — Date 10/29/00

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	CLOCK TIME RUN	DRY GAS METER, CF	PITOT IN. H_2O ΔP	ORIFICE ΔH IN. H_2O DESIRED	ORIFICE ΔH IN. H_2O ACTUAL	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP °F	IMPINGER TEMP °F	O_2	STACK TEMP. °F
G-1		0914.	0.0	716.0	3.8	1.949	1.80	76.	62.	3.	240.			122.
2			2.5	717.5	3.5	1.871	1.70	80.	64.	3.	250.		19.5	123.
3			5.0	719.4	3.8	1.949	1.80	80.	64	3.	245.			126.
4			7.5	721.	5.5	2.345	2.60	82.	64	5.	240.		20.2	127.
5			10.0	723.1	4.0	2	1.92	84.	65.	4	245.			128
6			12.5	725.4	7.0	2.642	3.30	84.	66.	9	240			127.
7			15.0	727.7	7.5	2.739	3.55	88.	67.	5.	245.		20.4	127.
8			17.5	730.2	6.2	2.49	2.95	89.	68.	5.	245.			126.
9			20.0	732.6	6.2	2.49	2.95	90.	68.	15.	250.			125
10			22.5	735.2	7.0	2.646	3.30	91.	70.	15	265.		20.4	127.
11			25.0	737.1	6.0	2.45	2.80	92.	70.	14.	245.			124.
12			27.5	739.4	6.5	2.55	2.10	92.	70.	15.	240			124.
STOP		0944.	29.0	742.718										
END														

COMMENTS:

EP = 0.0 [illegible] CO_2 = 0.5
1.5
0.5

Sheet 1 of 2

PARTICULATE FIELD DATA

Client: GLEN GERY
W. O. No.: 1008246 01
Plant: BIGLER
Run No.: G-5-2
Location: OUTLET
Date: 10/28/84
Operator: BURGER
Sample Box No.:
Meter Box No.: 2793
Meter ΔH:
C Factor:

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point

SKETCH

DUCT DIAMETER 4
26"

IMPS 222 150
60L +10

Pitot Calibration:
Thimble No.:
Filter No.:
Ambient Temp. °F:
Bar. Press. "Hg: 29.30
Assumed Moisture %: 7
Heater Box Setting, °F:
Probe Tip Dia., In.: .150
Probe Length:
Probe Heater Setting:
Avg. ΔP:
Avg. ΔH:

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	CLOCK TIME RUN	DRY GAS METER, CF	PITOT IN. H2O ΔP	ORIFICE ΔH IN. H2O DESIRED	ORIFICE ΔH IN. H2O ACTUAL	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	O_2	STACK TEMP. °F
A-1		1212.	0.0	744.390	1.26	1.093	0.59	52	52.	2.	240.			120.
2			4.0	746.1	1.30	1.19	0.64	56.	52.	2.	240.		20.6	121.
3			8.0	747.5	1.10	1.049	0.54	60.	54.	2.	245.			122.
4			12.0	749.4	0.72	.9473	0.35	62.	64.	2.	250.			121.
5			16.0	750.9	0.76	.8718	0.37	64.	55.	2	255.		20.2	124.
6			20.0	752.3	0.40	.6325	0.19	65.	56.	1	240.			124.
7			24.0	753.4	2.80	1.673	1.35	65.	58.	3.	240.			123.
8			28.0	755.6	3.20	1.789	1.55	72.	58.	4.	245.		20.2	124.
9			32.0	758.7	2.20	1.789	1.55	76.	60.	4.	250.			123.
10			36.0	761.5	4.0	.6325	1.95	78.	62.	4.	250.			123.
11			40.0	764.4	4.0	.6325	1.95	80.	63.	4.	255.			121.
12			44.0	767.4	4.4	2.0976	2.14	81.	64.	4.	255.		20.3	126.
End		1301.	48.0	771.3										

STATIC -29.5 CO_2 0.4

COMMENTS:

Sheet 2 of 2

Client GLEN GERY

PARTICULATE FIELD DATA
(continued)

W.O. No. 1005241001

Plant BIGLER

Location OUTLET

Run No. G-S-2

Date 10/20/88

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	CLOCK TIME RUN	DRY GAS METER, ft^3	PITOT IN. H_2O ΔP	ORIFICE ΔH IN. H_2O DESIRED	ORIFICE ΔH IN. H_2O ACTUAL	DRY GAS TEMP. ^oF INLET	DRY GAS TEMP. ^oF OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP ^oF	IMPINGER TEMP ^oF	$\%_{CO_2}$	STACK TEMP. ^oF
		1303.	0.0	771.7	1.60	1.265	0.78	74.	64.	3.	240.			119.
6-1			4.0	775.0	1.90	1.378	0.93	78.	66.	3.	245.		20.5	126.
2			8.0	778.1	2.0	1.414	0.97	76.	66.	4.	240.			119.
3			12.0	781.6	2.20	1.483	1.07	78.	67.	3.	245.			118.
4			16.0	784.9	2.20	1.483	1.07	78.	66.	3.	280.			120.
5			20.0	787.9	2.0	1.414	0.97	78.	66.	3.	245.		20.6	123.
6			24.0	791.9	4.1	2.025	2.0	78.	66.	4.	280.			122.
7			28.0	794.2	4.2	2.05	2.05	78.	66.	4	260.			121.
8			32.0	797.2	4.4	2.078	2.15	82.	66.	4	265.			121.
9			36.0	740.5	3.5	1.87	1.70	84.	67.	4.	260.		20.2	122.
10			40.0	794.1	3.9	1.975	1.90	84.	68.	4	255.			121.
11			44.0	796.7	3.5	1.87	1.70	84.	69.	4	250.			120.
12				796.6										
FOF		1352.	48.0	802.317										
(W-D														

LEAK- 0.0 AT 6"

COMMENTS:

Sheet 1 of 2

Client GLEN GERY

W. O. No. 1005AA001

Plant BIGLER

Run No. G-5-3

Location OUTLET

Date 10/28/04

Operator BURGER

Sample Box No. _____

Meter Box No. _____

Meter ΔH _____

C Factor _____

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point

SKETCH

IMPS GEL
360 +17

Pitot Calibration _____

Thimble No. _____

Filter No. _____

Ambient Temp. °F 50°

Bar. Press. "Hg 29.40

Assumed Moisture % 7

Heater Box Setting, °F _____

Probe Tip Dia., In. .150

Probe Length _____

Probe Heater Setting _____

Avg. ΔP _____ Avg. ΔH _____

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	CLOCK TIME RUN	DRY GAS METER, CF	PITOT IN. H_2O ΔP	ORIFICE ΔH IN. H_2O DESIRED	ORIFICE ΔH IN. H_2O ACTUAL	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN., Hg GAUGE	BOX TEMP. °F	IMPINGER TEMP. °F	O_2	STACK TEMP. °F
A-1		1912.	0.0	808.844	1.30	1.14	0.64	62.	55.	1.	240.		20.4	120.
2			4.0	810.3	1.40	1.183	0.68	62.	56.	1.	240.			122.
3			8.0	812.2	1.10	1.049	0.54	66.	57.	2.	250.			122.
4			12.0	814.0	0.75	.866	0.37	70.	58.	2.	245.			121.
5			16.0	815.5	0.70	.837	0.34	70.	60.	1	250.		20.5	122.
6			20.0	816.9	0.45	.671	0.22	64.	62.	1	250.			122.
7			24.0	818.2	3.0	1.732	1.45	68.	60.	3.	245.			123
8			28.0	820.6	3.5	1.871	1.20	74.	62.	3.	240			123.
9			32.0	822.3	4.0	A	1.95	80.	63.	4.	245.			121.
10			36.0	824.9	4.0	A	1.95	82.	64.	4.	245.		20.3	120.
11			40.0	829.6	4.4	0.098	2.15	82.	66.	4.	260.			121.
12			44.0	832.9	4.4	0.098	2.15	90.	66.	4.	245.			
STOP		1600.	48.0	836.10										

DIFF C -29.2

CO_2 0.6
0.4

COMMENTS:

Client GLEN GERY

PARTICULATE FIELD DATA
(continued)

Sheet 2 of 2

W.O. No. 1005AL001

Plant BIGLER

Location OUTLET

Run No. G-S-3

Date 10/28/88

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	CLOCK TIME RUN	DRY GAS METER, CF	PITOT IN. H_2O ΔP	ORIFICE ΔH IN. H_2O DESIRED	ORIFICE ΔH IN. H_2O ACTUAL	DRY GAS TEMP. °F INLET	DRY GAS TEMP. °F OUTLET	PUMP VACUUM IN. Hg GAUGE	BOX TEMP °F	IMPINGER TEMP °F	O_2	STACK TEMP. °F
														118.
B-1		1603.	0.0	836.6	2.0	1.414	0.97	72.	64.	3.	245.		20.1	119.
2			4.0	838.6	2.0	1.414	0.97	70.	65.	3.	244.			120.
3			8.0	840.5	2.1	1.45	1.03	72.	64.	3.	244.			120.
4			12.0	842.9	2.5	1.58	1.20	74.	64.	3.	246.		20.3	118.
5			16.0	845.5	2.6	1.61	1.26	73.	64.	3.	246.			120.
6			20.0	848.2	2.8	1.58	1.26	74.	64.	3.	246.			120.
7			24.0	850.5	3.8	1.95	1.85	76.	64.	4.	246.			121.
8			28.0	853.6	4.3	2.07	2.10	78.	65.	4.	245.			121.
9			32.0	856.9	4.3	2.07	2.10	80.	65.	4.	246.			121.
10			36.0	860.0	4.0	9	1.95	79.	65.	4.	246.		20.5	119.
11			40.0	863.2	3.5	1.87	1.80	79.	65.	4.	245.			118.
12.			44.0	866.2	3.0	1.73	1.45	78.	65.	4.	245.			
6 OF 6		1652.	48.0	869.235										
END		1												

LEAK 0.0 CFM AT 6"

COMMENTS:

APPENDIX 6

CALIBRATION DATA

Gilbert/Commonwealth Inc.
Testing Services Group
METER BOX CALIBRATION

DATE: 11/20/04 METER BOX NUMBER: 2799

BAROMETRIC PRESS. (Pb) = 29.85 in. Hg CALIBRATED BY: Burger

GAS VOLUME			TEMPERATURES						
				Dry Gas Meter					
Orifice Manometer Setting (delta H) In. H2O	Wet Test Meter (Vw) cu. ft.	Dry Gas Meter (Vd) cu. ft.	Wet Test Meter (Tw) deg. F	Inlet (Tdi) deg. F	Outlet (Tdo) deg. F	Average (Td) deg. F	Time min.	Y1	delta H@1
0.5	5.000	5.072	72	79	73	76.0	12.55	0.99	1.76
1.0	5.000	5.140	72	89	77	83.0	9.17	0.98	1.85
1.5	10.000	10.427	72	103	85	94.0	15.60	1.00	1.86
2.0	10.000	10.521	72	112	92	102.0	13.50	0.98	1.97
3.0	10.000	10.712	72	118	97	107.5	11.50	0.99	2.13
4.0	10.000	10.804	72	122	100	111.0	10.12	0.98	2.14
						AVERAGE Y=		0.99	

FORMULAS

$$Y1 = \frac{(Vw)(Pb)(Td+460)}{(Vd)(Pb+(H/13.6))(Tw+460)}$$

$$delta\ H@1 = \frac{0.921}{(Kn)(Cp)}$$

$$Kn = Qn \sqrt{\frac{(Pb)(29)}{(Tdo+460)(delta\ H)}}$$

$$Qn = \frac{(Vd)(Tdo+460)}{(Time)(Td+460)}$$

Gilbert/Commonwealth Inc.
Testing Services Group
METER BOX CALIBRATION

DATE: 10/25/88 METER BOX NUMBER: 2795

BAROMETRIC PRESS. (Pb) = 29.74 in. Hg CALIBRATED BY: Burger

Orifice Manometer Setting (delta H) in. H2O	GAS VOLUME: Wet Test Meter (Vw) cu. ft.	GAS VOLUME: Dry Gas Meter (Vd) cu. ft.	TEMPERATURES: Wet Test Meter (Tw) deg. F	TEMPERATURES: Dry Gas Meter Inlet (Tdi) deg. F	TEMPERATURES: Dry Gas Meter Outlet (Tdo) deg. F	TEMPERATURES: Dry Gas Meter Average (Td) deg. F	Time min.	Yi	delta H@i
0.5	5.000	5.072	70	78	72	75.0	12.58	0.99	1.77
1.0	5.000	5.148	70	90	76	83.0	9.20	0.99	1.88
1.5	10.000	10.427	70	101	83	92.0	15.55	1.00	2.00
2.0	10.500	11.135	70	111	90	100.5	14.40	0.99	2.06
3.0	10.250	11.043	70	116	96	106.0	11.55	0.98	2.02
4.0	10.000	10.884	70	120	98	109.0	10.10	0.98	2.13
							AVERAGE Yi:	0.99	

FORMULAS

$$Yi = \frac{(Vw)(Pb)(Td+460)}{(Vd)(Pb+(P/13.6))(Tw+460)}$$

$$delta\ H@i = \frac{0.921}{(Ka)(Km)}$$

$$Km = Qw \left| \frac{(Pb)(29)}{(Tdo+460)(delta\ P)} \right|$$

GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS
READING, PA.

