

Note: This material is related to a section in *AP42, 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 file number, the AP42 chapter and then the section. The file name "rel01_c01s02.pdf" would mean the file relates to AP42 chapter 1 section 2. The document may be out of date and related to a previous version of the section. The document has been saved for archival and historical purposes. The primary source should always be checked. If current related information is available, it will be posted on the AP42 webpage with the current version of the section.

These are the source test reports for AP 42 section 11.17 Lime Manufacturing.
They are referenced in the database as a group, Lime Manufacturing source tests.

Commonwealth of Pennsylvania
Environmental Resources
February 22, 1990

Subject: Source Test Review

To: Data File
Ampel, Inc.
Maxatawney Township, Berks County

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

Through: Chief, Source Testing and Monitoring Section *JM*

Ampel, Inc. operates a limestone pelletizing plant and associated bagging system at the aforementioned location. The gaseous effluent from the pellet dryer servicing the operation is controlled by two cyclone collectors. Emissions generated by the pellet bagging system are controlled by a baghouse collector.

On October 24 and 25, 1989 representatives of Gilbert/Commonwealth Engineering conducted particulate emission testing on both the dryer and bagging operation. Upon review of the final test report, several calculative errors were found which are discussed in the following paragraphs.

The stack area used in calculating the results of the pellet dryer tests (12.56 sq. ft.) was in error. I have recalculated the volumetric flowrates and mass emission rates for both tests using the correct stack area (7.07 sq. ft.). Although these parameters differ substantially from those stated in the report, the compliance status of the source is not affected, as the allowable emission limit is based on grain loading. The corrected values are reflected in the chart below.

The particulate weights for test run nos. 2 and 3 on the bagging system exhaust (.8435 gr. and .6185 gr., respectively) were transposed during final calculation of the test results. Although this error significantly alters the results of the tests individually, the average of the three test runs remains unchanged and the compliance status of the operation is unaffected. The values presented below reflect the correct particulate concentrations and mass emission rates for the tests in question.

The field sampling aspects of the test program were conducted in accordance with all pre-approved procedures. The tests are acceptable to the Department.

The following corrected data was extracted from the test report:

Pellet Dryer

Test Run Number	1	2
Volumetric Flowrate (dscfm)*	10481	10016
Particulate Emission Rate (lb/hr)*	6.05	4.85
Particulate Concentration (gr/dscf)	0.068	0.059
Allowable Concentration (gr/dscf)	0.04	0.04

*Calculated using correct stack area of 7.07 sq. ft.

Pellet Bagging System

Test Run Number	1	2	3
Volumetric Flowrate (dscfm)	2997	3049	3136
Particulate Emission Rate (lb/hr)	2.76	5.09**	3.76**
Particulate Concentration (gr/dscf)	0.107	0.195**	0.140**
Allowable Concentration (gr/dscf)	0.02	0.02	0.02

**Calculated using correct particulate weights

cc: Roger A. Fitterling, Reading District Office
Permit File No. 06-310-019
EPA/RSL
N. Rao Kona, Norristown Regional Office
Reading File
Douglas Leshner

JP:rjr

COMMONWEALTH OF PENNSYLVANIA
Environmental Resources
8-468-4175

DATE: January 26, 1990

SUBJECT: Ampel Incorporated Limestone Pelletizing Plant
File #06-310-019
Maxatawney Township, Berks County

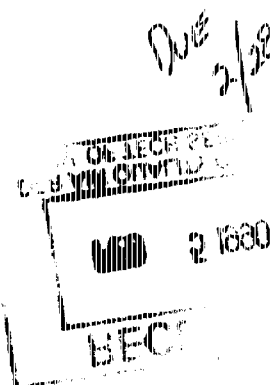
TO: L. BLAINE DeHAVEN, Chief
Source Testing & Monitoring Section
Division of Technical Services & Monitoring

FROM: ROGER A. FITTERLING *RF*
Air Pollution Control Engineer

Technical Services personnel are requested to review the attached stack test report to determine compliance with the requirements of Chapter 139. Sampling for visible and particulate emissions from the company's limestone pelletizing plant was conducted on October 24th and 25th, 1989 by representatives of Gilbert/Commonwealth Incorporated. The source is covered by Plan Approval No. 06-310-019, and issuance of an Operating Permit will be based upon the acceptability of the test. The allowable particulate emissions for the dryer is 0.04 gr/dcsf and for the bagger is 0.02 gr/dcsf.

