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

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

Background Report Reference

AP-42 Section Number: 12.8

Background Chapter: 4

Reference Number: 5

Title: Barnet Industries

US EPA

US EPA

April 1978

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: FEB 07 1980

SUBJECT: Secondary Aluminum Smelters - Rotary Furnace Test Data

FROM: David Schulz, EPA Region V

TO: Arch MacQueen
EPA, RTP, N.C. - MD - 14

As discussed I am submitting test data for the rotary furnaces at Barmet Industries - Rockport, Indiana dross recovery facilities.

Attached are copies of:

1) Particulate emission test results for the "old" baghouses conducted April 25-26, 1978.
2) Analysis results of particulate captured on sampling filters during that testing.
3) Particulate emission test results for the "new" baghouses conducted April 5-6, 1979.
4) The trip report from the inspector observing the testing on April 5-6, 1979.

Barmet replaced all existing rotary furnace baghouse control equipment with new baghouses of improved design pursuant to a consent decree.

If there are any questions concerning this information please feel free to contact me at (312) 353-2086.

Attachments

INTRODUCTION

Stationary source sampling was performed at Barmet Industries in Rockport, Indiana, on April 25 and 26, 1978. On April 25 three EPA Method 5 tests were made to determine the particulate emissions from Furnace B of Plant #1. These tests were made in the outlet stack located downstream of baghouse #2.

On April 26 similar testing was performed to determine the particulate emissions from Furnace P of Plant #2. These tests were made in the outlet stack located downstream of baghouse #1. At the same location two Andersen head particle sizing tests were performed.

David Schultz of EPA Region V, was on site on April 25 during the testing. R. Edwin Zylstra and Bill Dihu, also from EPA Region V, were present and read visible emissions on April 25 and 26.

The measurements made for stack gas flow rate and particulate emissions were made in accordance with the recommendations of the United States Environmental Protection Agency.

The following sections of this report treat a summary of results, a process description, and the sampling and analytical procedures used.

ENTROPY ENVIRONMENTALISTS, INC. SPECIALISTS IN SOURCE SAMPLING

SUMMARY OF RESULTS

Tables 1 and 2 on the following pages present results from the particulate emissions tests performed on Furnace B and Furnace P respectively. All values presented were determined following EPA Method 5 procedures.

The average emission rate (EPA 5) from Furnace B was 35.1 pounds per hour. During the testing, Furnace B was charged at an hourly rate averaging 10,410 pounds per hour. According to the Indiana Regulation APC 5, the maximum allowable emission rate for the charging rate stated is 12.38 pounds per hour.

The average emission rate (EPA 5) from Furnace P was 14.8 pounds per hour. During the testing, Furnace P was charged at an hourly rate averaging 6525 pounds per hour. According to Indiana Regulation APC 5, the maximum allowable emission rate for the charging rate stated is 9.05 pounds per hour.

In addition to the normal EPA Method 5 procedures, an analysis of the impinger waters for particulates was performed. Combining these results with the results stated previously, the average particulate emission rate (EPA 5 + Impingers) was 36.2 pounds per hour for Furnace B and 15.4 pounds per hour for Furnace P.

Table 3 presents the results from Andersen sampling head tests A-1 and A-2. Both tests were performed on April 26, 1978 at the baghouse outlet stack in line with Furnace P.

ENTROPY ENVIRONMENTALISTS, INC. SPECIALISTS IN SOURCE SAMPLING

TABLE 1

SUMMARY OF RESULTS, PARTICULATE EMISSIONS

PLANT #1, FURNACE B, BAGHOUSE #2 OUTLET

RUN NUMBER	1	2	3
DATE	4/25/78	4/25/78	4/25/78
STACK TEMPERATURE, DEG. F	165.	156.	124.
PERCENT ISOKINETIC	102.1	98.4	99.7
STACK FLOW RATE SCFM* DRY	34392.	36070.	38259.
STACK FLOW RATE ACFM,WET	43253.	44813.	45246.
VOLUME OF GAS SAMPLED SCF* DRY	45.44	45.54	49.36
PARTICULATES, EPA METHOD 5:			
CATCH - MGRAMS	270.8	526.3	226.8
CONCENTRATION - GR/DSCF*	0.0918	0.1780	0.0708
EMISSION RATE - LBS/HR	27.05	55.02	23.20
PARTICULATES, EPA METHOD 5 + IMPINGERS:			
CATCH - MGRAMS	282.8	537.2	237.3
CONCENTRATION - GR/DSCF*	0.0958	0.1817	0.0740
EMISSION RATE - LBS/HR	28.25	56.16	24.28

68 DEG F, 29.92 IN. HG

TABLE 2

SUMMARY OF RESULTS, PARTICULATE EMISSIONS

PLANT #2, FURNACE P, BAGHOUSE #1 OUTLET

RUN NUMBER	4	5	6
DATE	4/26/78	4/26/78	4/26/78
STACK TEMPERATURE, DEG. F	202.	202.	188.
PERCENT ISOKINETIC	102.7	102.6	98.5
STACK FLOW RATE SCFM* DRY	11519.	12377.	12056.
STACK FLOW RATE ACFM,WET	15527.	16521.	15661.
VOLUME OF GAS SAMPLED SCF* DRY	40.28	44.86	42.94
PARTICULATES, EPA METHOD 5:			
CATCH - MGRAMS	484.8	333.4	376.4
CONCENTRATION - GR/DSCF*	0.1854	0.1145	0.1350
EMISSION RATE - LBS/HR	18.30	12.14	13.95
PARTICULATES, EPA METHOD 5 + IMPINGERS:			
CATCH - MGRAMS	488.9	348.8	410.5
CONCENTRATION - GR/DSCF*	0.1869	0.1197	0.1472
EMISSION RATE - LBS/HR	18.45	12.70	15.21

* 68 DEG F, 29.92 IN. HG

TABLE 3

Particle Sizing Test Results

Test A-1

Aerodynamic Diameter Microns	Cumulative Percent Less Than Stated Size
15.0	96.0
9.4	84.8
6.3	79.4
4.4	74.2.
2.8	62.0
1.4	51.7
0.87	29.4
0.59	11.8

Test A-2

Aerodynamic Diameter Microns	Cumulative Percent Less Than Stated Size
15.5	96.4
9.6	87.9
6.4	81.4
4.5	76.8
2.8	54.3
1.5	39.1
0.88	32.2
0.61	19.2

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SPECIALISTS IN SOURCE SAMPLING

PROCESS DESCRIPTION AND OPERATION

Barmet Industries in Rockport, Indiana is a Dross Recovery Facility. Barmet has available for operation nine rotary furnaces, but only six are in operation at any one time. The furnaces can be either oil or gas fired. During the testing, gas was used.

Each furnace is manually charged with dross obtained from primary aluminum smelters and salt which acts as a fluxing agent. Each heat period, which includes charging, fluxing, and tapping, lasts four hours. Six furnaces are operated twenty-four hours a day.

The gases from the furnaces are drawn through a water spray evaporative cooler and a baghouse by an induced draft fan before passing through the outlet stack and into the atmosphere.

Each furnace has a second stack called the emergency exhaust stack. When either the baghouse or the induced draft fan is not in operation, a natural draft causes the gases from the furnace to pass directly to the atmosphere through the emergency exhaust stack. When the baghouse is in operation, a damper closes off the emergency stack. Figure 1 shows the process air flow schematic as described above.

During the testing on Furnace B, a noticeable amount of fugitive emissions was leaking out of the furnace and the water spray evaporative cooler. Likewise, during the testing on Furnace P, a noticeable amount of fugitive emissions was leaking out of the furnace.