CLIENT

PROJECT

FILING CODE

W.O. | PAGE 8F

ENGINEER

DATE

REVIEWED BY

DATE 10/15/85

SUBJECT

DESCRIPTION OF Pot Meter-Thermocouple Calibration

Pot Meter #	1
Thermocouple Type	K
Ice Bath Temperature °F	33
Certified Mercury Bulb °F	34
Ambient Temperature °F	72
Certified Mercury Bulb °F	71.5
Boiling H_2O °F	
Certified Mercury Bulb °F	
Hot Synthetic Oil °F	365
Certified Mercury Bulb °F	363

Remarks:

FILING CODE

GILBERT ASSOCIATES, INC.
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READING, PA.

CLIENT

PROJECT

FILING CODE

W.O. | PAGE OF

SYSTEM

CALCULATION FOR

Pot Meter-Thermocouple Calibration

ENGINEER

DATE

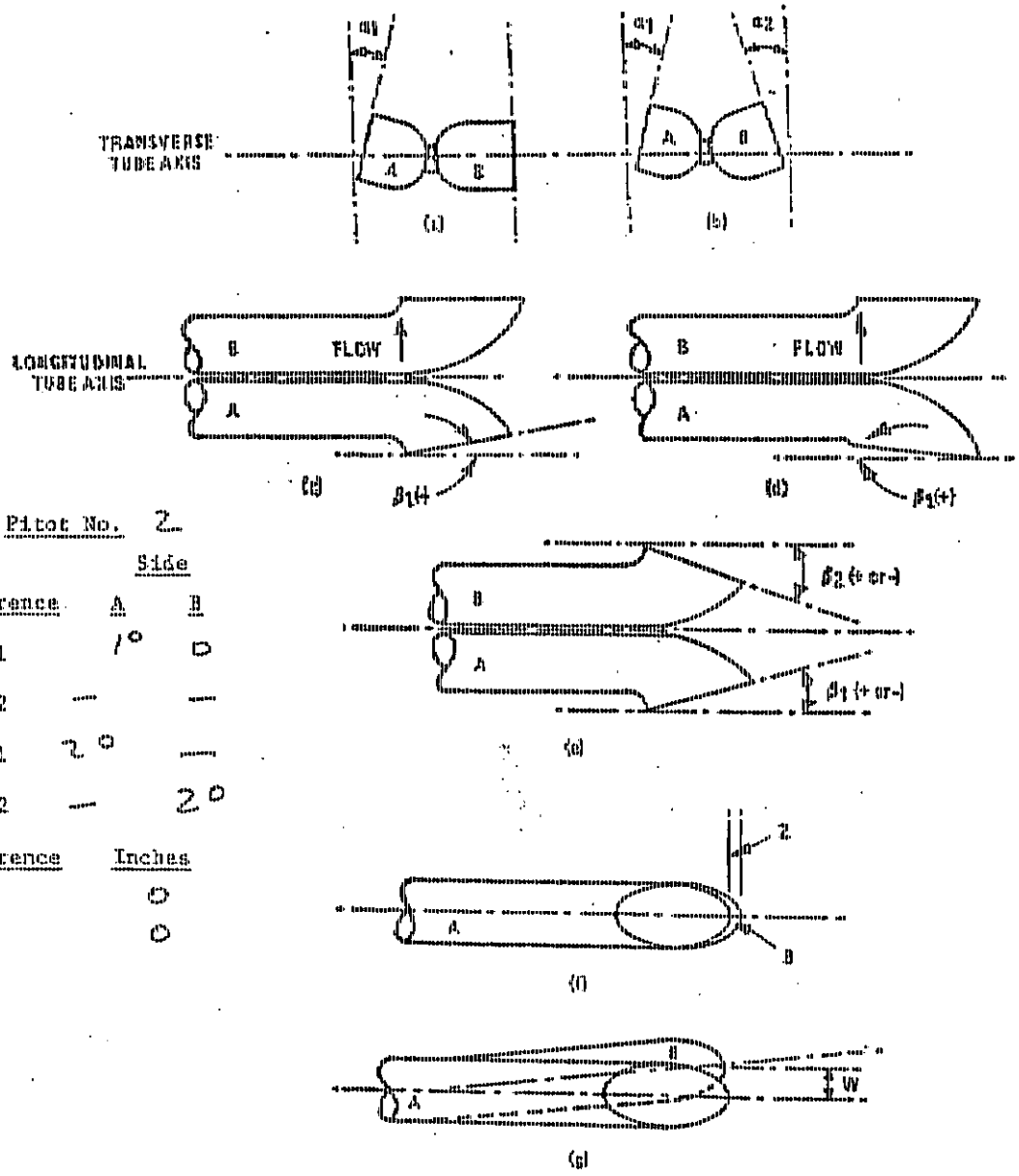
RECHECKED BY

DATE 10/9/58

Pot Meter #	1
Thermocouple Type	K
Ice Bath Temperature °F	33
Certified Mercury Bulb °F	34
Ambient Temperature °F	68
Certified Mercury Bulb °F	67
Boiling H_2O °F	
Certified Mercury Bulb °F	
Hot Synthetic Oil °F	363
Certified Mercury Bulb °F	360

Remarks:

FILING CODE

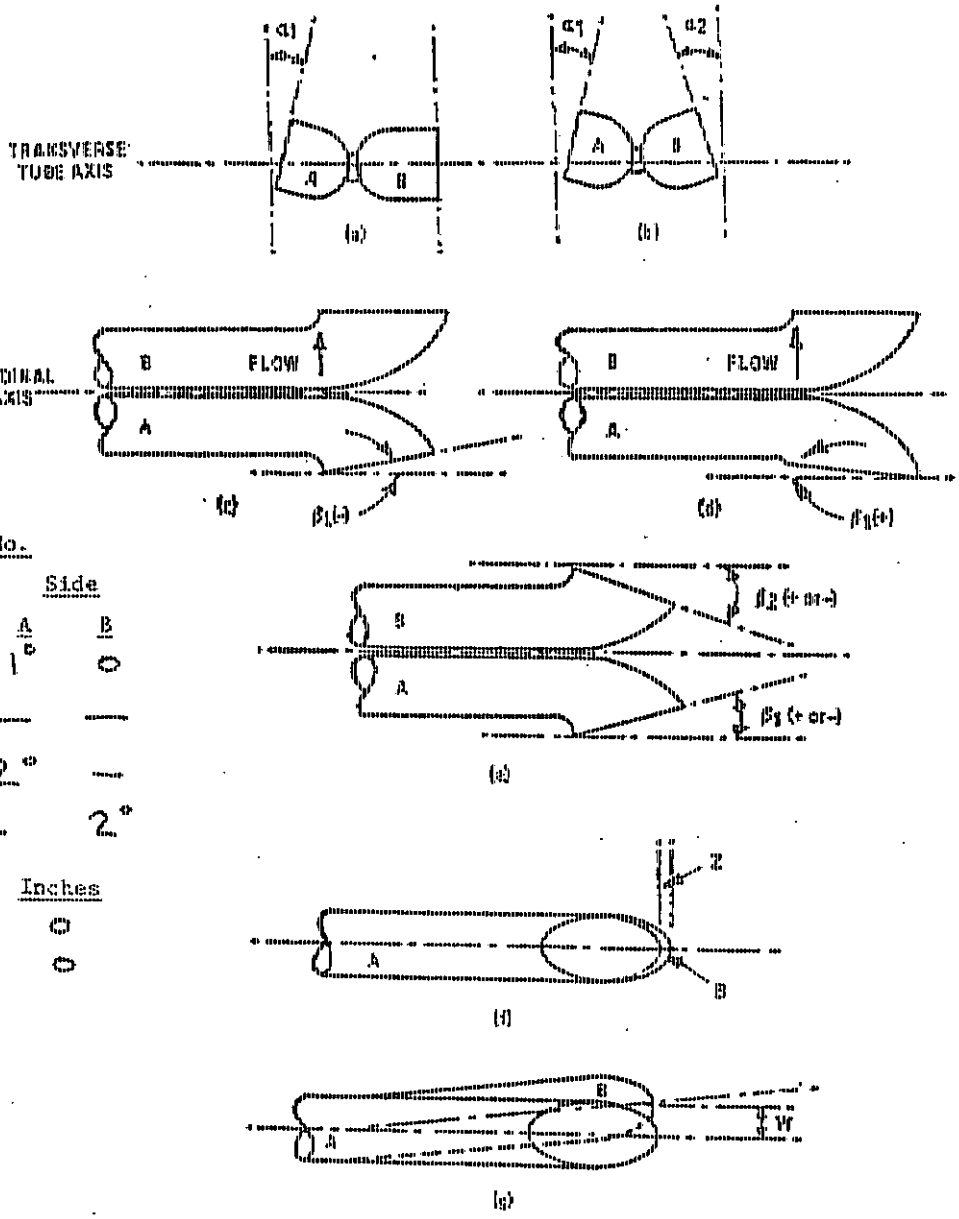


Pitot No. 2

Reference	Side A	Side B
A_1	1°	0
A_2	—	—
B_1	2°	—
B_2	—	2°

Reference	Inches
Z	0
W	0

Figure 2-3. Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect the baseline value of $C_p(s)$ so long as α_1 and $\alpha_2 < 10°$, β_1 and $\beta_2 < 5°$, $z < 0.32$ cm (1/8 in.) and $w <$ 0.08 cm (1/32 in.) (citation 11 in Section 6).



Pitot No.

Reference	Side A	Side B
A_1	1°	0
A_2	—	—
B_1	2°	—
B_2	—	2°

Reference	Inches
Z	0
W	0

Figure 2-3. Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect the baseline value of $C_p(s)$ so long as α_1 and $\alpha_2 < 10°$, β_1 and $\beta_2 < 5°$, $z < 0.32$ cm (1/8 in.) and $w < 0.03$ cm (1/32 in.) (citation 11 in Section 8).