Attachments

cc: Abatement and Compliance
Norristown Regional Office
Reading District Office
Re30 RF26.4



SOURCE SAMPLING REPORT FOR MEASUREMENT
OF PARTICULATE EMISSIONS

AMPEL MANUFACTURING
KUTZTOWN FACILITY
DRYER STACK AND BAGGING SYSTEM STACK

G/C, Inc., REPORT R-10-0702-000-1
OCTOBER, 1989

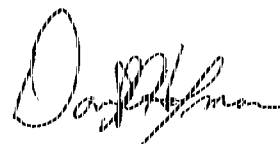
SOURCE SAMPLING REPORT FOR MEASUREMENT
OF PARTICULATE EMISSIONS

AMPEL MANUFACTURING
KUTZTOWN FACILITY
DRYER STACK AND BAGGING SYSTEM STACK

G/C, INC., REPORT R-10-0702-000-1
OCTOBER, 1989

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 Gilasoc/Telex 836-431

December 21, 1989

Mr. Paul Mattox
Ampel Manufacturing
Kutztown, PA 19530

Re: Submittal of Source Sampling Report for
Measurement of Particulate Emissions
AMPEL Manufacturing
Kutztown Facility
Dryer Stack and Bagging System Stack
G/C, Inc., Report R-10-0702-000-1

Dear Mr. Mattox:

We are pleased to submit six copies of our Report R-10-0702-000-1, dated December 21, 1989. This report contains results of source sampling for particulate emissions and determination of flue gas characteristics for the Dryer Stack and Bagging System Stack exhaust located at your Kutztown facility, as conducted on October 24-25, 1989.

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 stack outlet of each source 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 Ampel Manufacturing and trusts that this report will meet your complete acceptance.

Very truly yours,

David Hofmann
Project Coordinator
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 referenced operating conditions.

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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 Dryer Stack and the Bagging System Stack. The results show the Dryer Stack has an average emission of 0.063 gr/dscf. The Bagging System Stack has an average emission rate of 0.149 gr/dscf. Both sources are above the allowable emission rate of 0.04 gr/dscf.

TABLE 1
SUMMARY OF TEST RESULTS
AMPEL MANUFACTURING
DRYER STACK
KUTZTOWN, PA

R-10-0702-000-1

DATE	10/24/89	10/24/89
LOCATION		Dryer Stack
RUN NO.	A-1	A-2
TIME	1030	1249
<u>OPERATING DATA</u>		
Lbs/Hr	118,354	105,247
<u>FLUE GAS CHARACTERISTICS</u>		
DSCFM	18,667	17,544
ACFM	25,289	25,708
Temperature, °F	160	195
Moisture, %	15.0	16.9
<u>PARTICULATE EMISSIONS</u>		
Gr/DSCF	0.068	0.059
Lbs/Hr	10.80	8.93
Gr/DSCF, Average		0.063
Gr/DSCF, Allowable		0.04

TABLE 2

SUMMARY OF TEST RESULTS
 AMPEL MANUFACTURING
 BAGGING SYSTEM STACK
 KUTZTOWN, PA

R-10-0702-000-1

DATE	10/25/89	10/25/89	10/25/89
LOCATION	Bagging System Stack		
RUN NO.	B-1	B-2	B-3
TIME	0830	1041	1307
<u>OPERATING DATA</u>			
Lbs/Hr	37,800	39,557	26,453
<u>FLUE GAS CHARACTERISTICS</u>			
DSCFM	2,997	3,049	3,136
ACFM	2,969	3,114	3,226
Temperature, °F	60	78	80
Moisture, %	1.5	1.2	1.3
<u>PARTICULATE EMISSIONS</u>			
Gr/DSCF	0.107	0.150	0.191
Lbs/Hr	2.76	3.91	5.12
Gr/DSCF, Average		0.149	
Gr/DSCF, Allowable		0.040	
<u>VISIBLE EMISSIONS</u>			
Opacity, %	0	0	0

SECTION II - ANALYSIS

1. Introduction

The data presented in this report represents the results of source sampling exhaust emissions at both locations during referenced operating conditions.

Specific requirements of this source sampling program include the following:

- a. Identification of final particulate emissions from both sources.
- 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.
- e. Visible Emission test during the particulate tests at the Bagging System Stack only.

The sampling program was completed on October 24-25, 1989, by the Gilbert field test crew, with the assistance of personnel assigned by Ampel Manufacturing.

2. 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 two test runs at the Dryer Stack location and three test runs at the Bagging System location. A test run consisted of a particulate test using PADER approved Method 5 at both locations, and a visible emission test using EPA Method 9 at the Bagging System only.

The location and number of sampling ports and traverse points are detailed in Figures 1 and 2.

3. 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 Appendix 3.

4. 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 Tables 1 and 2.

5. Discussion

5.1 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.

5.2 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.

5.3 Unit Operating Conditions

This sampling program was undertaken as a compliance test program for the dryer stack and the Bagging System stack plant under 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 Ampel Manufacturing personnel.