Table 4 presents the furnace charging rates observed during tests 1-6. This data was provided by Barmet personnel.

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TABLE 4

DATE	HEAT PERIOD	FURNACE	CHARGING RATE (pounds per hour)
4-25-78	12:00 - 4:00 PM	B	10,266
4-25-78	4:00 -12:00 PM	B	10,721
4-26-78	12:00 - 4:00 PM	P	6,409
4-26-78	4:00 - 8:00 PM	P	6,678

A weighted average for tests 1-3 and tests 4-6 was calculated based on the amount of time sampled during each heat period. The average charging rate was 10,410 pounds per hour for tests 1-3 and 6525 pounds per hour for test 4-6.

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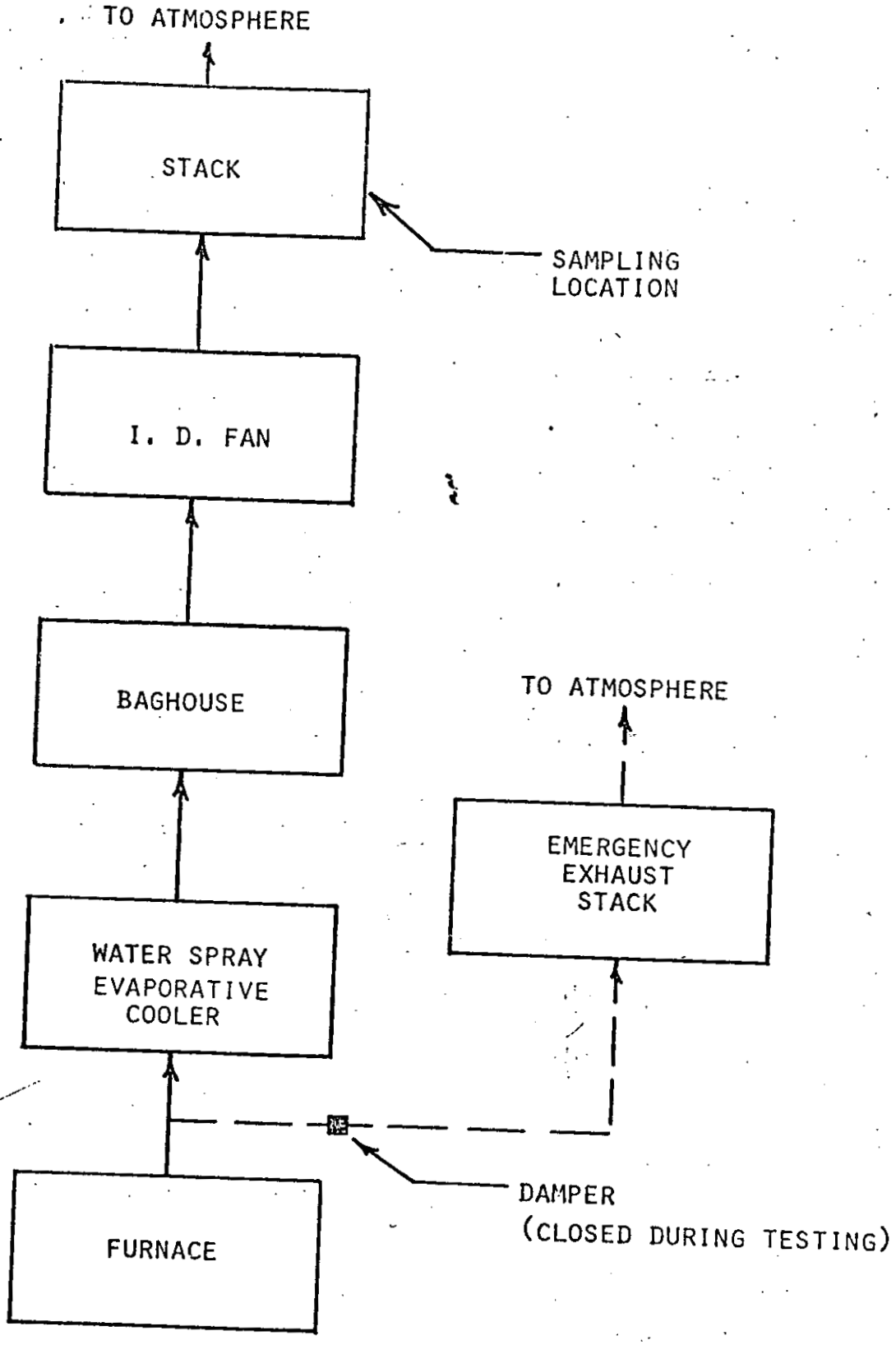

FIGURE 1. PROCESS AIR FLOW SCHEMATIC AND SAMPLING LOCATION; FURNACES B OR P

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SAMPLING AND ANALYTICAL PROCEDURES

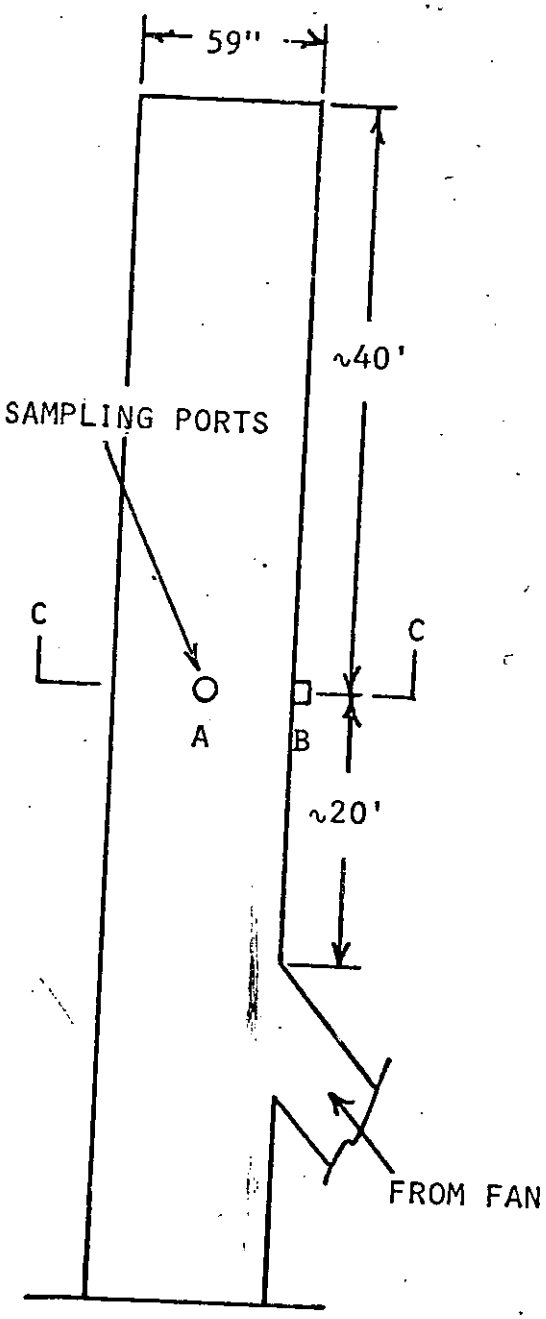
All sampling and analytical procedures used were those recommended by the United States Environmental Protection Agency. Complete details of the equipment and procedures used are described in Appendix E, which is extracted from the Federal Register, August 18, 1977.