APPENDIX 7

COMPUTER PRINTOUT

(Flue Gas Characteristics, Isokinetic Calculations, and Test Results for Particulates)

ISOKINETIC SAMPLING ANALYSIS

PROGRAM - I005

CLIENT NAME - GLEN-GERY

PROCESS - SANDUST DRYER

SAMPLING POINT- STACK

PLANT LOCATION - BIGLER PA

CONTROL EQUIPMT - NONE

POLLUTANTS - PARTICULATE

GILBERT ASSOCIATES, INC.
READING, PENNA.
100526001 11/21/88

RESULTS OF FLOW AND ISOKINETIC CALCULATIONS -

			G-S-1	G-S-2	G-S-3
RUN NUMBER -			G-S-1	G-S-2	G-S-3
DATE OF RUN -			10-28-88	10-28-88	10-28-88
TIME AT BEGINNING OF RUN			842.0	1212.0	1512.0
TIME AT END OF RUN			944.0	1352.0	1652.0
DN	SAMPLING NOZZLE DIAMETER	IN.	0.150	0.150	0.150
Y	DRY GAS METER FACTOR	-	0.990	0.990	0.990
PB	BAROMETRIC PRESSURE	IN. HG. ABS.	29.38	29.38	29.40
TT	NET TIME OF TEST	MIN.	60.0	96.0	96.0
VM	SAMPLED GAS VOLUME	CU. FT.	48.748	58.927	60.411
TM	AVG. GAS METER TEMPERATURE	DEGR. F.	69.	68.	68.
PM	AVG. ORIFICE PRESSURE DROP	IN. H2O	2.30	1.27	1.33
VMSTD	VOLUME OF DRY GAS SAMPLED	DSCF	47.460	57.356	58.961
VW	H2O FROM IMPINGER, SILICA GEL	ML	56.0	90.0	77.0
VWGAS	H2O COLLECTED AT STD.COND.	STD. CU. FT.	2.638	4.239	3.627
M	STACK GAS MOISTURE BY VOLUME	PERCENT	5.3	6.9	5.8
	CO2 IN DRY STACK GASES	PERCENT	0.5	0.5	0.5
	O2 IN DRY STACK GASES	PERCENT	20.4	20.4	20.4
	CO IN DRY STACK GASES	PERCENT	0.0	0.0	0.0
	N2 IN DRY STACK GASES	PERCENT	79.1	79.1	79.1
MD	MOL FRACTION OF DRY GAS	-	0.95	0.93	0.94
MWD	MOL WGT. OF STACK GAS, DRY	-	28.90	28.90	28.90
EA	EXCESS AIR	PERCENT	4228.8	4228.8	4228.8
MW	MOL WGT. OF STACK GAS, WET	-	28.32	28.15	28.26
AS	STACK AREA	SQ. IN.	1017.9	1017.9	1017.9
PST	STATIC PRESSURE OF STACK GAS	IN. HG.	-2.15	-2.17	-2.15
PS	STACK GAS PRESSURE	IN. HG. ABS.	27.15	27.13	27.25
TS	AVG. STACK TEMPERATURE	DEGR. F.	125.	121.	121.
CP	PITOT TUBE COEFFICIENT	-	0.840	0.840	0.840
VS	STACK GAS VELOC., STACK COND.	AFPM	7993.	5845.	5969.
QS	STACK GAS VOL., DRY STD. COND.	DSCFM	44001.	31804.	33050.
QA	STACK GAS VOLUMN, STACK COND.	ACFM	56499.	41315.	42192.
I	ISOKINETIC RATIO	PERCENT	103.3	107.9	106.7

GRAIN LOADING AND EMISSION CALCULATIONS -

RUN NUMBER -		G-S-1	G-S-2	G-S-3
DATE OF RUN -		10-28-88	10-28-88	10-28-88
PROBE AND CYCLONE	MILLIGRAMS	17.40	18.90	25.40
	GRAINS/ACF	0.0044	0.0039	0.0052
	GRAINS/SCF	0.0056	0.0051	0.0068
	LB/HR - CONC	2.13	1.38	1.86
	LB/HR - AREA	2.21	1.50	2.01
	LB/HR - AVG	2.17	1.44	1.95
FILTER	MILLIGRAMS	51.00	51.10	59.30
TOTAL - ABOVE ITEMS	MILLIGRAMS	68.40	70.00	84.70
	GRAINS/ACF	0.0172	0.0144	0.0175
	GRAINS/SCF	0.0222	0.0188	0.0221
	LB/HR - CONC	8.37	5.12	6.27
	LB/HR - AREA	8.67	5.55	6.71
	LB/HR - AVG	8.52	5.34	6.49
TOTAL - INCL. IMPINGER CATCH	MILLIGRAMS	79.20	76.40	89.80
	GRAINS/ACF	0.0199	0.0157	0.0183
	GRAINS/SCF	0.0257	0.0205	0.0235
	LB/HR - CONC	9.69	5.59	6.64
	LB/HR - AREA	10.04	6.06	7.12
	LB/HR - AVG	9.87	5.82	6.88

NOTE; filter includes back half rinse.

LISTING OF FIELD DATA AND RESULTS AT EACH POINT

POINT NO.	POINT DISTANCE (IN)	CLOCK TIME	TIME INCRMT (MINS)	DRY GAS METER (CF)	ORIFICE DELTA H (IN. H2O)	GAS TEMPERATURES IN (DEGREES F)	GAS TEMPERATURES OUT (DEGREES F)	VELOCITY HEAD (IN. H2O)	STACK PRESS (IN. H2O)	STACK TEMP (DEGR. F)	(VEL. HD.)X (STACK TEMP.) (IN. H2O-DEG R)	SQR ROOT OF PREVIOUS RESULT	STACK GAS VEL (AFPM)
RUN NO. - G-S-1													
A-1	0.0	842.0	0.0	693.970	1.15	52.0	52.0	2.400	-29.30	122.0	1396.80	37.37	5808.3
A-2	0.0	844.5	2.5	695.280	1.10	54.0	52.0	2.500	-29.30	124.0	1460.00	38.21	5938.2
A-3	0.0	847.0	5.0	696.600	1.05	56.0	52.0	2.200	-29.30	125.0	1287.00	35.87	5575.3
A-4	0.0	849.5	7.5	698.600	0.71	61.0	52.0	1.500	-29.30	125.0	877.50	29.62	4603.7
A-5	0.0	852.0	10.0	699.500	0.52	62.0	52.0	1.100	-29.30	126.0	644.60	25.39	3945.7
A-6	0.0	854.5	12.5	700.600	0.28	64.0	54.0	0.600	-29.30	125.0	351.00	18.74	2911.6
A-7	0.0	857.0	15.0	701.300	2.15	65.0	54.0	4.500	-29.30	125.0	2632.50	51.31	7973.8
A-8	0.0	859.5	17.5	703.300	2.85	72.0	56.0	6.000	-29.30	125.0	3510.00	59.25	9207.3
A-9	0.0	902.0	20.0	705.300	2.85	78.0	57.0	6.000	-29.30	125.0	3510.00	59.25	9207.3
A-10	0.0	904.5	22.5	707.700	3.35	80.0	58.0	7.200	-29.30	124.0	4204.80	64.84	10077.5
A-11	0.0	907.0	25.0	710.100	3.60	82.0	60.0	7.500	-29.30	123.0	4372.50	66.12	10276.5
A-12	0.0	909.5	27.5	712.700	3.80	85.0	61.0	7.900	-29.30	123.0	4605.70	67.87	10547.0
STOP		912.0	30.0	716.000									
B-1	0.0	914.0	0.0	716.000	1.80	76.0	62.0	3.800	-29.30	122.0	2211.60	47.03	7388.6
B-2	0.0	916.5	2.5	717.500	1.70	80.0	64.0	3.500	-29.30	123.0	2048.50	45.17	7028.2
B-3	0.0	919.0	5.0	719.400	1.80	80.0	64.0	3.800	-29.30	126.0	2226.80	47.19	7333.7
B-4	0.0	921.5	7.5	721.000	2.60	82.0	64.0	5.500	-29.30	127.0	3228.50	56.82	8830.4
B-5	0.0	924.0	10.0	723.100	1.92	84.0	65.0	4.000	-29.30	128.0	2352.00	48.50	7537.0
B-6	0.0	926.5	12.5	725.400	3.30	84.0	66.0	7.000	-29.30	127.0	4109.00	64.10	9962.1
B-7	0.0	929.0	15.0	727.700	3.55	88.0	67.0	7.500	-29.30	127.0	4402.50	66.35	10311.7
B-8	0.0	931.5	17.5	730.200	2.95	89.0	68.0	6.200	-29.30	126.0	3633.20	60.28	9367.5
B-9	0.0	934.0	20.0	732.600	2.95	90.0	68.0	6.200	-29.30	125.0	3627.60	60.22	9359.5
B-10	0.0	936.5	22.5	735.200	3.30	91.0	70.0	7.000	-29.30	127.0	4109.00	64.10	9962.1
B-11	0.0	939.0	25.0	737.100	2.80	92.0	70.0	6.000	-29.30	124.0	3504.00	59.19	9199.5
B-12	0.0	941.5	27.5	739.600	3.10	92.0	70.0	6.500	-29.30	124.0	3796.00	61.61	9575.1
STOP		944.0	30.0	742.718									
			TT	VM	FM		TM		PST	TS			
OVERALL RESULTS			60.0 (NET)	48.746 (NET)	2.30 (AVG)		68.7 (AVG)	4.850 (AVG)	-29.30 (AVG)	124.9 (AVG)	2837.18 (AVG)	51.43 (AVG)	7993.3 (AVG)

LISTING OF FIELD DATA AND RESULTS AT EACH POINT

POINT NO.	POINT DISTANCE (IN)	CLOCK TIME	TIME INCRMT (MINS)	DRY GAS METER (CF)	ORIFICE DELTA H (IN. H2O)	GAS TEMPERATURES IN (DEGREES F)	GAS TEMPERATURES OUT (DEGREES F)	VELOCITY HEAD (IN. H2O)	STACK PRESS (IN. H2O)	STACK TEMP (DEGR. F)	(VEL. HD.)X (STACK TEMP.) (IN. H2O-DEG R)	SQR ROOT OF PREVIOUS RESULT	STACK GAS VEL (AFPM)
RUN NO. - G-5-2													
A-1	0.0	1212.0	0.0	744.390	0.59	52.0	52.0	1.200	-29.50	120.0	696.00	26.38	4114.0
A-2	0.0	1216.0	4.0	746.100	0.64	56.0	52.0	1.300	-29.50	121.0	755.30	27.48	4285.6
A-3	0.0	1220.0	8.0	747.500	0.54	60.0	54.0	1.100	-29.50	122.0	640.20	25.30	3945.6
A-4	0.0	1224.0	12.0	749.400	0.35	63.0	54.0	0.720	-29.50	121.0	418.32	20.45	3189.4
A-5	0.0	1228.0	16.0	750.900	0.37	64.0	55.0	0.760	-29.50	124.0	443.84	21.07	3285.3
A-6	0.0	1232.0	20.0	752.380	0.19	65.0	56.0	0.480	-29.50	124.0	235.60	15.28	2383.4
A-7	0.0	1236.0	24.0	753.400	1.35	65.0	58.0	2.800	-29.50	122.0	1629.60	40.37	6295.0
A-8	0.0	1240.0	28.0	755.600	1.55	72.0	58.0	3.200	-29.50	124.0	1868.80	43.23	6741.2
A-9	0.0	1244.0	32.0	758.700	1.55	76.0	60.0	3.200	-29.50	123.0	1865.40	43.19	6735.4
A-10	0.0	1248.0	36.0	761.500	1.95	78.0	62.0	4.000	-29.50	123.0	2332.00	48.29	7530.4
A-11	0.0	1252.0	40.0	764.400	1.95	80.0	63.0	4.000	-29.50	121.0	2324.00	48.21	7517.5
A-12	0.0	1256.0	44.0	767.400	2.15	81.0	64.0	4.400	-29.50	120.0	2552.00	50.52	7877.6
STOP		1301.0	48.0	771.300									
B-1	0.0	1303.0	0.0	771.300	0.78	74.0	64.0	1.600	-29.50	119.0	926.40	30.44	4746.3
B-2	0.0	1307.0	4.0	773.000	0.93	78.0	66.0	1.900	-29.50	120.0	1102.00	33.20	5176.6
B-3	0.0	1311.0	8.0	775.100	0.97	76.0	66.0	2.000	-29.50	119.0	1158.00	34.03	5306.5
B-4	0.0	1315.0	12.0	777.600	1.07	78.0	67.0	2.200	-29.50	118.0	1271.60	35.66	5560.7
B-5	0.0	1319.0	16.0	779.900	1.07	78.0	66.0	2.200	-29.50	120.0	1276.00	35.72	5570.3
B-6	0.0	1323.0	20.0	781.900	0.97	78.0	66.0	2.000	-29.50	123.0	1166.00	34.15	5324.8
B-7	0.0	1327.0	24.0	784.200	2.00	78.0	66.0	4.100	-29.50	123.0	2390.30	48.89	7624.0
B-8	0.0	1331.0	28.0	787.200	2.05	78.0	66.0	4.200	-29.50	121.0	2440.20	49.40	7703.1
B-9	0.0	1335.0	32.0	790.500	2.15	82.0	66.0	4.400	-29.50	121.0	2556.40	50.56	7884.4
B-10	0.0	1339.0	36.0	794.100	1.70	84.0	67.0	3.500	-29.50	122.0	2037.00	45.13	7038.8
B-11	0.0	1343.0	40.0	796.700	1.90	84.0	68.0	3.900	-29.50	121.0	2265.90	47.60	7422.9
B-12	0.0	1347.0	44.0	799.600	1.70	84.0	68.0	3.500	-29.50	120.0	2030.80	45.06	7025.9
STOP		1352.0	48.0	803.317									
OVERALL RESULTS			TT 96.0 (NET)	VM 58.927 (NET)	PM 1.27 (AVG)		TM 67.7 (AVG)	2.607 (AVG)	PSI -29.50 (AVG)	TS 121.3 (AVG)	1515.79 (AVG)	37.48 (AVG)	5845.2 (AVG)