5.4 Emissions

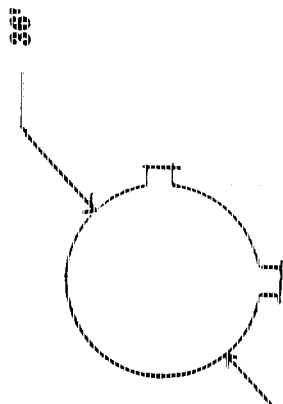
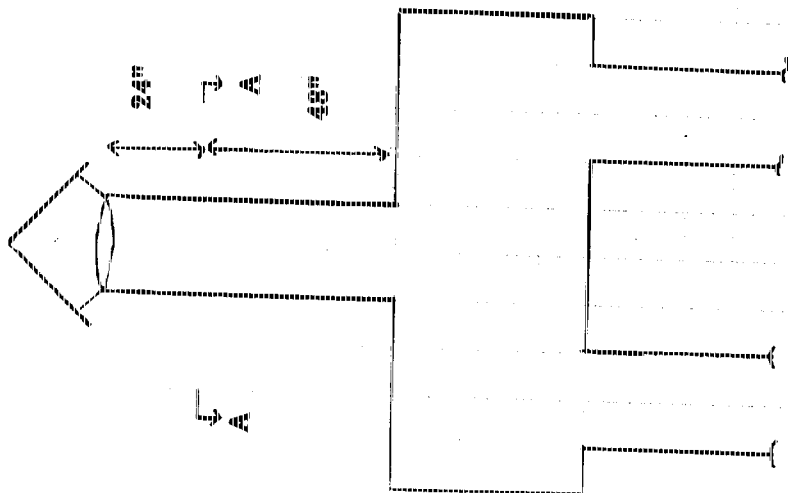
5.4.1 Particulate

The reported particulate emissions as summarized in Tables 1 and 2, are expressed as a concentration (grains/SCF) and emission rate (lbs/hour) as measured.

5.4.2 Visible

The reported visible emissions as summarized in Table 2, are expressed as a percent.

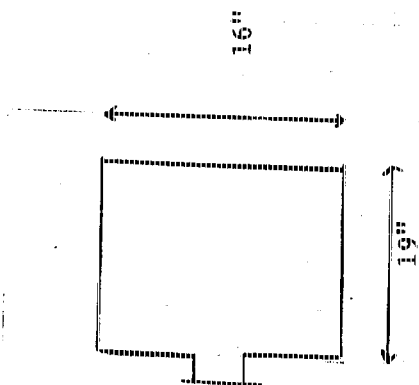
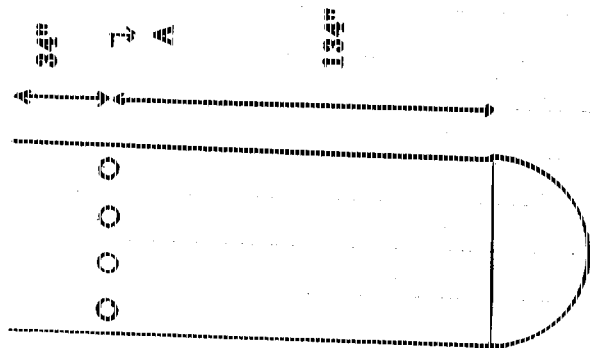
SECTION A-A



Point No. Distance From Port, inches

1	1.00
2	2.41
3	4.25
4	6.37
5	9.00
6	12.82
7	23.18
8	27.00
9	29.63
10	31.75
11	33.59
12	35.00

FIGURE 1 Pellet Oyster
SUMMARY OF TEST PORTS AND TRAVERSE POINTS
AMPEL MANUFACTURING
KUTZTOWN FACILITY



Point No. Distance From Port, Inches

1	3.17
2	9.50 ✓
3	15.83

FIGURE 2

SUMMARY OF TEST PORTS AND TRAVERSE POINTS
 AMPEL MANUFACTURING
 KUTZTOWN FACILITY

SECTION III
APPENDICES

SECTION III - APPENDICES

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(Flue Gas Characteristics, Isokinetic Calculations, and Test Results for Particulate Emissions)
8. Sample Calculations

APPENDIX 1
PROJECT PARTICIPANTS

APPENDIX 1
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:

Dave Hofmann
Don Wary
Gary Helm

Project Coordinator
Sr. Engineering Technician
Engineering Technician

Laboratory Participants:

Carl J. Wummer
Vaughan O'Neill

Chemist
Laboratory Technician

All field tests were completed with the assistance of technical personnel from Ampel Manufacturing.

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

2.2 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 locations 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 the 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 3.5 minutes at each of the traverse points at the Dryer Stack and 8.0 minutes at the Bagging System Stack.

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

2.3 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, accumulations on the glass fiber filter plus a .22 micron filtration of the impinger water. 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 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.

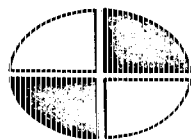
Laboratory analysis of the particulate samples collected during the test run proceeded according to EPA Method 5 (Appendix 2.1).