The number and location of the sampling points used on April 25, 1978 at plant #1 were determined following the procedures specified in Method 1. The stack cross section was divided into 36 equal areas. One sampling point was positioned at the centroid of each equal area (see figure 2). Each point was sampled for two minutes for a total test time of 72 minutes for each run.

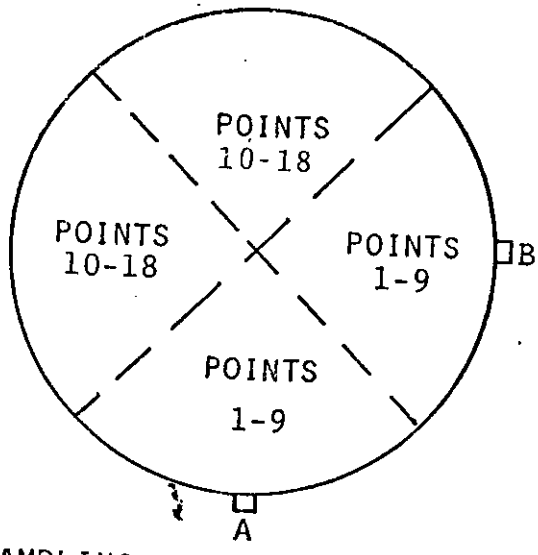
An identical sampling strategy was applied on April 26, 1978 for sampling at plant #2. Thirty-six points were sampled for two minutes each for a total test time of 72 minutes for each run. Andersen test A-1 was performed at point 6 on traverse axis A. Andersen test A-2 was made at point 6 on traverse axis B. See figure 3 for the sampling location schematic.

Velocity measurements were made according to Method 2. The molecular weight of the stack gases was determined following the procedures of Method 3. Method 5 was used for particulate emissions determinations. In addition to standard analytical procedures specified in Method 5, back-half analysis of the impinger water catches for particulates was performed. Details of all procedures used appear in Appendix E.

ENTROPY ENVIRONMENTALISTS, INC. SPECIALISTS IN SOURCE SAMPLING

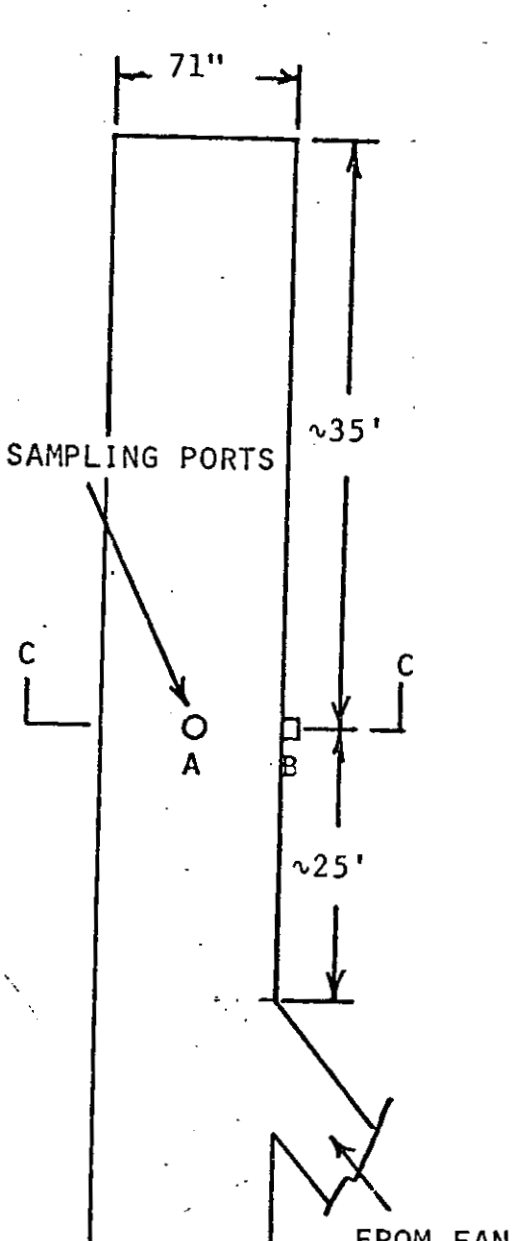


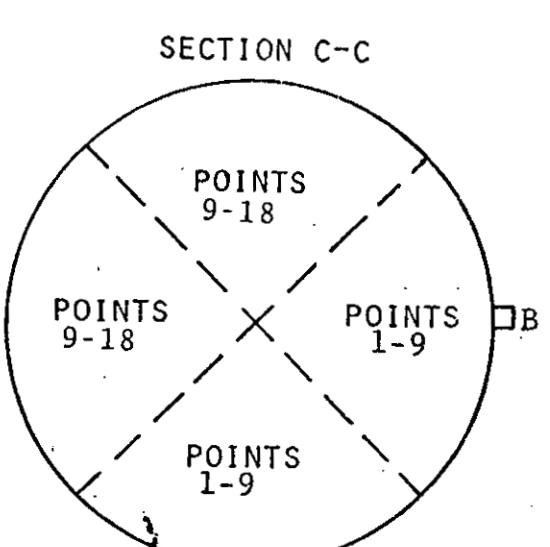
SECTION C-C



SAMPLING POINT NUMBER	DISTANCE FROM INSIDE WALL
1	0.8"
2	2.6
3	4.4
4	6.4
5	8.6
6	11.1
7	13.9
8	17.4
9	22.5
10	36.7
11	41.5
12	45.1
13	47.9
14	50.4
15	52.6
16	54.6
17	56.4
18	58.2

FIGURE 2. STACK DIMENSIONS & SAMPLING POINT LOCATIONS, FURNACE B, BAGHOUSE #2 OUTLET





SAMPLING POINT NUMBER	DISTANCE FROM INSIDE WALL
1	1.0"
2	3.1
3	5.3
4	7.7
5	10.4
6	13.3
7	16.7
8	21.0
9	27.1
10	43.9
11	50.0
12	54.2
13	57.7
14	60.6
15	63.3
16	65.7
17	67.9
18	70.0

FIGURE 3. STACK DIMENSIONS & SAMPLING POINT LOCATIONS, FURNACE P, BAGHOUSE #1 OUTLET

ENTROPY
SPECIALISTS IN SOURCE

TABLE 3

DROSS ANALYSIS (units unknown)

SAMPLE #	TRACE ELEMENT Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Be	Na	Ca
R.50B4189	0.19	0.60	0.070	0.65	0.61	0.012	0.007	0.028	0.022	0.0001	0.0014	0.0011
R.50B4190	0.20	0.62	0.074	0.66	0.63	0.013	0.007	0.028	0.021	0.0000	0.0016	0.0012

Certain of the elements analyzed are relatively high in amount. These include iron (Fe), Manganese (Mn) and magnesium (Mg). In addition to the dross, large amounts of salt (NaCl) are used in the process.

b. Stack Sampling

The visible emission evaluations are reported separately; however, it can be stated that the plant emissions were in violation of standards during each evaluation completed.

(1) Grab Samples

As described earlier, grab samples for particulate were collected at two of the baghouses. The results of the analysis for trace elements contained in the particulate are described in Table 4 below. The data are uncorrected for blank values. However, only those elements showing levels significantly above the amounts contained in the blank filters are reported.