LISTING OF FIELD DATA AND RESULTS AT EACH POINT

POINT NO.	POINT DISTANCE (IN)	CLOCK TIME	TIME INCRMT (MINS)	DRY GAS METER (CF)	ORIFICE DELTA H (IN. H2O)	GAS TEMPERATURES IN (DEGREES F)	GAS TEMPERATURES OUT (DEGREES F)	VELOCITY HEAD (IN. H2O)	STACK PRESS (IN. H2O)	STACK TEMP (DEGR. F)	(VEL. HD.)X (STACK TEMP.)	SQR ROOT OF PREVIOUS RESULT (IN. H2O-DEG R)	STACK GAS VEL (AFPM)
RUN NO. -	G-S-3												
A-1	0.0	1512.0	0.0	808.844	0.84	62.0	55.0	1.300	-29.20	120.0	754.80	27.46	4263.4
A-2	0.0	1516.0	4.0	810.300	0.68	63.0	56.0	1.400	-29.20	121.0	813.40	28.52	4428.1
A-3	0.0	1520.0	8.0	812.300	0.54	66.0	57.0	1.100	-29.20	122.0	640.20	25.30	3928.5
A-4	0.0	1524.0	12.0	814.000	0.39	70.0	58.0	0.750	-29.20	122.0	436.50	20.89	3243.8
A-5	0.0	1528.0	16.0	815.500	0.34	70.0	60.0	0.700	-29.20	121.0	406.70	20.17	3131.2
A-6	0.0	1532.0	20.0	816.900	0.22	68.0	60.0	0.450	-29.20	122.0	261.90	16.18	2512.7
A-7	0.0	1536.0	24.0	818.200	1.45	68.0	60.0	3.000	-29.20	122.0	1746.80	41.79	6487.7
A-8	0.0	1540.0	28.0	820.600	1.70	74.0	62.0	3.500	-29.20	123.0	2040.50	45.17	7013.5
A-9	0.0	1544.0	32.0	823.300	1.95	80.0	63.0	4.000	-29.20	123.0	2332.00	48.29	7497.8
A-10	0.0	1548.0	36.0	826.800	1.95	82.0	64.0	4.000	-29.20	121.0	2324.00	48.21	7484.9
A-11	0.0	1552.0	40.0	829.600	2.15	82.0	66.0	4.400	-29.20	120.0	2552.00	50.52	7843.5
A-12	0.0	1556.0	44.0	832.900	2.15	80.0	66.0	4.400	-29.20	121.0	2556.40	50.56	7850.2
STOP		1600.0	48.0	836.600									
B-1	0.0	1603.0	0.0	836.600	0.97	72.0	64.0	2.000	-29.20	118.0	1156.00	34.00	5278.9
B-2	0.0	1607.0	4.0	838.600	0.97	70.0	65.0	2.000	-29.20	119.0	1158.00	34.05	5283.5
B-3	0.0	1611.0	8.0	840.500	1.05	72.0	64.0	2.100	-29.20	120.0	1218.00	34.90	5418.7
B-4	0.0	1615.0	12.0	842.900	1.20	74.0	64.0	2.500	-29.20	120.0	1450.00	38.08	5912.2
B-5	0.0	1619.0	16.0	845.500	1.26	73.0	64.0	2.600	-29.20	118.0	1502.80	38.77	6018.9
B-6	0.0	1623.0	20.0	848.200	1.20	74.0	64.0	2.500	-29.20	120.0	1450.00	38.08	5912.2
B-7	0.0	1627.0	24.0	850.500	1.85	76.0	64.0	3.800	-29.20	120.0	2204.00	46.95	7289.1
B-8	0.0	1631.0	28.0	853.600	2.10	78.0	65.0	4.300	-29.20	121.0	2498.30	49.98	7760.5
B-9	0.0	1635.0	32.0	856.900	2.10	80.0	65.0	4.300	-29.20	121.0	2498.30	49.98	7760.5
B-10	0.0	1639.0	36.0	860.000	1.95	78.0	65.0	4.000	-29.20	121.0	2326.00	48.21	7484.9
B-11	0.0	1643.0	40.0	863.200	1.70	78.0	65.0	3.500	-29.20	119.0	2026.50	45.02	6989.4
B-12	0.0	1647.0	44.0	866.200	1.45	78.0	65.0	3.000	-29.20	118.0	1734.00	41.64	6465.4
STOP		1652.0	48.0	869.255									
OVERALL RESULTS			TT 96.0 (NET)	VM 60.411 (NET)	PM 1.33 (AVG)		TM 66.1 (AVG)	2.735 (AVG)	PSI -29.20 (AVG)	TS 120.5 (AVG)	1586.81 (AVG)	38.45 (AVG)	5969.1 (AVG)

APPENDIX 3

SAMPLE CALCULATIONS

SAMPLE CALCULATIONS

Particulate Isokinetic Sampling

I. Calculations for stack volume and Isokinetic Ratio

Time	Dry Gas Meter Ft^3	Pitot ΔP, In.H_2O	Orifice ΔH, In.H_2O	Dry Gas Temp °F In	Out	Stack Static Pressure In. H_2O	Stack Temp °F
T	VM	ΔP	PM	TMI	TMO	PST	TS

1. DN = Nozzle Diameter, inches
2. PB = Barometric Pressure, inches Hg
3. TT = Net Sampling Time, minutes
4. VM = VM final - VM initial = Sample Gas Volume, ft^3
5. TM = Average Dry Gas Temperature at Meter, °F

$$TM = \frac{\text{Avg. TMI} + \text{Avg. TMO}}{2}$$

6. PM = Average Orifice Pressure Drop, inches H_2O

$$PM = \text{Avg. } \Delta H$$

7. Volume of dry gas sampled at standard conditions[a], DSCF

$$VMSTD = \frac{17.65 \times VM \times Y \left(BP + \frac{PM}{13.6}\right)}{(TM + 460)}$$

8. VW = Total Water Collected = gm H_2O Silica gel + ml Imp. H_2O = ml
9. Volume of water vapor at standard conditions[b], SCF

$$VW \text{ gas} = 0.0471 \times VW = SCF$$

10. Percent moisture in stack gas

$$\%\ M = \frac{100 \times VW \text{ gas}}{VM \text{ STD} + VW \text{ gas}}$$

11. Mole fraction of dry gas

$$MD = \frac{100 - \%M}{100}$$

12. Molecular weight of dry stack gas

$$MWD = (\%CO_2 \times \frac{44}{100}) + (\%O_2 \times \frac{32}{100}) + \left[(\%CO + \%N_2) \times \frac{28}{100} \right]$$

12A. %EA = % Excess Air $= \frac{[(\% O_2) - 0.5 (\%CO)]}{0.264 (\%N_2) - [(\%O_2) + 0.5\% (CO)]} \times 100$

13. Molecular weight of wet stack gas

$$MW = MWD \times MD + 18 (1 - MD)$$

14. AS = Stack Area, square inches

15. PS = Stack Pressure, inches Hg

$$PS = PB \pm \text{Avg. PST}$$

NOTE: PST in. Hg. $= \frac{\text{PST in. } H_2O}{13.6}$

16. TS = Average Stack Temperature, °F

TS = Average TS

17. SDE = Average $\sqrt{\text{Velocity Head } (\Delta P) \times (\text{Stack Temperature} + 460)}$

(Calculated each line)

$$SDE = \text{Avg } \sqrt{\Delta P \times (TS + 460)}$$

18. Stack gas velocity at stack conditions, fpm

$$VS = 5130 \times Cp \times \text{Avg}(SDE) \times \left[\frac{1}{PS \times MW}\right]^{1/2} = FPM$$

Cp = pitot tube coefficient

19. Stack gas volumetric flow rate at standard conditions[c], DSCFM

$$Q_s = \frac{0.123 \times VS \times AS \times MD \times PS}{(TS + 460)} = DSCFM$$

20. Stack gas volumetric flow rate at stack conditions, ACFM

$$Q_a = \frac{.05667 \times QS (TS + 460)}{PS \times MD} = ACFM$$

21. Percent isokinetic

$$\%I = \frac{1,032 \times (TS + 460) \times VMSTD}{VS \times TT \times PS \times MD \times (DN)^2}$$

NOTES: [a]Dry standard cubic feet at 69°F, 29.92 in. Hg.

[b]Standard conditions at 68°F, 29.92 in. Hg.

[c]Dry standard cubic feet per minute at 68°F, 29.92 in. Hg.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF AIR QUALITY CONTROL

8/25/88

GLEN-GERY CORPORATION
BIGLER, PENNSYLVANIA

PROCESS DESCRIPTION

Glen-Gery Corporation operates two brick kilns at their Bigler, Pennsylvania facility. Stack Test Nos. 3484A and B were conducted for total sulfates and SO_2, respectively, in the stack which services Kiln No. 1.

This kiln is a continuous push, tunnel type, with a capacity of 23 brick cars. Each car holds approximately 2,300 "ECONO-Bricks." During the test program 100% clay bricks were being fired.

The brick cars are loaded through a door at the feed end of the kiln. Four 7 1/2 horsepower recirculation fans provide even heating of the bricks as they approach the firing zones within the kiln. The kiln itself consists of two preheating zones, two combustion zones, a quick cool zone and the primary cooling zone. Preheat zone No. 1 contains six natural gas burners (three per side) while preheat zone No. 2 contains 16 burners (eight on a side). Combustion zone Nos. 1 and 2 each have 12 burners (six per side). Following the combustion zones the brick cars travel through the air balance point which isolates the heating zones from the cooling zones. The quick cool zone contains two 7 1/2 horsepower fans which blow a mixture of ambient and hot air directly down on the bricks to initiate cooling. The cars then enter the primary cooling zone equipped with a single 7 1/2 horsepower fan that utilizes 100% ambient air for the final cooling before the bricks are discharged from the kiln. Hot air from the cooling zones is discharged through a 15 horsepower fan to a drying room where the bricks await entry into the kiln.