4 MPZ DRYER

Time	Run #	Dryer Temp °F	Fed Oil Per pails
0954	A-1	590	42
1022		640	42
1108		660	45
1141		670	45
1155		700	40
1224		690	35
	A-2		
1245		710	35
1305		700	34
		700	35
1431		690	30

AGG 3 tons/Hr
 Limestone 17 tons/Hr
 coarse 7.5 tons/Hr

APPENDIX 4
ANALYTICAL RESULTS FOR PARTICULATES

**SSM**SPOTTS, STEVENS AND MCCOY, INC.
ENGINEERS • PLANNERS • SCIENTISTSANALYTICAL
LABORATORY
30 Noble Street
P.O. Box 6527
Reading PA 19611-0527
(215) 376-6581
FAX (215) 376-6950**CERTIFICATE OF ANALYSIS**

CLIENT: GILBERT/COMMONWEALTH INC REPORT NO: 8932372
P O BOX 1498 P.O. NO.: 52568
READING PA 19603 DATE REPORTED: November 14, 1989
DATE RECEIVED: November 01, 1989
WORK ORDER NO.: 13361-001

SAMPLING DATE: OCTOBER 24, 1989 BY: CLIENT

SAMPLE DESCRIPTION: STACK

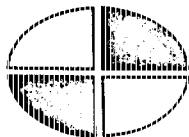
SAMPLE IDENTIFICATION: AMPEL
W.D. #10-0702-000

LAB NO.	RUN	PARTICULATE SOURCE	PARTICULATE WT (mg)
8932372-1	A-1	Impinger Water	218.5
8932372-1	A-1	Impinger Water (> 0.22 µm)	10.8
8932372-1	A-1	Impinger Acetone	3.2
8932372-1	A-1	Probe Acetone	14.8
8932372-1	A-1	Probe Water	204.2
8932372-1	A-1	Filter	45.1
8932372-2	A-2	Impinger Water	277.6
8932372-2	A-2	Impinger Water (> 0.22 µm)	2.9
8932372-2	A-2	Impinger Acetone	2.5
8932372-2	A-2	Probe Acetone	6.7
8932372-2	A-2	Probe Water	171.9
8932372-2	A-2	Filter	39.2
8932372-3	B-1	Impinger Water	3.8
8932372-3	B-1	Impinger Water (> 0.22 µm)	0.4
8932372-3	B-1	Impinger Acetone	3.4
8932372-3	B-1	Probe Acetone	9.0
8932372-3	B-1	Probe Water	310.6
8932372-3	B-1	Filter	136.2

277.6
204.2
310.6

CERTIFICATIONS AND AFFILIATIONS

AMERICAN
INDUSTRIAL
HYGIENE
ASSOCIATIONMARYLAND
State Certified
Water Quality
LaboratoryNEW JERSEY
State Certified
Water LaboratoryPENNSYLVANIA
Certified Drinking
Water LaboratoryChemical/Biological
(Environmental)



SSM
SPOTTS, STEVENS AND MCCOY, INC.
ENGINEERS • PLANNERS • SCIENTISTS

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LABORATORY**
30 Noble Street
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FAX (215) 376-6950

CERTIFICATE OF ANALYSIS

GILBERT/COMMONWEALTH INC
REPORT #8932372

NOVEMBER 14, 1989
PAGE 2

SAMPLE IDENTIFICATION: AMPEL
W.D. #10-0702-000

LAB NO.	RUN	PARTICULATE SOURCE	PARTICULATE WT (mg)
8932372-4	B-2	Impinger Water	6.0
8932372-4	B-2	Impinger Water (> 0.22 µm)	0.6
8932372-4	B-2	Impinger Acetone	4.9
8932372-4	B-2	Probe Acetone	3.9
8932372-4	B-2	Probe Water	650.4
8932372-4	B-2	Filter	188.6
843.5 actual			
618.6 used			
8932372-5	B-3	Impinger Water	3.6
8932372-5	B-3	Impinger Water (> 0.22 µm)	0.3
8932372-5	B-3	Impinger Acetone	6.1
8932372-5	B-3	Probe Acetone	13.4
8932372-5	B-3	Probe Water	458.9
8932372-5	B-3	Filter	146.0
618.6 actual			
10.5 used			

Respectfully submitted,

CARL J. WUMMER - GROUP LEADER
LABORATORY SERVICES

cc: Steve Brockel

CERTIFICATIONS AND AFFILIATIONS

**AMERICAN
INDUSTRIAL
HYGIENE
ASSOCIATION**



MARYLAND
State Certified
Water Quality
Laboratory

NEW JERSEY
State Certified
Water Laboratory

PENNSYLVANIA
Certified Drinking
Water Laboratory



Chemical/Biological
(Environmental)

APPENDIX 5

RAW FIELD DATA

5.1 DRYER STACK

5.2 BAGGING SYSTEM STACK

APPENDIX 5
RAW FIELD DATA
5.1 DRYER STACK

Sheet 1 of 2

PARTICULATE FIELD DATA

Client Amgen

VERY IMPORTANT - FILL IN ALL BLANKS

Pitot Calibration 0.8%

W. O. No.

Read and record at the start of each test point

Thimble No.