TABLE 4

GRAB SAMPLES, CHEMICAL ANALYSIS

LOCATION	RUN #	CONCENTRATION (ug/m^3) Cl	Fl	Na	Ca	Al	Fe	Mn	Mg
Plant #1	1	≈26,000	≤50	*	*	*	*	*	*
Baghouse #2	2	-	150	*	*	*	*	*	*
	3	19,000	≤50	*	*	*	*	*	*
Plant #2	1	12,000	200	*	*	*	*	*	*
Baghouse #2	2	14,000	500	*	*	*	*	*	*
	3	5,000	200	*	*	*	*	*	*

- Sample results not reported because sampler malfunctioned
* Results not reported, reagent blank concentrations could not be determined

(2) Baghouse Capture

The analytical results of the particulate sample taken below the hopper of Baghouse #4, Plant #1 are described in Table 5.

TABLE 5

PARTICULATE ANALYSIS, BAGHOUSE CAPTURE

	CONCENTRATION	
ELEMENT	mg/g	ug/g
Chloride	580	
Fluoride	2.7	
Sodium	350	
Calcium	4.1	
Aluminum		900
Iron		170
Manganese		22
Magnesium		800

(3) Contractor Sampling

A complete description of the stack sampling, including sampling location, is contained in a report prepared by the contractor. Copies of the report are available from the Enforcement Division, Region V. However, as described earlier, the sample filters were analyzed for trace elements by CRL. The results of the analysis are contained in Table 6.

TABLE 6

STACK SAMPLING RESULTS, CONTRACTOR

CONCENTRATION (ug/m3)

SAMPLE RUN	Cl	Fl	Na	Ca	Al	Fe	Mn	Mg
1	103,000	220	49,000	2,200	214	863	15	150
2	180,000	160	117,000	2,000	65	587	12	90
3	38,000	89	20,200	1,700	124	1,230	53	80
4	65,000	6,100	123,000	1,300	1,340	415	32	440
5	29,000	3,100	70,900	1,300	1,720	547	31	490
6	56,000	1,600	35,500	2,300	1,130	95	9	370

c. Ambient Sampling

Numerous problems related to service of the network resulted in some loss of data. The decision to use inexperienced personnel proved to be the major reason for problems which were discovered and corrected during the audits performed or only discovered following completion of the survey. The sampling for particulate proved to be somewhat questionable during the first 10 days of the survey because of faulty inkpens resulting in incomplete transducer (flow) charts. This resulted in the loss of some data or less assurance in the quality of

more of the early data collected. During the course of the survey, mechanical problems with the wind recorder resulted in the loss of several days of wind data. This problem was eventually resolved by changing recorders. Following the completion of the study, it was discovered that the tape samplers had faulty timers resulting in the complete loss of COH data at Station C and the partial loss of COH data at Station B. The data for Station B for the first eighteen days proved to be useable. All data for Station A were correctable.

(1) High Volume Sampling

The suspended particulate data (TSP) for each station are summarized in Table 7 below. All data for each day of sampling are described in Appendix B as well as the 24 hour average wind and the occurrence of precipitation. Specific to the average wind, if the daily average was from the southwest but did not prevail for at least six hours, the average recorded is followed by a question mark. If should also be noted that the data on rainfall are as measured at the Evansville airport. Data averages are included in Table 7 by station and parameter. In addition, the range of the data are presented. The parameters displayed are those that had significant concentrations above the filter blanks and also had an excellent distribution of concentration through the three stations.

TABLE 7

SUSPENDED PARTICULATE AND TRACE ELEMENTS, ug/m3

		PARAMETER								
LOCATION	CONCENTRATION	TSP	Cl	Fl	Na	Ca	Al	Fe	Mn	Mg
A	Average	71.9	10.98	0.127	7.1	2.9	0.648	0.578	0.028	0.3
	Minimum	30	1	0.02	0.40	1.5	0.10	0.08	0.009	0.05
	Maximum	154	67	0.4	39	10	2.11	1.73	0.058	1.1
	2nd Maximum	140	39	0.4	27	7.8	1.60	1.0	0.054	0.82
B	Average	163.5	17.82	0.191	15.3	9.6	1.116	1.26	0.059	1.03
	Minimum	25	2	0.05	0.30	1.6	0.12	0.09	0.008	0.04
	Maximum	761	120	1.7	130	39	2.11	3.40	0.160	3.3
	2nd Maximum	369	110	0.4	55	23	2.03	2.63	0.110	2.0
C	Average	142.7	30.77	0.282	17.5	6.7	1.281	1.13	0.046	0.84
	Minimum	24	2	0.02	0.2	1.5	0.12	0.17	0.008	0.04
	Maximum	533	164	2.1	80	2.9	3.65	2.80	0.140	2.4
	2nd Maximum	403	120	2.0	78	13	3.59	2.74	0.100	2.3

The second maximum value is reported for comparison to the air quality standard. The interpretation of point source oriented network sampling is that a violation of the standard occurs if monitoring data reflect a total of two excursions considering all stations in the network. The data for Stations B&C indicate violations at the individual stations.

BARMET OF INDIANA, INC.
P. O. Box 66 Rockport, Indiana 47635 Phone: (812) 649-2294

May 21, 1979

Indiana State Board of Health
1330 W. Michigan Street
Indianapolis, Indiana 46206

Attention: Mr. E.F. Stresino, Chief, Enforcement Branch
Air Pollution Control Division

Reference: Consent Decree Cause Number C-78-314

Dear Mr. Stresino:

Pursuant to the reference Consent Decree, herewith enclosed (1) duly executed copy of the particulate compliance tests and collection efficiency determinations for Plant 1 and Plant 2 baghouses, as agreed your letter of 28 December 1978.

You will be pleased to note, as we are, the results of the tests.

Very truly yours,

BARMET OF INDIANA, INC.

John A. Grunigen, Jr.
Plant Manager

JAG/bch

ENCLOSURE: (1) one

cc: Mr. T. Magan
Kahn, Dees, Donovan & Kahn

Mr. D. Schultz
AEB/EPA Chicago, Illinois

ROBERT B. JACKO, Ph.D., P.E.
Environmental Engineering Consultant
Air Pollution Specialist

Office Phone:
(317) 743-1320

University Phone:
(317) 494-3696

2530 Shagbark
W. Lafayette, Indiana
47906

May 4, 1979

Mr. John A. Grunigen, Plant Manager
Barmet of Indiana, Inc.
P. O. Box 66
Rockport, Indiana 47635

Dear Mr. Grunigen:

Attached are the results of the particulate compliance tests and collection efficiency determinations on Plant 2, Baghouse 5 and Plant 1, Baghouse 1 serving the aluminum dross reverbatory furnaces.

I have appreciated the opportunity of providing these engineering services to Barmet and thank you for the fine cooperation we received from the plant personnel.

Sincerely yours,

Robert B. Jacko

Robert B. Jacko

RBJ:vj

PARTICULATE EMISSION COMPLIANCE TESTS
AND
BAGHOUSE COLLECTION EFFICIENCY DETERMINATION

AT
PLANT 2, FURNACE "S", BAGHOUSE 5
PLANT 1, FURNACE "A", BAGHOUSE 1

FOR
BARMET OF INDIANA, INC.
ROCKPORT, INDIANA

By
Robert B. Jacko, Ph.D., P.E.
2530 Shagbark Road
West Lafayette, Indiana 47906

Test Dates
April 5&6, 1979

Report Date
May 6, 1979

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ABSTRACT

Particulate emission compliance tests at Plant 2, Baghouse 5 and Plant 1, Baghouse 1 at the Barmet of Indiana Facility in Rockport, Indiana shows the particulate mass emissions to be substantially below the allowable limit. Baghouse 5 has an average emission rate of 1.28 lb/hr and compares to 13.3 allowable at a process weight rate of 5.8 tons/hr. Baghouse 1 average emission rate is 0.30 lb/hr and is substantially below the allowable of 16.5 lb/hr at a process weight rate of 8.0 tons/hr.