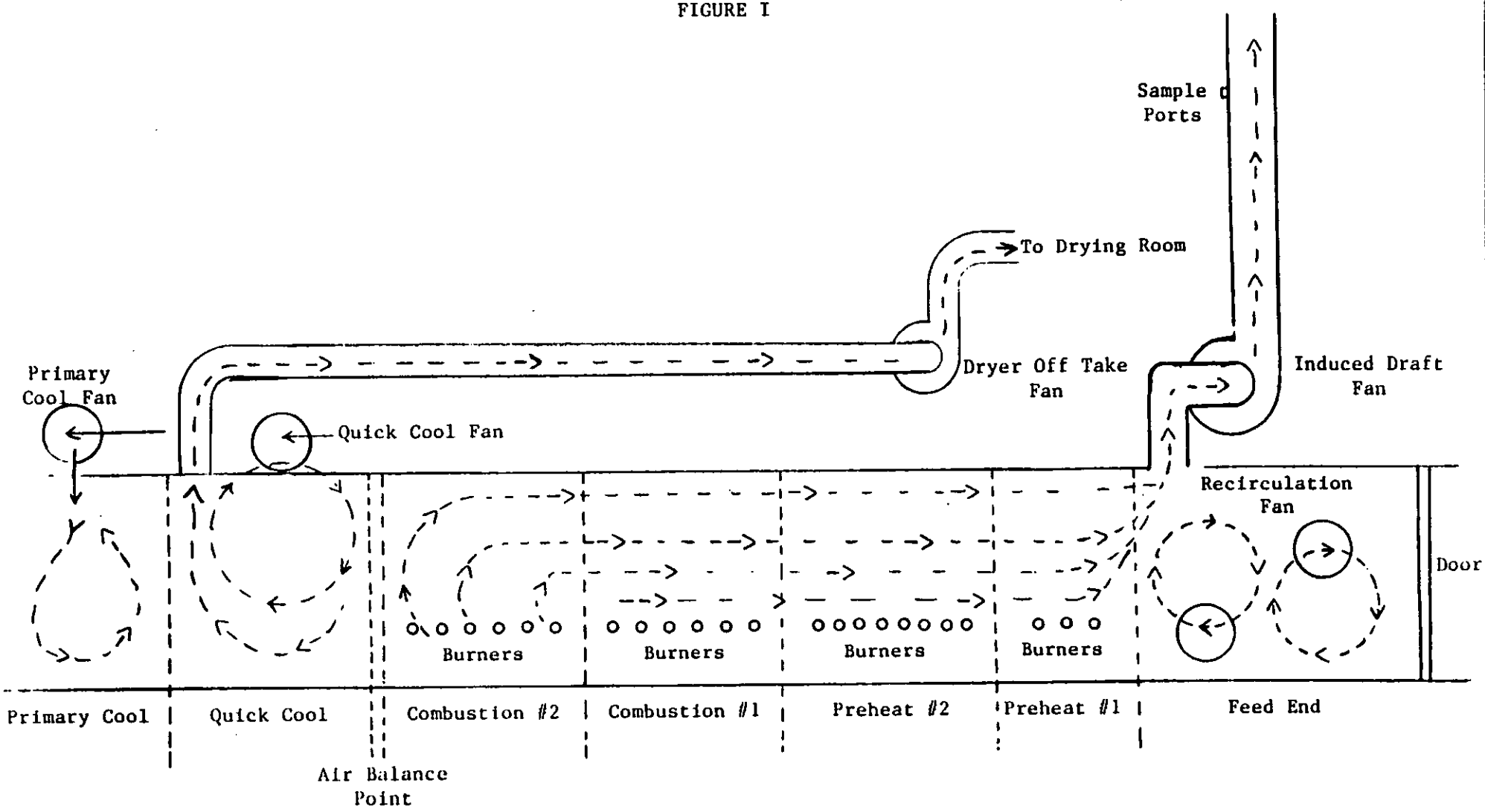
Combustion air is provided through the natural gas burners by a 20 horsepower induced draft fan located near the feed end of the kiln. Effluent from the kiln is discharged to the atmosphere through a 27 1/2 inch square brick stack having an exit point approximately 30 feet above grade.

A process flow diagram appears in Figure 1.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF AIR QUALITY CONTROL

GLEN-GERY CORPORATION
BIGLER, PENNSYLVANIA

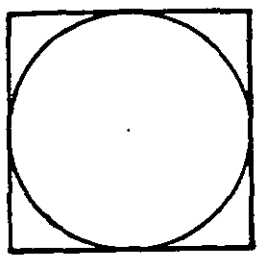
PROCESS FLOW DIAGRAM
FIGURE I



TEST DATA SUMMARY

	SULFATES	PART.	SO2
Test No.	3484A	3484AA	3484B
Test Date	11/15/84	11/15/84	11/15/84
No. of Traverse Points/Sampling Points	21/21	21/21	21/6
Stack or Duct Area at Sampling Plane (sq ft) ....A	5.25	5.25	5.25
Barometric Pressure (preliminary traverse) (in. Hg) ....Pbp	28.40	28.40	28.40
(sample traverse) (in. Hg) ....Pbs	28.40	28.40	28.40
Condensate Volume (ml) Vlc	79.0	79.0	47.0
Avg. Pressure Drop at Orifice (in. WG) ....DH	1.8	1.8	1.6
Avg. Meter Temperature (deg F) ....Tm	76	76	72
Volume of Water Vapor Condensed (scf) ....Vwc	3.7	3.7	2.2
Meter Y-factor ....Yf	1.01	1.01	1.01
Volume of Gas Sampled (dscf) ....Vms	65.8	65.8	43.1
Total Sample Time (min) ....o	81.0	81.0	60.0
Moisture in Gas Stream (%) ....Bws	5.3	5.3	5.3
Dry Molecular Wt. (preliminary traverse) (lb/lb-mole) ....Mdp	28.90	28.90	28.90
(sample traverse) (lb/lb-mole) ....Mds	29.25	29.25	28.93
Molecular Wt. (preliminary traverse) (lb/lb-mole) ....Msp	28.32	28.32	28.32
(sample traverse) (lb/lb-mole) ....Mss	28.65	28.65	28.35
Pitot Tube Coefficient (preliminary traverse) ....Cpp	0.842	0.842	0.842
(sample traverse) ....Cps	0.842	0.842	0.846
Average Corrected Velocity (preliminary traverse) (fps) ...Vsp	60.4	60.4	60.4
(sample traverse) (fps) ....Vss	58.9	58.9	62.2
Stack Static Pressure (in. WG) ....Pg	-0.35	-0.35	-0.35
Average Stack Temperature (preliminary traverse) (deg F) ..Tsp	287	287	287
(sample traverse) (deg F) ....Tss	295	295	294
Volumetric Flow Rate (preliminary traverse) (dscfm) ....Qsp	12,100	12,100	12,100
(sample traverse) (dscfm) ....Qss	11,700	11,700	12,400
Sample Nozzle Diameter (in.) ....Dn	0.252	0.252	0.251
Percent Isokinetic Sampling (%) I	105.5	105.5	NA
Weight Collected (gm) ....Mn	0.2053	0.0412	0.7797
Pollutant Concentration (gr/dscf) ....Cs	0.048	0.010	0.279
Allowable Pollutant Concentration (gr/dscf)	NA	0.04	NA
Pollutant Mass Emission Rate (lb/hr) ....E	5.0	1.0	28.9
Allowable Mass Emission Rate (lb/hr)	NA	NA	NA
Pollutant Concentration (ppm) C	28	NA	241
Allowable Pollutant Concentration (ppm)	NA	NA	500
Heat Input To Combustion Unit (mm btu/hr) ....HI	NA	NA	NA
Pollutant Mass Emission Rate (lb/mm btu) ....E'	NA	NA	NA
Allowable Mass Emission Rate (lb/mm btu)	NA	NA	NA

SAMPLING LOCATION INFORMATION



Distance from wall to point (in.):

1. 1 15/16	4. 13 3/4	7. 25 9/16	10.
2. 5 7/8	5. 17 11/16	8.	11.
3. 9 13/16	6. 21 5/8	9.	12.

Flue configuration: 27.5IN.X27.5IN. Area: 5.25 sq.ft.
Port location: IN STACK APPROX. 10 FT. DOWNSTREAM FROM I.D. FAN
No. of ports: THREE 9 IN. O.C.

COMMONWEALTH OF PENNSYLVANIA
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BUREAU OF AIR QUALITY CONTROL

GLEN-GERY CORPORATION
BIGLER, PENNSYLVANIA

DISCUSSION

Stack Test No. 3484A was conducted utilizing standard procedures for the isokinetic collection of a particulate sample as set forth in Chapter 139 of the Pennsylvania Department of Environmental Resources' Rules and Regulations. A 21-point velocity traverse was conducted in the test stack in order to determine the effluent volumetric flow rate. A 21-point sampling program with a sampling period of four minutes per point was conducted for a total sample time of 84 minutes.

The primary purpose of Stack Test No. 3484A was to determine the total sulfates in the effluent eminating from the test stack. The results indicate a sulfate concentration of 28 ppm. Particulate analysis (3484AA) of the sample indicate a particulate concentration of 0.01 gr./dscf. The allowable particulate emission rate according to Chapter 123, Section 123.13 of the Pennsylvania Department of Environmental Resources' Rules and Regulations is 0.04 gr./dscf.

Stack Test No. 3484B was conducted utilizing standard procedures for the collection of an SO_2 sample as set forth in Chapter 139 of the Pennsylvania Department of Environmental Resources' Rules and Regulations. A six-point constant rate sampling program was conducted with a sample period of ten minutes per point for a total sample time of 60 minutes.

The results of Stack Test No. 3484B indicate an SO_2 concentration of 241 ppm. The allowable concentration according to Chapter 123, Section 123.21 of the Pennsylvania Department of Environmental Resources' Rules and Regulations is 500 ppm.

The results of Stack Test Nos. 3484A and B are representative of the emissions discharging into the test stack and the operating conditions of the process during the tests.

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF AIR QUALITY CONTROL

GLEN-GERY CORPORATION
BIGLER, PENNSYLVANIA

PROCESS DESCRIPTION

Glen-Gery Corporation operates two brick kilns at their Bigler, Pennsylvania facility. Stack Test Numbers 1984A and B were conducted for sulfur oxides and hydrogen fluoride emissions, respectively, in the stack which services Kiln No. 1. Kiln No. 2 was not in operation at the time.

Kiln No. 1 is a continuous push tunnel type with a capacity of 23 brick cars. Each car holds approximately eight tons of dried bricks. During the test program, cars were loaded through the feed end of the kiln at approximately 100 minute intervals and remained in the kiln from 36 to 38 hours. Four 7½-horsepower recirculation fans provide even heating of the bricks as they approach the preheat zones within the kiln.

The kiln consists of two preheating zones, two combustion zones, a quick cool zone, and the primary cooling zone. Preheat Zone No. 1 contains six natural gas burners (three per side) while preheat Zone No. 2 contains 16 burners (eight per side). Combustion Zone Nos. 1 and 2 each have 12 burners (six per side). Following the combustion zones, the brick cars travel through the air balance point which isolates the heating zones from the cooling zones. The quick cool zone contains two 7½-horsepower fans which blow a mixture of ambient and hot air directly down on the bricks to initiate cooling. The cars then enter the primary cooling zone equipped with a single seven and one-half horsepower fan that utilizes 100% ambient air for the final cooling before the bricks are discharged from the kiln. Hot air from the cooling zones is discharged to a drying room via a 15 horsepower fan where the bricks await entry to the kiln.

Combustion air is provided through the natural gas burners by a 20 horsepower induced draft fan located near the feed end of the kiln. Effluent from the kiln is discharged to the atmosphere through a 27½ inch square brick stack having an exit point approximately 30 feet above grade.

A process flow diagram appears in Figure 1.