Plant Kutzbach

SECTION

Filter No. 35403

Run No. A-1

Ambient Temp. of 48

Location stack

Bar. Press. 29.40

Date 10/24/89

Assumed Moisture % 22

Operator DCW

Heater Box Setting, of 255

Sample Box No.

Probe Tip Dia., in. .300

Meter Box No. 2773

Probe Length

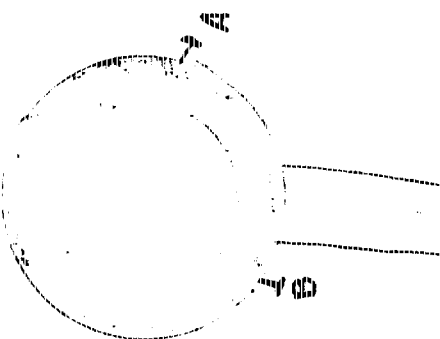
Meter/An

Probe Heater Setting 25 KV

C Factor

Avg. ΔP

Avg. ΔE



POINT	DISTANCE IN INCHES	CLOCK TIME	ACTUAL RUN	DRY GAS METER, CF	PITOT IN. H ₂ O	ORIFICE A H IN. H ₂ O	DRY GAS TEMP. OF	PUMP VACUUM IN. Hg	BOX TEMP. OF	IMPINGER TEMP. OF	STACK TEMP. OF
A-1		10:30	0.0	330.400	0.36	2.20	50.	3	250	46	170.
2		35			0.38	1.75	58.		260		178.
3		7.	342.0		0.35	1.56	68.		265		183.
4		100	344.4		0.35	1.54	72.		255	17.0	182.
5		14.	342.8		0.34	1.53	76.		250		185.
6		27.5	349.0		0.36	1.63	80.		265		187.
7		21.	351.6		0.30	1.90	83.		220	47	186.
8		24.5	354.7		0.30	1.90	85.		265	17.7	186.
9		28.	356.8		0.32	1.98	87.		265		187.
10		31.5	359.5		0.34	2.15	89.		260	17.1	188.
11		35.	362.3		0.35	2.20	90.		260		187.
12		38.5	365.2		0.33	2.08	91.		255		187.
13		42.	367.9								

4.96 27.80 Co2 2.2 2.4 246 EMP 258

Sheet 1 of 2

PARTICULATE FIELD DATA

Client UNPPL

Pilot Calibration 0.87

W. O. No.

Read and record at the start of each test point

Plant Whitman

Filter No. S-904

Run No. L.2

Ambient Temp. of 71

Location S/Sok

Bar. Press. "Hg

Date 10/20/89

Assumed Moisture % 10

Operator OCW

Heater Box Setting, of 205

Sample Box No.

Probe Tip Dia., in. .300

Meter Box No. 2793

Probe Length

Meter ΔH

Probe Heater Setting 25 WV

C Factor

Avg. ΔP

Avg. ΔH

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	DRY GAS METER, CF	PITOT IN. H ₂ O ΔP	ORIFICE ΔH IN. H ₂ O		DRY GAS TEMP. OF		PUMP VACUUM IN. HG GAUGE	BOX TEMP. OF	IMPINGER TEMP. OF	STACK TEMP. OF
					DESIGNED	ACTUAL	INLET	OUTLET				
R-1		1249.0-0	398.702	0.18	180		70.	72.	-	145	52	147.
2		3.5	401.2	0.13	147		75.	72.		250		171.
3		7.	403.5	0.21	132		81.	72.		150		152.
4		10.5	405.0	0.21	111		84.	72.		150		171.
5		14.	402.9	0.21	122		87.	74.		255		246
6		17.5	410.2	0.23	124		88.	74.		255	53	216
7		21.	412.5	0.18	153		90.	75.		210		189.
8		24.5	-	0.13	110		93.	74.		249		162.
9		18.	417.4	0.38	238		95.	77.		245		134.
10		20.5	420.4	0.40	253		97.	78.		240		130.
11		35.	413.1	0.40	182		99.	79.		240		124.
12		38.5	416.4	0.41	260		100.	80.		155		118.
13		42.	414.316									

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0210.

PARTICULATE FIELD DATA
(continued)

Client
W.O. No.
Plant
Run No.