Simultaneous tests up and downstream of the baghouses indicate very high collection efficiencies for particulates of 98.94% for baghouse 5 and 99.76 for baghouse 1.

INTRODUCTION

On April 5th and 6th, 1979 a series of particulate emission tests were performed both upstream and downstream of Baghouse 5 and 1 serving aluminum dross reverbatory furnaces "S" and "A" at plant 2 and 1 respectively at Barmet of Indiana in Rockport, Indiana. The tests included EPA particulate emission compliance tests at the baghouse outlets and particulate mass flow rate determinations upstream of the baghouse. The baghouse outlet particulate compliance tests were then compared to Indiana APC 5 for allowable emissions and the upstream tests were used to compute collector efficiency.

PROCESS AND FACILITY DESCRIPTION

Approximately equal amounts of NaCl and aluminum dross are charged to reverbatory furnaces. The fine particulates in the exhaust gases from the furnaces are collected in an induced draft hood system, cooled after passing through a serpentine - free convection heat exchanger and removed in a baghouse filter. The NaCl is used as a fluxing agent to assist in separating impurities from the aluminum contained in the skim.

The baghouses are equipped with Nomex® filter material and are cleaned with a shaker system. To protect the bags, thermocouples sense the inlet gas temperature and activate

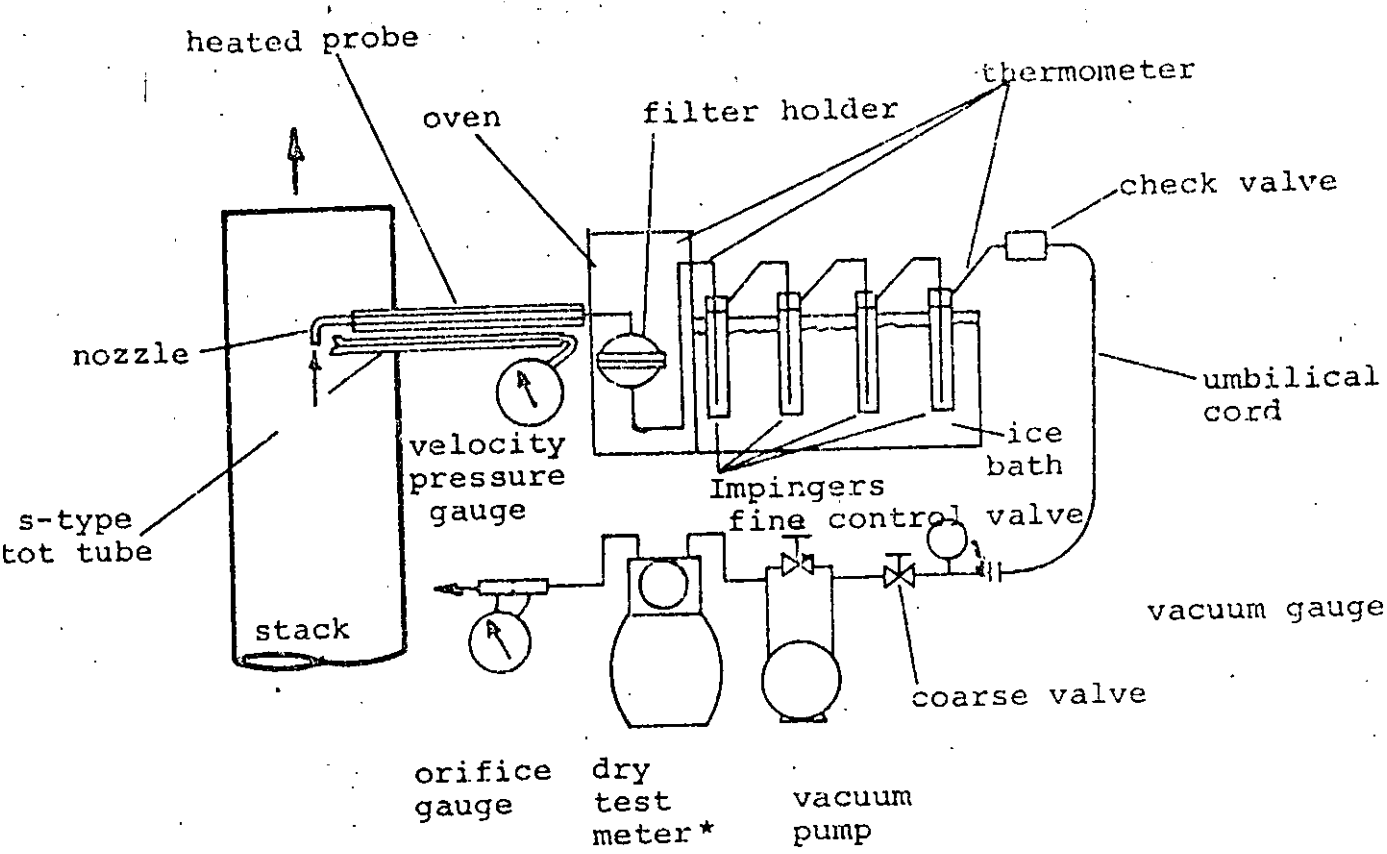
an ambient air damper located just upstream of the baghouse. Under normal operation the ambient air dampers are closed.

SAMPLING PROCEDURE AND HARDWARE

Baghouse Outlet Compliance Tests

The particulate compliance tests used throughout these tests were in accordance with those specified in Federal Register, Vol. 36, number 247 of December 23, 1971 entitled "Environmental Protection Agency - Standards of Performance for New Stationary Sources" and revisions published in the August 18, 1977 Federal Register, part II. The sampling train used to extract the particulate samples is shown in Figure 1. A glass lined probe was used for all tests.

The baghouse has eight outlet ducts. Therefore, the overall sampling strategy was to determine the particulate concentration in one of the ducts and simultaneously measure the total gas flow entering the common inlet baghouse duct. The product of the particulate concentration and total baghouse volumetric gas flow results in the emission rate of particulates. Mr. A Sunderland of the Indiana State Board of Health Air Pollution Division selected the outlet duct to be sampled just prior to the tests and observed all testing along with Mr. John Connell of Region 5 EPA. Prior to testing the specific sampling strategy guidelines were obtained in writing from Mr. Paul Dubenetzky, Chief of Source Sampling at the Indiana State Board of Health and the actual



*compensating to 70°F

Figure 1.

Particulate, SO_3, SO_2 Sampling Train

number of traverse points and location were received in a sketch from Mr. Dan Hancock also of the Indiana State Board of Health.

Figure 2 contains a top view of each of the baghouses sampled. In each view the outlet duct sampled is indicated.

Figure 3 shows the location of the sampling ports and traverse points in the baghouse outlet duct. This duct section above the bolt flange was fabricated so that once one of the eight baghouse outlet ducts was selected for sampling on the morning of the tests, this section was bolted into place. This same duct section was used on both baghouses.

Tests Upstream of Baghouse

All particulate tests upstream of the baghouse used identical EPA-type sampling hardware as was used for the baghouse downstream compliance tests except that the probe had a stainless steel liner instead of glass. The sampling plane and traverse points location are shown in Figures 4 and 5 for Furnace "S" and "A" respectively. Note that the inlet duct configuration is quite different for each baghouse. A total of 44 traverse points were selected per EPA guidelines on baghouse 5 Furnace "S". Note that the location of the sampling plane on Figure 5 for baghouse 1 is in an ideal location being 17 diameters from the nearest upstream flow disturbance and 8 diameters from the nearest downstream flow disturbance. As a result, 12 traverse points were selected for sampling per EPA guidelines.