COMMONWEALTH OF PENNSYLVANIA
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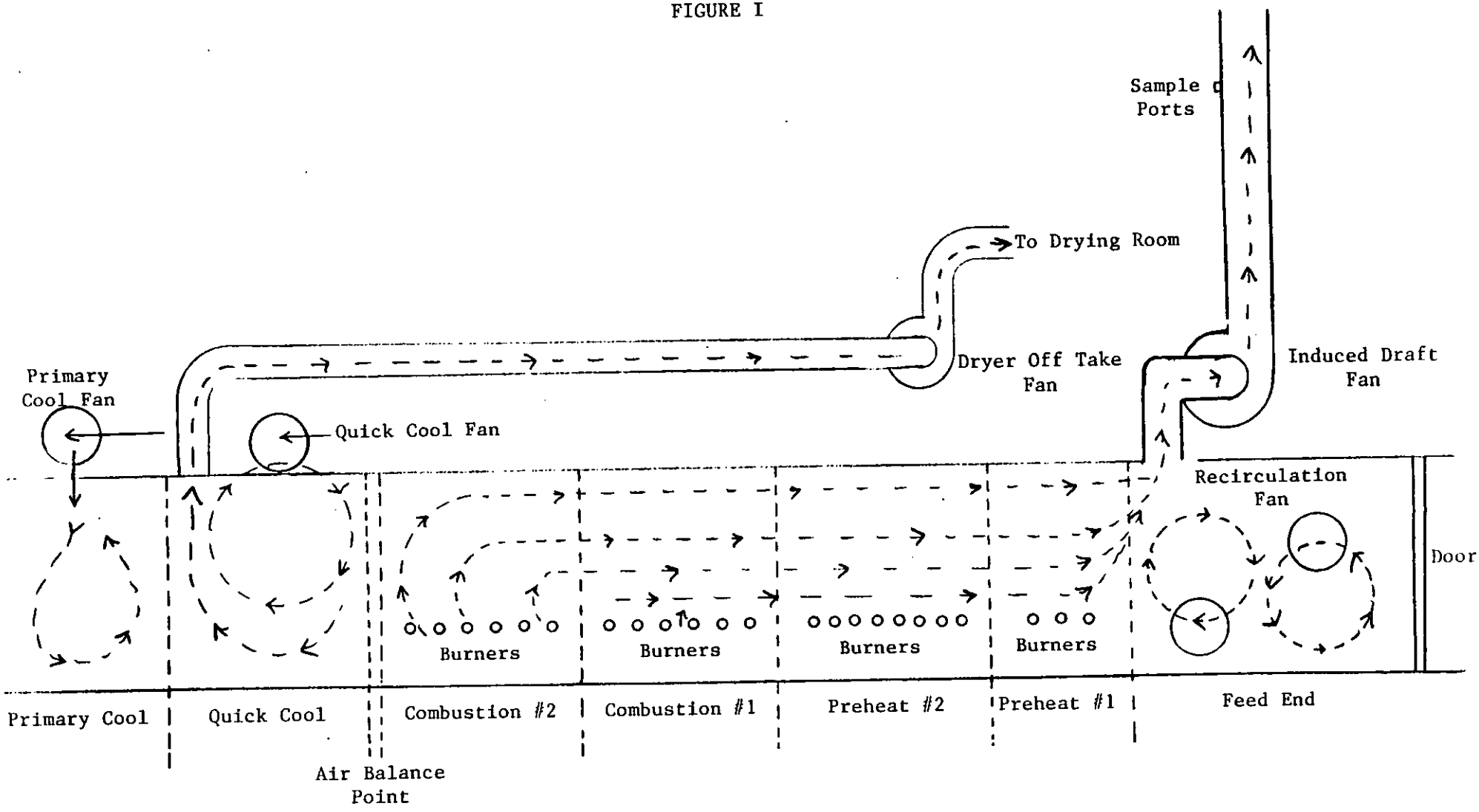
BUREAU OF AIR QUALITY CONTROL

GLEN-GERY CORPORATION
BIGLER, PENNSYLVANIA

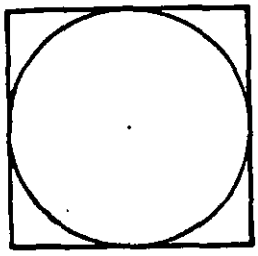
PROCESS FLOW DIAGRAM
FIGURE I



TEST DATA SUMMARY

		SOX	HF
Test No.		1984 A	1984 B
Test Date		07/25/84	07/25/84
No. of Traverse Points/Sampling Points		21/6	21/21
Stack or Duct Area at Sampling Plane (sq ft)	A	5.25	5.25
Barometric Pressure (preliminary traverse) (in. Hg)	Pbp	28.50	28.50
(sample traverse) (in. Hg)	Pbs	28.50	28.50
Condensate Volume (ml)	Vlc	120.7	108.6
Avg. Pressure Drop at Orifice (in. WG)	DH	2.1	1.9
Avg. Meter Temperature (deg F)	Tm	98	106
Volume of Water Vapor Condensed (scf)	Vwc	5.7	5.1
Meter Y-factor	Yf	1.01	1.01
Volume of Gas Sampled (dscf)	Vms	84.1	82.3
Total Sample Time (min)	θ	120.0	126.0
Moisture in Gas Stream (%)	Bws	5.8	5.8
Dry Molecular Wt. (preliminary traverse) (lb/lb-mole)	Mdp	28.97	28.97
(sample traverse) (lb/lb-mole)	Mds	28.96	28.77
Molecular Wt. (preliminary traverse) (lb/lb-mole)	Msp	28.33	28.33
(sample traverse) (lb/lb-mole)	Mss	28.32	28.14
Pitot Tube Coefficient (preliminary traverse)	Cpp	0.835	0.835
(sample traverse)	Cps	0.846	0.842
Average Corrected Velocity (preliminary traverse) (fps)	Vsp	56.2	56.2
(sample traverse) (fps)	Vss	62.0	56.5
Stack Static Pressure (in. WG)	Pg	-0.34	-0.34
Average Stack Temperature (preliminary traverse) (deg F)	Tsp	294	294
(sample traverse) (deg F)	Tss	305	298
Volumetric Flow Rate (preliminary traverse) (dscfm)	Qsp	11,200	11,200
(sample traverse) (dscfm)	Qss	12,100	11,200
Sample Nozzle Diameter (in.)	Dn	0.253	0.251
Percent Isokinetic Sampling (%)	I	NA	89.4
Weight Collected (gm)	Mn	0.8412	0.1400
Pollutant Concentration (gr/dscf)	Cs	0.154	0.026
Allowable Pollutant Concentration (gr/dscf)		NA	NA
Pollutant Mass Emission Rate (lb/hr)	E	14.8	2.5
Allowable Mass Emission Rate (lb/hr)		NA	NA
Pollutant Concentration (ppm)	C	133	72
Allowable Pollutant Concentration (ppm)		500	NA
Heat Input To Combustion Unit (mm btu/hr)	HI	NA	NA
Pollutant Mass Emission Rate (lb/mm btu)	E'	NA	NA
Allowable Mass Emission Rate (lb/mm btu)		NA	NA

SAMPLING LOCATION INFORMATION



Distance from wall to point (in.):

1. 1 15/16	4. 13 3/4	7. 25 9/16	10.
2. 5 7/8	5. 17 11/16	8.	11.
3. 9 13/16	6. 21 5/8	9.	12.

Flue configuration: 27.5IN.X27.5IN. Area: 5.25 sq.ft.
Port location: APPROX. 10 FEET DOWNSTREAM FROM I.D. FAN
No. of ports: THREE 9 IN. O.C.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF AIR QUALITY CONTROL

GLEN-GERY CORPORATION
BIGLER, PENNSYLVANIA

DISCUSSION

Stack Test No. 1984A was conducted utilizing standard procedures for the collection of an SO_x sample as set forth in Chapter 139 of the Pennsylvania Department of Environmental Resources' Rules and Regulations. A 21-point preliminary velocity traverse was conducted in the test stack in order to determine the velocity profile and effluent volumetric flowrate. A six-point, constant rate, sampling program was conducted with a sample period of 20 minutes per point for a total sample time of 120 minutes.

The results of Stack Test No. 1984A indicate an SO_x, expressed as SO_2, concentration of 133 ppm. The allowable concentration, according to Chapter 123 Section 123.21 of the Pennsylvania Department of Environmental Resources' Rules and Regulations, is 500 ppm.

Stack Test No. 1984B was conducted utilizing EPA Method 13B for the collection of a total fluoride sample. A 21-point, isokinetic sampling program was conducted with a sampling period of six minutes per point for a total sample time of 126 minutes.

The results of Stack Test No. 1984B indicate a total fluoride expressed as hydrogen fluoride concentration of 72 ppm.

The results of Stack Test Nos. 1984A and B are representative of the emissions discharging from the test stack and the operating conditions of the process during the test.

Glen-Gery Brick Bigler Facility
Reading PA

SECTION I - SUMMARY OF TEST RESULTS

A summary of test results from the source sampling program is presented in Table 1. As such, the results are considered representative of emission characteristics from the saw dust dryer during referenced operating conditions. The results show the particulate emissions are below the limit of 0.04 gr/dscf.

October 1988

SECTION II - ANALYSIS

1. Introduction

The data presented in this report represents the results of source sampling exhaust emissions at the outlet location of the saw dust dryer during referenced operating conditions.

Specific requirements of this source sampling program include the following:

a. Identification of final particulate emissions from the saw dust dryer.

b. Average flue gas temperature, moisture, and volume of flow at the sampling location.

c. Orsat analysis of flue gas conditions at the point of sampling.

d. Record of pertinent operating conditions during period of the test run.

The sampling program was completed on October 28, 1988 by the Gilbert field test crew, with the assistance of personnel assigned by Glen-Gery, Spotts, Stevens, & McCoy and witnessed by the PADER.

2. Description of the Plant Exhaust System

The exhaust gases from the saw dust rotary dryer are sent to a mechanical collecter followed by the sampling location, then through the fan and exhausted out of the stack.

3. Sampling Program Procedures

To satisfy the objectives established for this project, the sampling program was set-up on a basis of using one test train positioned at the test location and completing three test runs at the location. A test run consisted of a particulate test using EPA Method 5.

The location and number of sampling ports and traverse points are detailed in Figure 1.

4. Operating Conditions

In the execution of this sampling program, an attempt was made to achieve near normal load for the plant. The amount of product generated was recorded by the operator. This record is included in the summary table (see Table 1).

5. Results

Test data developed by each test run, together with analytical results from laboratory analysis of samples generated by the field sampling program, are reproduced in the Appendices included with this report. Information on basic gas characteristics developed by each test run is contained in the printout of the computer program included as Appendix 7.

A summary of pertinent test results and essential information to evaluate test results developed for each test run is included with this report as Table 1.

6. Discussion

6.1 Sampling Conditions

All field sampling work was completed out of doors and subject to prevailing weather conditions; however, there were no interruptions in the operation of individual test trains due to equipment or weather problems.

During the completion of this test program, the plant was maintained near the normal load condition.

6.2 Exhaust Flue Gas Volume and Composition

Test data for measurement of exhaust flue gas volume and related velocities developed by traversing of the stack show that the measured gas volumes between tests were consistent with expected values. For purposes of this report, indicated emissions are based on these measured gas volumes.

6.3 Unit Operating Conditions

This sampling program was undertaken as a compliance test program for the saw dust dryer representative load operating conditions. In the execution of this program, all applicable operation conditions were referenced.

Operating conditions were monitored throughout the duration of the sampling program by Glen-Gery personnel.

6.4 Emissions

6.4.1 Particulate

The reported particulate emissions as summarized in Tables 1 are expressed as a concentration (grains/SCF) and emission rate (lbs/hour) as measured. The particulate emissions for all three runs are within any applicable limitations.

TABLE 1

SUMMARY OF TEST RESULTS
GLEN-GERY BRICK
BIGLER FACILITY

G/C, INC. REPORT R-10-0526-001-1

LOCATION	SAW DUST DRYER EXHAUST		
RUN NO.	G-S-1	G-S-2	G-S-3
DATE	10/28/88	10/28/88	10/28/88
TIME	1025	1236	1430
OPERATING DATA(1)			
Feed Rate	30	30	30
FLUE GAS CHARACTERISTICS			
DSCFM	~~44,001~~ 23780	~~31,804~~ 17154	~~33,050~~ 17539
ACFM	56,499	41,315	42,192
Temperature, °F	125	121	121
Moisture, %	5.3	6.9	5.8
PARTICULATE EMISSIONS			
Gr/DSCF	0.0222	0.0188	0.0221
lbs/hr	8.52	5.53	6.49

(1) Nos. 1 & 2 Kiln operating, Kiln mix
(a) Calgary Grey - 100% Buff Clay
(b) Rustic Myrrh - 50% Clay, 50% shale
(c) KNW - 100% shale.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF AIR QUALITY CONTROL

12/1/87

GLEN-GERY CORPORATION
BIGLER, PENNSYLVANIA

PROCESS DESCRIPTION

Glen-Gery Corporation operates two brick kilns designated as Nos. 1 and 2 at its facility located in Bigler, PA. Stack Test Nos. 02087 A, B, C, D and E were conducted on the stack servicing Kiln No. 2 for the determination of particulate, total sulfate, sulfur oxides, hydrogen fluoride and total hydrocarbon emissions, respectively.

Kiln No. 2 is a continuous push, tunnel-type with a capacity of 23 brick cars. During the testing, a "Calgary Gray" 100% clay brick was fired at a rate of 16 cars/day, each car holding approximately 4320 bricks.