Location
Date

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	CLOCK TIME RUN	DRY GAS METER, CF	PITOT IN. H ₂ O Δ P	ORIFICE Δ H IN. H ₂ O		DRY GAS TEMP. OF		PUMP VACUUM IN. Hg GAUGE	BOX TEMP OF	IMPINGER TEMP OF	STACK TEMP. OF
						DESIRED	ACTUAL	INLET	OUTLET				
1		1344.	3.0	429.226	0.30		140	81	79		250	56	238
2			3.5		0.26		162	89	79		250		258
3			7.	435.4	0.25		138	94	80		250		246
4			10.5	426.8	0.23		128	95	81		255		233
5			14.	439.1	0.22		121	96	82		255		224
6			17.5	441.2	0.25		140	99	83		260	59	194
7			21.	443.7	0.29		172	102	84		260		171
8			24.5	446.5	0.30		160	104	86		260		163
9			28.	448.9	0.29		181	107	86		265		144
10			31.5	451.3	0.30		183	106	87		260		164
11			35	454.0	0.32		200	105	88		260		169
12			38.5	456.7	0.33		208	106	89		255		170
13			42.	459.573									

COMMENTS: 4.95 leak at 2" OOG 1.0
398.0 2.2
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APPENDIX 5
RAW FIELD DATA
5.2 BAGGING SYSTEM STACK

[illegible]

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 UNIVERSITY OF MICHIGAN PRESS

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POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	DRY GAS METER, CF	PISTON IN. #20 AT	ORIFICE A B IN. #7 O		DRY GAS TEMP. OF		PUMP VACUUM IN. HG GAUGE	BOX TEMP. OF	SPRINGER TEMP. OF	STACK TEMP. OF
					DESIRE	ACTUAL	INLET	OUTLET				
A-1		0830-0-0	420.456	0.10		0.90	50.	49.	-	245	41	52.
		4.	443.7	0.11		0.99	56.	49.		245		53.
2		8.	464.8	0.14		1.27	63.	49.		250		54.
		12.	466.9	0.165		1.49	70.	52.		250		54.
3		16.	470.2	0.22		1.93	80.	56.		255		56.
		20.	472.7	0.22		1.93	82.	56.		255		56.
		24.	476.549									
B-1		0856-0-0	475.549	0.14		1.27	82.	62.	-	255	44	57.
		4.	478.1	0.14		1.27	85.	66.		250		58.
		8.	481.0	0.20		1.82	90.	68.		250		58.
		12.	483.5	0.20		1.82	92.	69.		250		58.
3		16.	486.8	0.26		2.35	94.	72.		245		58.
		20.	489.7	0.25		2.28	97.	74.		245		59.

Year	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100																																																																																																			
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PARTICULATE FIELD DATA
(continued)

Client NO. 881
 W.O. No. 12012/100
 Plant 12012/100
 Run No. 12-1

Location 0221
 Date 10/23/81

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL	DRY GAS METER CF RUN	PITOT IN. H ₂ O Δ P	ORIFICE Δ H IN. H ₂ O		DRY GAS TEMP. OF		PUMP VACUUM IN. Hg GAUGE	BOX TEMP OF	IMPINGER TEMP OF	STACK TEMP. OF
					DESIRED	ACTUAL	INLET	OUTLET				
			14.1									
			492.956									
		0921.0	492.956	0.18	1.66	1.66	94.	77.	-	245	47	60.
		4.	493.9	0.18	1.66	1.66	95.	78.		250		61.
		8.	498.9	0.23	2.10	2.10	99.	80.		250		61.
		12.	501.8	0.23	2.09	2.09	100.	80.		250		62.
		16.	505.3	0.28	2.55	2.55	104.	83.		255		63.
		20.	508.7	0.26	2.38	2.38	107.	84.		255		64.
		24.	511.904									
		0947.0	511.906	0.14	1.30	1.30	104.	84.	-	255	52	65.
		4.	517.5	0.14	1.30	1.30	105.	86.		250		66.
		8.	517.4	0.18	1.68	1.68	105.	88.		250		67.
		12.	520.1	0.20	1.83	1.83	106.	89.		250		67.
		16.	523.6	0.25	2.28	2.28	110.	89.		245		67.
		20.	526.6	0.25	2.28	2.28	111.	90.		245		68.
		24.	529.67									
			460.4									
			492.2									

COMMENTS: 135 158 60/19
look at 2" feed
1.12 1.14

**PARTICIPATE THE DAY
(Continued)**

430000

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[illegible]

COMMENTS

3-13

250

58-2-1-1-2-2

536

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[illegible]

2000

Sheet 1 of 2

PARTICULATE FIELD DATA

VERY IMPORTANT - FILL IN ALL BLANKS

Pitot Calibration 0.84

Client Amesbury

W. O. No.
 Read and record at the start of each test point

SKETCH

Plant

Run No. 67

Location 303A

Date 10/26/60

Operator

Sample Box No.

Water Box No. 3032

Water/ΔH

Q Factor

Thimble No.