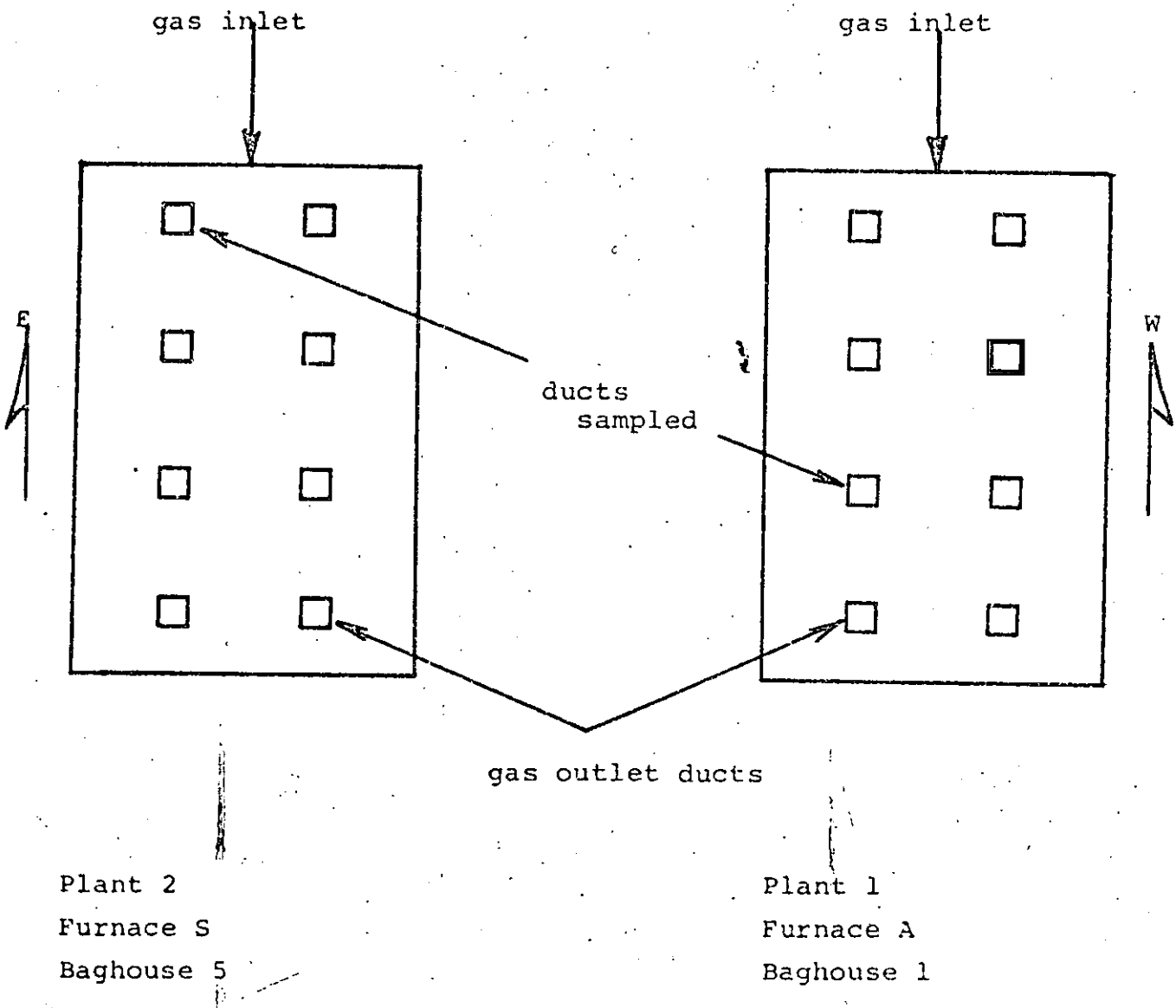


Figure 2 Top View of Baghouses Showing Outlet Ducts Sampled

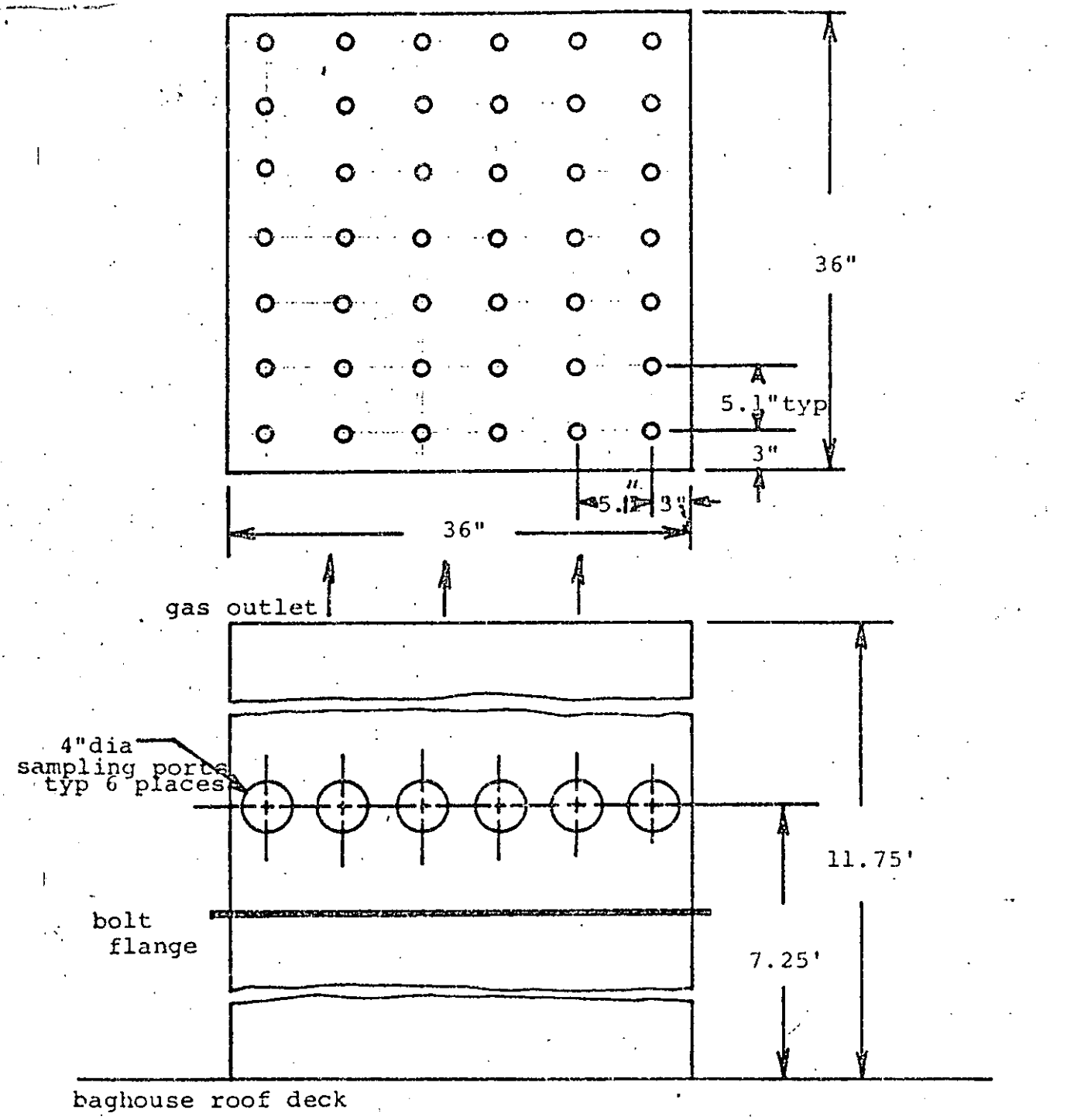
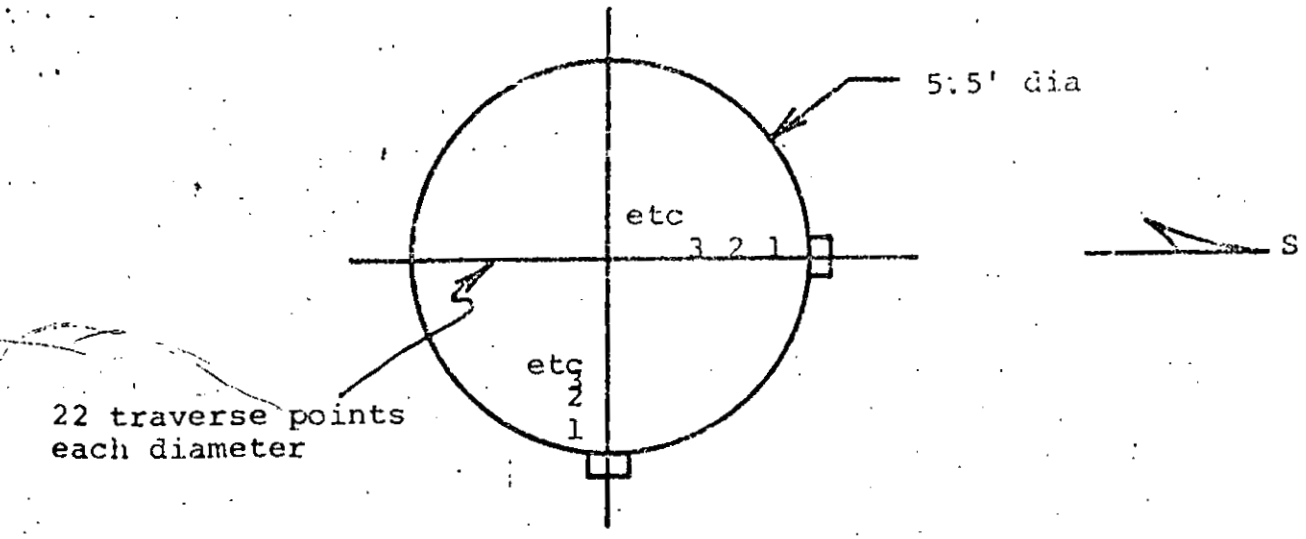