Crushed shale and clay are supplied to separate feed bins which are equipped with controls to regulate the quantities of each type of material entering the conveyor system. Manganese is added for coloring if required and Barium Carbonate is added to prevent the brick from developing a "scum" when fired. The desired mix is sent via an inclined conveyor to a pugmill where it is mixed with water. The wet mixture is then sent to an extruder and formed into "slugs". The "slugs" are cut into bricks and loaded onto brick cars. The cars are then sent to one of four drying rooms to await entry into the kiln.

The brick cars are loaded through a door at the feed end of the kiln. The brick cars pass through three combustion zones, a quick cool zone and a primary cooling zone. Heat is supplied to the kiln by natural gas and sawdust burners located on either side of the kiln. Combustion air is provided by air lines running into the burners. During the testing 18 natural gas and 20 sawdust burners were in operation. Following the combustion zone, the brick cars travel through an air-balance point which isolates the heating zones from the cooling zones. The quick-cool zone utilizes ambient and hot air mixture run by fans directly onto the brick to initiate cooling. The cars then enter the primary cooling zone that utilizes ambient air for final cooling of the bricks. Hot air from the cooling zones is discharged by fans to the drying rooms.

Effluent from the kiln is directed by a 20 HP fan to a 36-inch I.D. stack and discharged to the atmosphere at a point 85 ft. above grade.

A process flow diagram is given on Figure I.

COMMONWEALTH OF PENNSYLVANIA
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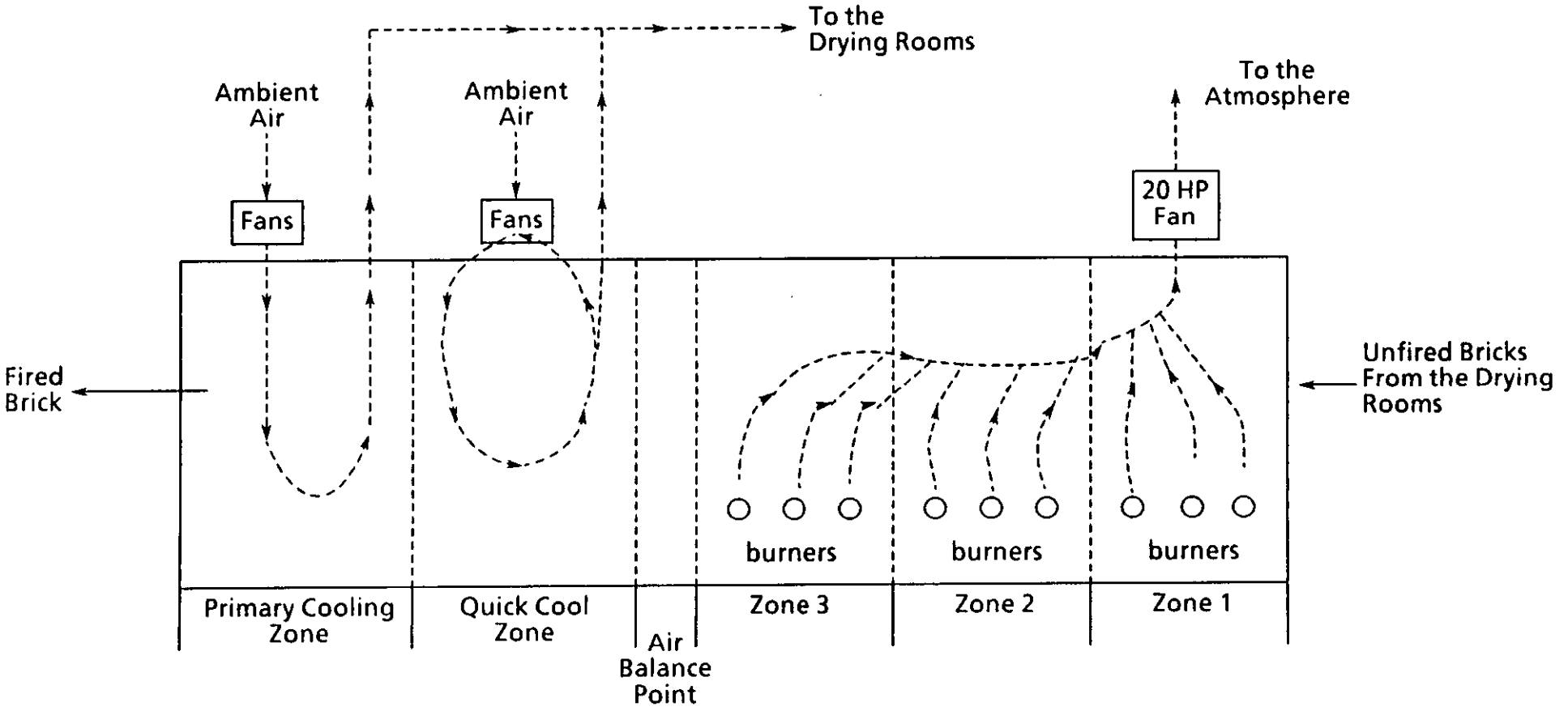
GLEN-GERY CORPORATION
BIGLER, PENNSYLVANIA

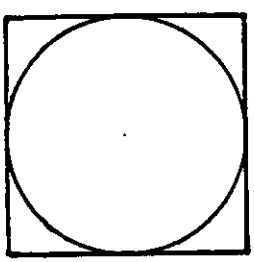
Figure I
Process Flow Diagram, Kiln No. 2



TEST DATA SUMMARY

		PART.	SULFATES	SOX
Test No.		02087A	02087B	02087C
Test Date		11/02/87	11/02/87	11/02/87
No. of Traverse Points/Sampling Points		24/24	24/24	24/2
Stack or Duct Area at Sampling Plane (sq ft)	A	7.07	7.07	7.07
Barometric Pressure (preliminary traverse) (in. Hg)	Pbp	28.68	28.68	28.68
(sample traverse) (in. Hg)	Pbs	28.68	28.68	28.68
Condensate Volume (ml)	Vlc	109.4	109.4	86.1
Avg. Pressure Drop at Orifice (in. WG)	DH	2.8	2.8	1.7
Avg. Meter Temperature (deg F)	Tm	103	103	87
Volume of Water Vapor Condensed (scf)	Vwc	5.2	5.2	4.1
Meter Y-factor	Yf	0.99	0.99	0.99
Volume of Gas Sampled (dscf)	Vms	63.1	63.1	42.8
Total Sample Time (min)	e	72.0	72.0	60.0
Moisture in Gas Stream (%)	Bws	7.6	7.6	7.6
Dry Molecular Wt. (preliminary traverse) (lb/lb-mole)	Mdp	29.22	29.22	29.22
(sample traverse) (lb/lb-mole)	Mds	29.22	29.22	29.22
Molecular Wt. (preliminary traverse) (lb/lb-mole)	Msp	28.37	28.37	28.37
(sample traverse) (lb/lb-mole)	Mss	28.37	28.37	28.37
Pitot Tube Coefficient (preliminary traverse)	Cpp	0.814	0.814	0.814
(sample traverse)	Cps	0.814	0.814	0.806
Average Corrected Velocity (preliminary traverse) (fps)	Vsp	48.0	48.0	48.0
(sample traverse) (fps)	Vss	48.1	48.1	47.2
Stack Static Pressure (in. WG)	Pg	-0.28	-0.28	-0.28
Average Stack Temperature (preliminary traverse) (deg F)	Tsp	388	388	388
(sample traverse) (deg F)	Tss	380	380	395
Volumetric Flow Rate (preliminary traverse) (dscfm)	Qsp	11,300	11,300	11,300
(sample traverse) (dscfm)	Qss	11,400	11,400	11,000
Sample Nozzle Diameter (in.)	Dn	0.318	0.318	0.252
Percent Isokinetic Sampling (%)	I	98.4	98.4	NA
Weight Collected (gm)	Mn	0.1038	0.1020	0.8148
Pollutant Concentration (gr/dscf)	Cs	0.025	0.025	0.294
Allowable Pollutant Concentration (gr/dscf)		0.04	NA	NA
Pollutant Mass Emission Rate (lb/hr)	E	2.4	2.4	28.5
Allowable Mass Emission Rate (lb/hr)		NA	NA	NA
Pollutant Concentration (ppm)	C	NA	14.4	254.0
Allowable Pollutant Concentration (ppm)		NA	NA	500
Heat Input To Combustion Unit (mm btu/hr)	HI	NA	NA	NA
Pollutant Mass Emission Rate (lb/mm btu)	E'	NA	NA	NA
Allowable Mass Emission Rate (lb/mm btu)		NA	NA	NA

SAMPLING LOCATION INFORMATION



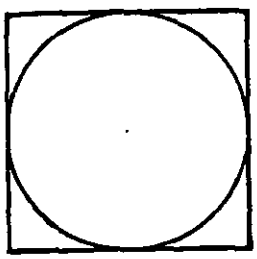
Distance from wall to point (in.):

1. 1	4. 6 3/8	7. 23 3/16	10. 31 3/4
2. 2 7/16	5. 9	8. 27	11. 33 9/16
3. 4 1/4	6. 12 13/16	9. 29 5/8	12. 35

Flue configuration: 36 IN. I. D. Area: 7.07 sq.ft.
Port location: APPROX 8 FT DOWNSTREAM OF FAN
No. of ports: 2 @ 90 DEGREES

TEST DATA SUMMARY

		HF	ORGANICS
Test No.		02087D	02087E
Test Date		11/03/87	11/03/87
No. of Traverse Points/Sampling Points		24/24	24/24
Stack or Duct Area at Sampling Plane (sq ft)	A	7.07	7.07
Barometric Pressure (preliminary traverse) (in. Hg)	Pbp	28.45	28.45
(sample traverse) (in. Hg)	Pbs	28.45	28.45
Condensate Volume (ml)	Vlc	95.6	102.0
Avg. Pressure Drop at Orifice (in. WG)	DH	2.5	2.2
Avg. Meter Temperature (deg F)	Tm	86	93
Volume of Water Vapor Condensed (scf)	Vwc	4.5	4.8
Meter Y-factor	Yf	0.99	0.99
Volume of Gas Sampled (dscf)	Vms	59.8	58.8
Total Sample Time (min)	θ	72.0	72.0
Moisture in Gas Stream (%)	Bws	7.0	7.0
Dry Molecular Wt. (preliminary traverse) (lb/lb-mole)	Mdp	29.40	29.42
(sample traverse) (lb/lb-mole)	Mds	29.40	29.42
Molecular Wt. (preliminary traverse) (lb/lb-mole)	Msp	28.60	28.62
(sample traverse) (lb/lb-mole)	Mss	28.60	28.62
Pitot Tube Coefficient (preliminary traverse)	Cpp	0.814	0.814
(sample traverse)	Cps	0.806	0.814
Average Corrected Velocity (preliminary traverse) (fps)	Vsp	48.7	48.7
(sample traverse) (fps)	Vss	45.0	45.4
Stack Static Pressure (in. WG)	Pg	-0.24	-0.24
Average Stack Temperature (preliminary traverse) (deg F)	Tsp	406	406
(sample traverse) (deg F)	Tss	373	363
Volumetric Flow Rate (preliminary traverse) (dscfm)	Qsp	11,200	11,200
(sample traverse) (dscfm)	Qss	10,700	11,000
Sample Nozzle Diameter (in.)	Dn	0.314	0.318
Percent Isokinetic Sampling (%)	I	101.8	95.6
Weight Collected (gm)	Mn	0.1637	0.1805
Pollutant Concentration (gr/dscf)	Cs	0.042	0.047
Allowable Pollutant Concentration (gr/dscf)		NA	NA
Pollutant Mass Emission Rate (lb/hr)	E	3.8	4.4
Allowable Mass Emission Rate (lb/hr)		NA	NA
Pollutant Concentration (ppm)	C	116.1	NA
Allowable Pollutant Concentration (ppm)		NA	NA
Heat Input To Combustion Unit (mm btu/hr)	HI	NA	NA
Pollutant Mass Emission Rate (lb/mm btu)	E'	NA	NA
Allowable Mass Emission Rate (lb/mm btu)		NA	NA



SAMPLING LOCATION INFORMATION

Distance from wall to point (in.):

1. 1	4. 6 3/8	7. 23 3/16	10. 31 3/4
2. 2 7/16	5. 9	8. 27	11. 33 9/16
3. 4 1/4	6. 12 13/16	9. 29 5/8	12. 35