Filter No. 5-903

Ambient Temp. of 61

Bar. Press. "Hg 30.18

Assumed Moisture % 1

Heater Box Setting: of 250

Probe Tip Dia., in. .300

Probe Length

Probe Heater Setting 20 kW

Avg. ΔP Avg. ΔH

POINT	DISTANCE IN INCHES	CLOCK TIME ACTUAL RUN	DRY GAS METER, OF	PITOT IN. H ₂ O ΔP	ORIFICE Δ H IN. H ₂ O		DRY GAS TEMP. OF		PUMP VACUUM IN. HG GAUGE	BOX TEMP. OF	IMPINGER TEMP. OF	STACK TEMP. OF
					DESIRED	ACTUAL	INLET	OUTLET				
1	1041.	0.0	529.907	0.11		102	84	87	1	250	55	73.
			532.1	0.10		99.2	86	87		250		77.
2			534.4	0.17		130	92	87	2	255		77.
			524.8	0.16		150	77	88		255		77.
3			539.7	0.21		192	104	89	3	255		75.
			542.7	0.21		197	105	89		260		
4			545.572									
5			548.572	0.15		140	103	89	4	255	56	75.
			548.2	0.15		140	105	90		255		76.
6			551.0	0.23		209	104	91		250		77.
			554.1	0.22		198	105	92		250		77.
7			557.4	0.25		225	106	93		250		78.
			560.5	0.25		228	110	94		245		78.

133 sup Col 21

+1.10

1.44

PARTICULATE FIELD DATA

Sheet 1 of 2

VERY IMPORTANT - FILL IN ALL BLANKS

Client

W. O. No.

Plant

Run No.

Location

Date

Operator

Sample Box No.

Meter Box No.

Meter ΔH

C Factor

Pitot Calibration 0.84

Thimble No.

Filter No. 5-9108

Ambient Temp. of 68

Bar. Press. "Hg 30.13

Assumed Moisture % 2

Heater Box Setting, of 250

Probe Tip Dia., in. .300

Probe Length

Probe Heater Setting 20 kV

Avg. ΔP Avg. ΔH

Read and record at the start of each test point

SKETCH

POINT	DISTANCE IN INCHES	CLOCK TIME	DRY GAS METER, CF	PITOT IN. H ₂ O ΔP	ORIFICE ΔH IN. H ₂ O		DRY GAS TEMP. OF		PUMP VACUUM IN. Hg GAUGE	BOX TEMP. OF	INFLINGER TEMP. OF	STACK TEMP. OF
					DESIGNED	ACTUAL	INLET	OUTLET				
1	147	1307.0-0	599.707	0.11		1.01	85.	87.	-	248	59	78.
		4.1	602.1	0.10		0.91	90.	88.		248		78.
		8.1	604.2	0.16		1.48	98.	88.		245		79.
		12.1	606.8	0.16		1.48	100.	88.		245		78.
		16.1	609.8	0.23		2.10	104.	88.		250		78.
		20.1	612.8	0.22		1.97	107.	89.		250		78.
		24.1	615.712									
2	140	1333.0-0	615.712	0.15		1.38	104.	90.	-	250	60	78.
		4.1	618.2	0.16		1.46	106.	91.		253		79.
		8.1	621.3	0.22		1.98	107.	92.		255		79.
		12.1	624.0	0.22		1.98	110.	92.		255		79.
		16.1	627.8	0.28		2.53	117.	94.		260		80.
		20.1	630.9	0.25		2.23	114.	95.		255		80.

DOWN cell up 10.94 up IN
UP cell down 10.94 down OUT

4.10
4.15

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POINT	DISTANCE IN INCHES	CLOCK TIME		DRY GAS METER, CF	PITOT IN. H ₂ O Δ P	ORIFICE Δ H IN. H ₂ O		DRY GAS TEMP. OF		PUMP VACUUM IN. Hg GAUGE	BOX TEMP OF	IMPINGER TEMP OF	STACK TEMP. OF
		ACTUAL	RUN			DESIRED	ACTUAL	INLET	OUTLET				
			27.	634.014									
C-1	130	1359.	0.0	634.014	0.17	156	168.	96.	-	255	60		80.
			4.	637.0	0.15	139	116.	96.		250			81.
			8.	639.7	0.13	209	112.	97.		266			80.
			12.	642.7	0.24	218	113.	97.		250			80.
			16.	646.2	0.28	255	115.	97.		245			81.
			20.	649.6	0.28	255	116.	98.		246			82.
			24.	652.730									
D-1	100	1425.	0.0	652.730	0.14	129	110.	99.	-	250	61		82.
			4.	655.6	0.15	138	110.	99.		255			81.
			8.	658.3	0.20	182	112.	99.		260			82.
			12.	661.2	0.20	182	114.	99.		260			82.
			16.	664.6	0.30	273	116.	100.		255			81.
			20.	667.7	0.30	273	117.	100.		250			81.
			24.	671.323									
				600									




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22/09/2017

Figure 9-1. Field data sheet.