Figure 3 Sampling Plane Cross-section and Traverse Point Location for Both Baghouse Outlet Tests. (Plant 2,1, Furnace S, A, Baghouse 5,1, respectively)



horizontal sampling plane

point	distance (inches)	point	distance (inches)
1	2.0	12	39.7
2	3.6	13	44.7
3	5.2	14	48.0
4	7.0	15	51.0
5	8.7	16	53.2
6	10.6	17	55.4
7	12.8	18	57.3
8	15.2	19	59.0
9	18.0	20	60.8
10	21.3	21	62.4
11	26.3	22	63.9

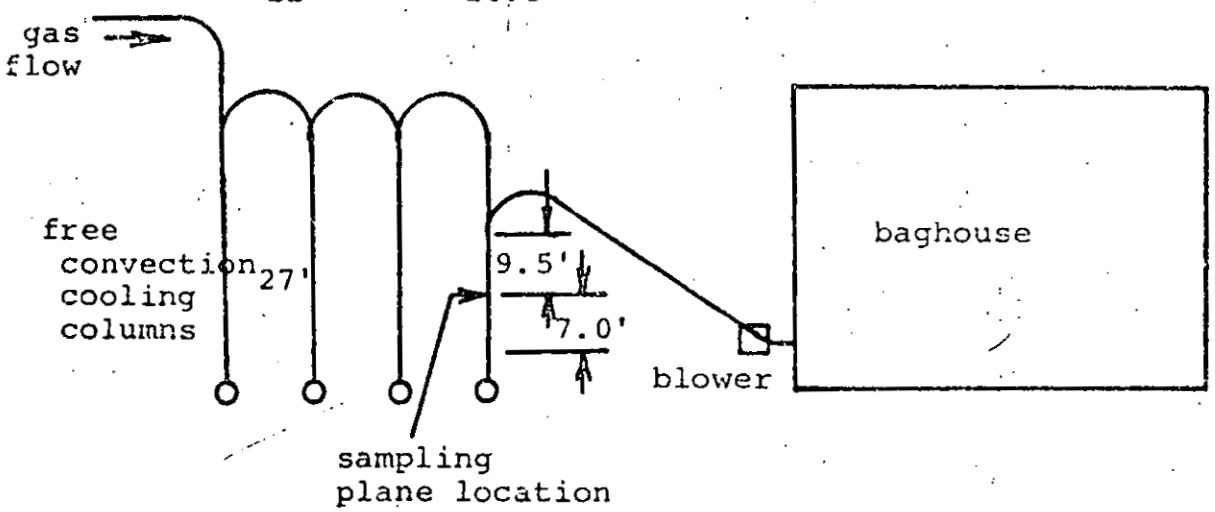
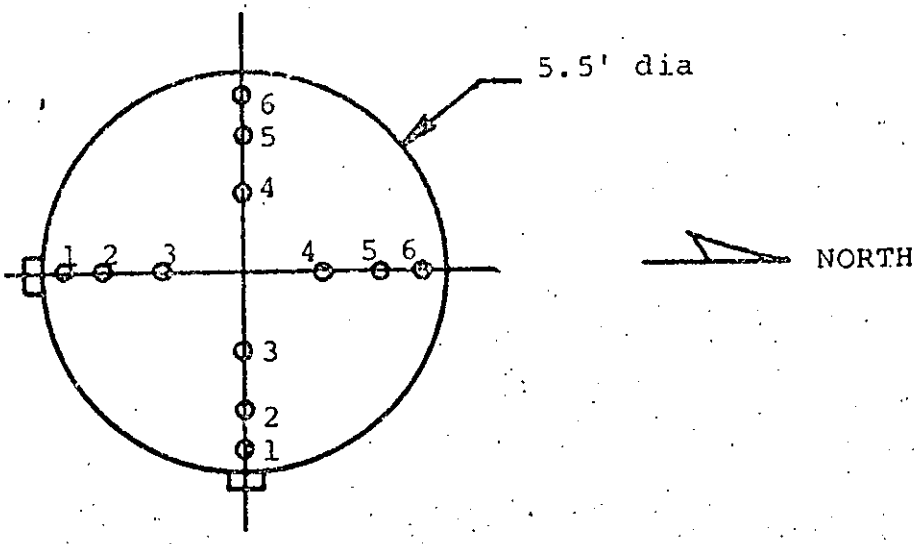