Flue configuration: 36 IN. I. D. Area: 7.07 sq.ft.
Port location: APPROX 8 FT DOWNSTREAM OF FAN
No. of ports: 2 @ 90 DEGREES

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF AIR QUALITY CONTROL

GLEN-GERY CORPORATION
BIGLER, PENNSYLVANIA

PROCESS DATA

Date: 11/02/87 Test Nos. 02087 A, B & C

Combustion Zone Temperatures (°F)		
Zone 1	Zone 2	Zone 3
1590	1725	1950

Fuel Consumption (per day)

Sawdust	26 tons
Natural Gas	143 x 10^3 CF

Date: 11/03/87 Test Nos. 02087 D & E

Combustion Zone Temperatures (°F)		
Zone 1	Zone 2	Zone 3
1590	1725	1950

Fuel Consumption (per day)

Sawdust	26 tons
Natural Gas	147 x 10^3 CF

COMMONWEALTH OF PENNSYLVANIA
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BUREAU OF AIR QUALITY CONTROL

GLEN - GERY CORPORATION
BIGLER, PENNSYLVANIA

DISCUSSION

Stack Test No. 02087A was conducted utilizing the standard procedures for the isokinetic collection of a particulate sample and Stack Test No. 02087D was conducted utilizing standard procedures for the collection of a gaseous sample, as specified in Chapter 139 of the Pennsylvania Department of Environmental Resources' Rules and Regulations. Stack Test No. 02087D was conducted utilizing EPA Method 13B for the isokinetic collection of a total fluoride sample. Stack Test No. 02087E was conducted using an EPA Method 5 train modified with the fourth and fifth impingers containing activated charcoal and silica gel, respectively, and utilizing the standard procedures for the isokinetic collection of a particulate sample, as specified in Chapter 139 of the Pennsylvania Department of Environmental Resources' Rules and Regulations. A 24 point preliminary velocity traverse was conducted in the test stack to determine the velocity profile and the volumetric flow rate on both test dates. A 24 point isokinetic sampling program with a sampling period of three minutes per point was conducted for Stack Test Nos. 02087A, D, and E. A two point constant rate sampling program with a sampling period of 30 minutes per point was conducted for Stack Test No. 02087C.

Stack Test No. 02087A was conducted to determine both particulate and sulfate emissions. The stack samples were first analyzed for particulate matter and then a total sulfate analysis (Stack Test No. 02087B) was performed. The results indicate a particulate concentration of 0.025 gr/dscf and a sulfate concentration of 14.4 ppm. The allowable particulate concentration according to Chaper 123, Section 123.13 of the Pennsylvania Department of Environmental Resources' Rules and Regulations is 0.04 gr/dscf.

The results of Stack Test No. 02087C indicate a SO_x (expressed as SO_2) concentration of 254 ppm. The allowable concentration according to Chaper 123, Section 123.21 of the Pennsylvania Department of Environmental Resources' Rules and Regulations is 500 ppm.

The results from Stack Test Nos. 02087D and E indicate a Fluoride (expressed as HF) concentration of 116.1 ppm and a total hydrocarbon concentration of 0.047 gr/dscf.

The process appeared to operate normally during the testing. The quick cool fans were being repaired on the test dates, but this has no effect on the kiln effluent flow rate.

The particulate/sulfate test and the SO_X test were conducted with no sampling or equipment problems. During the hydrogen fluoride test, the paper filter between the 3rd and 4th impinger was changed because the filter had become wet. The wet filter was causing a high vacuum and a low sample rate. The sampling module (same for all the tests) used for the total hydrocarbons test was unable to sample at a rate high enough to maintain an isokinetic rate. The low sample rate and the high vacuum was probably due to the resistance caused by the charcoal impinger. In order to obtain an acceptable percent isokinetic, the sample points with low velocity heads were sampled at a rate higher than the isokinetic rate.

1.0 INTRODUCTION

On April 11, 1990, the Hydrogen Cyanide emissions testing was conducted on the Kiln afterburner Stack (new unit No. 2) at Foseco, Inc's. plant in Mt. Braddock, PA. The test program was authorized by Mr. Barry Bittner of Foseco, Inc. Testing was performed by Mr. John C. Parry and Mr. Russell Lantz of Hemeon Associates, Inc. Process coordination was provided by Mr. Orrin Clingan, Jr. of Foseco, Inc. Observing the testing was Mr. Dick Murray of the PA Department of Environmental Resources.

PURPOSE

The purpose of this compliance test program was to determine the Hydrogen Cyanide emissions from the Kiln Afterburner Stack and its compliance with the PA Department of environmental Resources.

2.0 SUMMARY OF RESULTS

Table No. 1 below represents the hydrogen cyanide emission results from testing the Afterburner Stack at Foseco, Inc.'s plant in Mt. Braddock, PA.

TABLE NO. 1

Hydrogen Cyanide Emission Results

Date 1990	Sample Location	Test No.	Hydrogen Cyanide Emission	
			PPM [a]	Measured [b] lb/hr
4-10-90	Afterburner Stack	1	0.458	0.004587
4-10-90	Afterburner Stack	2	0.028	0.0002106
4-10-90	Afterburner Stack	3	0.000	0.000000

a - Parts per million by volume
b - Pounds per hour.

Table No. 2 is a summary of the flue gas parameters.

Table No. 2
SUMMARY OF FLUE GAS PARAMETERS
****

FLO

TEST NO.	1	2	3
TEST DATA			
Test Date	4/10/90	4/10/90	4/10/90
Static Pres.,in.WC	-.56	-.56	-.56
Pitot Readings, rms	1.11	1.22	1.112
Gas Temp., deg.F	530	521	778
Flowmeter Ave.,"WC	1.04	1.22	.748
Gasmeter Av. Temp., deg. F	71	68	76
Sampling Time, min.	120	60	120
Sample Vol., acf	70.65	35.527	60.692
Barom. Pres., in. Hg	29.03	28.9	28.73
Condensate, ml	40	24	54
Desica. Gain, gms	16.7	5.5	12.7
GAS COMPOSITION			
CO2, mole fraction	.015	.015	.015
O2, mole fraction	.19	.19	.19
N2, mole fraction	.795	.795	.795
AREAS			
Stack Diameter, in.	13.5	13.5	13.5
Stack Area, sq.ft.	.9940196	.9940196	.9940196
Nozzle Diameter, in.	.197	.197	.197
Nozz. Area, sq.ft.	.0002117	.0002117	.0002117
CALCULATED RESULTS			
Gas, Dry mol. wt.	29.01	29	29
Gas Dens.,lb/cu ft	.075	.075	.075
Sample vol., dry scf	68.5	34.5	57.7
Gas samp., dry lbs	5.14	2.59	4.33
Water in Samp.,lbs	.125	.065	.147
Water Cont. lbs/lb	.024	.025	.034
Water, volume %	3.8	3.9	5.2
Water, weight %	2.3	2.5	3.3
Gas Mol. Wt., Actual	28.59	28.57	28.43
Gas Dens. in stack	.0384	.0385	.0382
Stack Gas, acfm	4900	5200	5600
Stack Gas, lbs/hr	11300	12000	10100
St. Gas, lbs/hr dry	11000	11700	9800
St. Gas, scfm,dry	2440	2600	2180
Percent Isokinetic	109.9	103.9	103.6

3.0 PROCESS & TEST PROGRAM DESCRIPTION

PROCESS DESCRIPTION

Polyurethane foam impregnated with a slurry of ceramic material is fired in a kiln for 17 hours. The impregnated foam is subjected to a scheduled temperature increase which reaches a maximum temperature of 2300°F. The polyurethane foam is destroyed leaving a porous ceramic block which is used by Foseco's customers to filter molten aluminum.

The kiln is heated at 275°F per hour until the temperature reaches 652°F - 752°F. It is held at 2300°F for two hours and then cooled at 400°F per hour to approximately 1600°F.

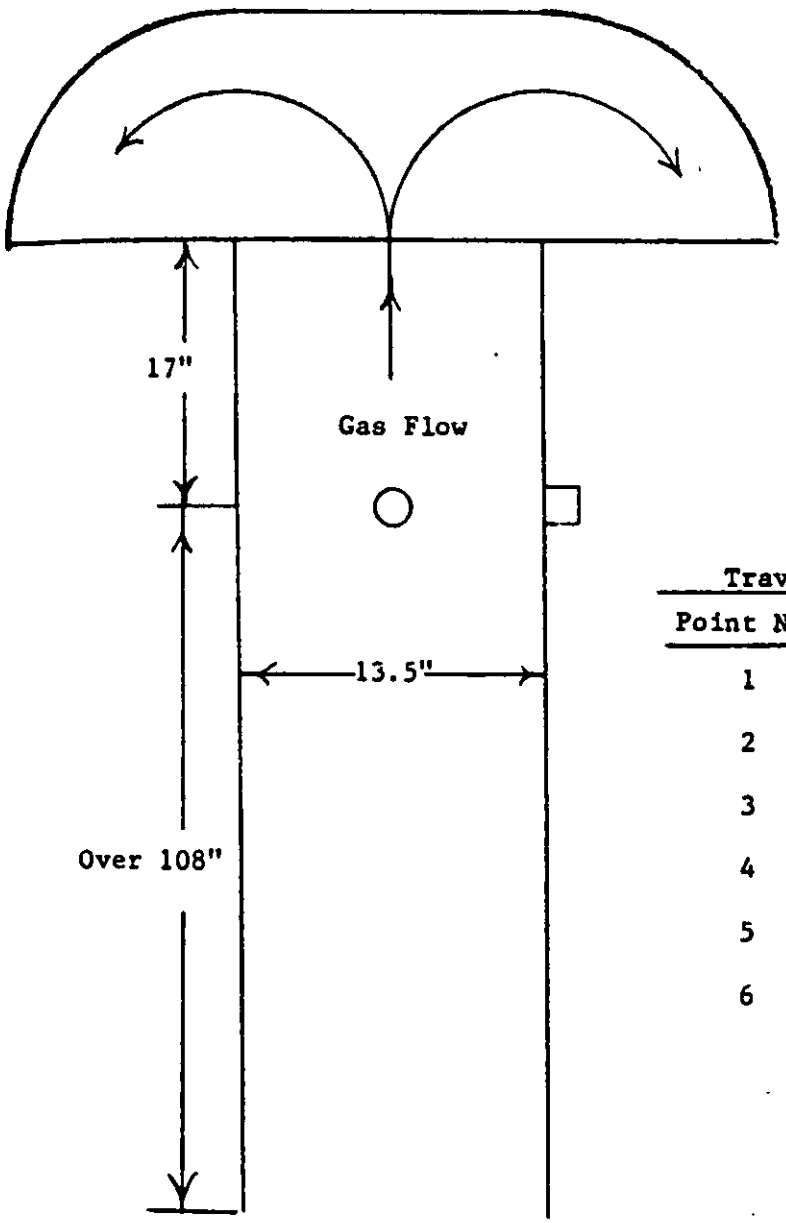
Hydrogen cyanide is released from the foam at 400°F. The kiln is fired by 12 natural gas burners which have a maximum heating input of 3.5 million Btu/hr.

SAMPLING PROCEDURES

Sampling ports were provided at at least eight stack diameters above the draft damper as shown in Figure No. 1.

Samples were taken according to EPA Methods 1 and 2 along two axes of the stack at right angles to each other. EPA Methods 3 and 4 were used for the determination of gas composition and moisture. A Method 5 sampling train was used to perform isokinetic sampling. The impingers contained 0.1N KOH.

Sampling began when the kiln temperature reached 400°F. The first sample was taken for a 2 hour period. Due to severe weather conditions, the second sample was taken for a period of 1 hour beginning about 1 hour after the first sample was completed. The third sample was taken for 2 hours during the holding period after the kiln reached its maximum temperature of 2300°F.



2 Ports 90° Apart

6 Points Per Port

12 Points Total

Traverse Point Location

Point Number	Percent of Diameter
1	4.4
2	14.6
3	29.6
4	70.4
5	85.4
6	95.6

Figure No. 1

Kiln Afterburner Stack

New Unit No. 2

Foseco, Inc. - Mt. Braddock, PA