Figure 4 Sampling Plane Cross-section and Traverse Point LOcation for Plant 2, Furnace S, Baghouse 5 Upstream Sample



vertical sampling plane

Point	distance (inches)
1	2.9
2	9.6
3	19.5
4	46.5
5	56.4
6	63.1

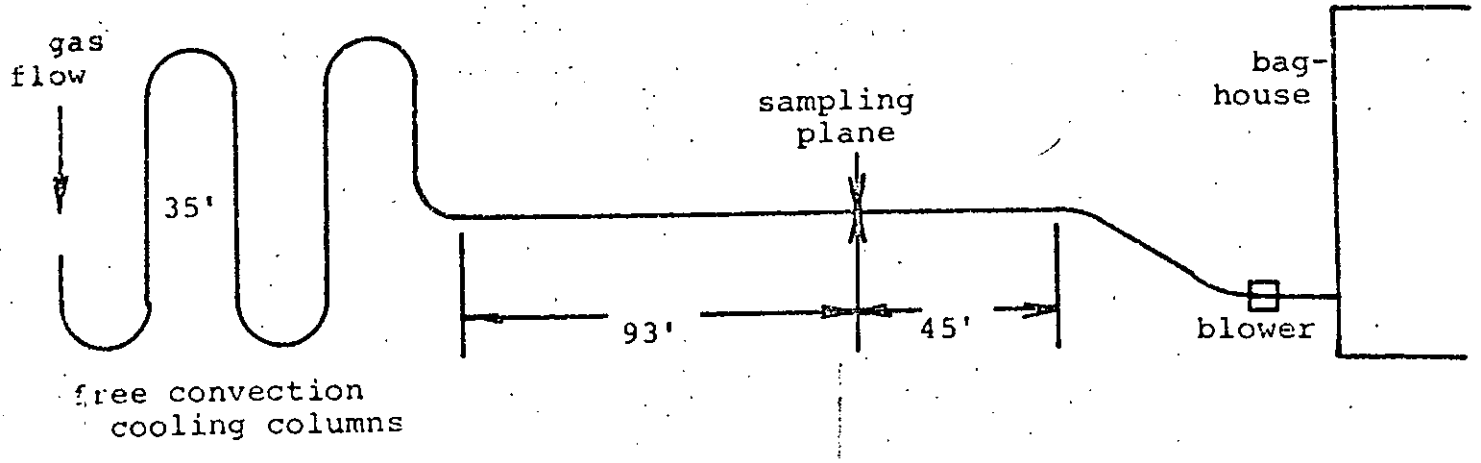


Figure 5 Sampling Plane Cross-section and Traverse Point Location for Plant 1, Furnace A, Baghouse 1 Upstream Sample

Simultaneous Determination of C_s and Q_s

On each baghouse outlet duct, 3 compliance tests were performed during three furnace heats. During the first compliance run on each baghouse, a simultaneous particulate test was performed upstream of the baghouses as was shown in Figures 4 and 5. This test was used for baghouse collection efficiency determination. From this test, the total time averaged over-the-heat gas flow rate, Q_s, to the baghouse was also measured. During the second and third compliance tests at the baghouse outlet duct, upstream Q_s was determined by pitot and temperature traverses using the same probe and hardware as used during the first upstream particulate test run. Because of possible gas flow variations over the time of the heat, Q_s determinations were made early, midway and late in the heat. This assured that the same time averaged upstream Q_s value would be used with the same time averaged downstream C_s value.

PRESENTATION AND DISCUSSION OF RESULTS

Appendix 1 through 8 contains the condensate, backwash and filter weights; orifice pressure drop values; stack temperatures; velocity pressures, sample volumes; and time and other important test parameters. Pertinent calculations leading to the particulate concentrations, and isokinetic percentages are also included.

Appendix 9 through 19 contains the upstream Q_s determinations for the 2nd and 3rd outlet compliance runs for each baghouse. The 1st Q_s run is included in Appendix 1 and 5 and is identified as an "upstream" run.

Appendix 20 contains the original field data sheets.

Plant 2, Furnace "S", Baghouse 5 particulate emission test results are in Table 1. The baghouse outlet particulate concentration ranges from 2.8×10^{-7} lb/scfd (0.0041 grains/scfd) to 7.6×10^{-7} lb/scfd (0.0053 grains/scfd) with the corresponding inlet gas flow rate from 37,600 to 42,200 scfm. The average concentration is 5.4×10^{-7} lb/scfd (0.0038 grains/scfd) with an inlet flow of 39,817 scfm. The corresponding particulate mass emission rate is 1.28 lb/hr and is well below the allowable emission rate of 13.3 lb/hr. Note also that the average isokinetic percentage is 99.7%.

Plant 1, Furnace "A", baghouse 1 particulate emission test results are in Table 2. This baghouse appears to be operating more effectively than baghouse 5. The average particulate concentration is 3.6 times lower than baghouse 5 and the mass emission rate is 4.3 times lower. Note also from Table 2 that the mass emission rate is substantially below the allowable value per Indiana APC 5. The average isokinetic percentage is 105.4%.

Table 3 contains the baghouse collection efficiency for particulates. The data corresponds to the simultaneous test runs made up and downstream of the baghouse.

Table 1. Overall Stack Test Results - Plant 2, Furance S, Baghouse 5, 4/5/79

Run/ Heat No.	C_s Partic. Concen. @ Baghouse Outlet lb/scfd	Q_s Volumetric Flow Rate @ Baghouse Inlet scfm	MER Baghouse Partic. Mass Emission Rate lb/hr	Process Weight Rate ton /hr	Allowable[1] Particulate Emission Rate lb/hr	Isokinetic Percentage
1/1	5.8×10^{-7}	42,200	1.47	4.9	11.9	100.6
2/2	2.8×10^{-7}	39,100	0.67	6.2	13.9	97.6
	avg.	40,200 39,650				
3/3	7.6×10^{-7}	37,900	1.71	6.4	14.2	101.0
	avg.	36,600 38,300 37,600				
overall average	5.4×10^{-7}	39,817	1.28	5.8	13.3	99.7

[1] Based on Indiana APC 5, $E = 4.1E^{0.67}$ where P = process weight rate in ton/hr, E = allowable particulate emissions in lb/hr.

Table 2. Overall Stack Test Results - Plant 1, Furnace A, Baghouse 1, 4/6/79

Run/ Heat No.	C_s, Partic. Concen. @ Baghouse Outlet lb/scfd	Q_s, Volumetric Flow Rate @ Baghouse Inlet scfm	MER Baghouse Partic. Mass Emission Rate lb/hr	Process Weight Rate ton/hr	Allowable[1] Particulate Emission Rate lb/hr	Isokinetic Percentage
4/1	1.3×10^{-7}	36,000	0.28	7.7	16.1	105.8
5/2	2.2×10^{-7}	33,800	0.43	7.8	16.2	104.2
		32,300				
		31,700				
	avg.	32,600				
6/3	1.0×10^{-7}	33,400	0.18	8.4	17.1	106.1
		30,800				
		25,700				
	avg.	29,967				
overall average	1.5×10^{-7}	32,856	0.30	8.0	16.5	105.4

[1] Based on Indiana APC 5, $E = 4.1P^{0.67}$ Where P = process weight rate in ton/hr, E = Allowable particulate emissions in lb/hr.

Table 3. Baghouse Particulate Collection Efficiency

	η_c, %
Plant 2, Furnace S, Baghouse 5	98.94
Plant 1, Furnace A, Baghouse 1	99.76

Plant 2, Baghouse 5 and Plant 1, Baghouse 1, have collection efficiencies of 98.94% and 99.76%, respectively.

SUMMARY

(1) Plant 2, Baghouse 5 and Plant 1, Baghouse 1 are substantially below the particulate emission rate regulation specified in Indiana APC 5.

(2) Both baghouses are operating with collection efficiencies above 98.9%.