COMPANY	<u>Amper</u>	HOURS OF OBSERVATION	<u>10/2/88</u>
LOCATION	<u>Bloom</u>	OBSERVER	<u>10/2/88</u>
TEST NUMBER		OBSERVER CERTIFICATION DATE	
DATE	<u>10/2/88</u>	OBSERVER AFFILIATION	
TYPE FACILITY		POINT OF EMISSIONS	
CONTROL DEVICE	<u>Baghouse</u>	HEIGHT OF DISCHARGE POINT	

SUMMARY OF AVERAGE OPACITY

Set Number	Time		Opacity	
	Start	End	Sum	Average
B-1	0831	1001	0	0
B-2	1040	1211	10	0
B-3	1335	1435	0	0

Readings ranged from 0 to 2 opacity

The source was/was not in compliance with the time evaluation was made.

Initial	Final
0831	1046
101	101
B	W
Ground	Ground
Brown	Brown
Cal m. cal.	Cal m. cal.
Cal m. cal.	Cal m. cal.
37	39
N/A	N/A
Brown	Brown

CLOCK TIME
OBSERVER LOCATION
Distance to Discharge
Direction from Discharge
Height of Observation Point
BACKGROUND DESCRIPTION
WEATHER CONDITIONS
Wind Direction
Wind Speed
Ambient Temperature
SKY CONDITIONS (clear, overcast, clouds, etc.)
PLUME DESCRIPTION
Color
Distance Visible
OTHER INFORMATION

FIGURE 9-2 OBSERVATION RECORD
(Continued)

PAGE 1 OF

COMPANY Ames
LOCATION Blawie
TEST NUMBER
DATE 10/28/60

OBSERVER Hofmann
TYPE FACILITY
POINT OF EMISSIONS

Hr.	Min.	Seconds				STEAM PLUME (check if applicable)		COMMENTS
		0	15	30	45	Attached	Detached	
0	0	0	0	0	0			
1	0	0	0	0	0			
2	0	0	0	0	0			
3	0	0	0	0	0			
4	0	0	0	0	0			
5	0	0	0	0	0			
6	0	0	0	0	0			
7	0	0	0	0	0			
8	0	0	0	0	0			
9	0	0	0	0	0			
10	0	0	0	0	0			
11	0	0	0	0	0			
12	0	0	0	0	0			
13	0	0	0	0	0			
14	0	0	0	0	0			
15	0	0	0	0	0			
16	0	0	0	0	0			
17	0	0	0	0	0			
18	0	0	0	0	0			
19	0	0	0	0	0			
20	0	0	0	0	0			
21	0	0	0	0	0			
22	0	0	0	0	0			
23	0	0	0	0	0			
24	0	0	0	0	0			
25	0	0	0	0	0			
26	0	0	0	0	0			
27	0	0	0	0	0			
28	0	0	0	0	0			
29	0	0	0	0	0			

Pages

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-8

49 bias
page

FIGURE 9-2 OBSERVATION RECORD
(Continued)

PAGE 2 OF

COMPANY Ampco
LOCATION Baggerton
TEST NUMBER B-1
DATE 10/25/74

OBSERVER Hofmann
TYPE FACILITY
POINT OF EMISSIONS

Hr.	Min.	Seconds				STEAM PLUME (check if applicable)		COMMENTS
		0	15	30	45	Attached	Detached	
0721	0	0	0	0	0			
	1	0	0	0	0			
	2	0	0	0	0			
	3	0	0	0	0			
	4	0	0	0	0			
	5	0	0	0	0			
	6	0	0	0	0			
	7	0	0	0	0			
	8	0	0	0	0			
	9	0	0	0	0			
	10	0	0	0	0			
	11	0	0	0	0			
	12	0	0	0	0			
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	14	0	0	0	0			
	15	0	0	0	0			
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	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
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	23	0	0	0	0			
	24	0	0	0	0			
	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			

FIGURE 9-2 OBSERVATION RECORD
(Continued)

PAGE 3 OF 3

COMPANY Amel
LOCATION Beverly
TEST NUMBER 1
DATE 10/15/89

OBSERVER [Signature]
TYPE FACILITY _____
POINT OF EMISSIONS _____

Hr.	Min.	Seconds				STEAM PLUME (check if applicable)		COMMENTS
		0	15	30	45	Attached	Detached	
00	0	0	0	0	0			
	1	0	0	0	0			
	2	0	0	0	0			
	3	0	0	0	0			
	4	0	0	0	0			
	5	0	0	0	0			
	6	0	0	0	0			
	7	0	0	0	0			
	8	0	0	0	0			
	9	0	0	0	0			
	10	0	0	0	0			
	11	0	0	0	0			
	12	0	0	0	0			
	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	21	0	0	0	0			
	22	0	0	0	0			
	23	0	0	0	0			
	24	0	0	0	0			
	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			

FIGURE 9-2 OBSERVATION RECORD
(Continued)

PAGE 1 OF 1

COMPANY Ampel
LOCATION Berkeley
TEST NUMBER 2
DATE 10/28/09

OBSERVER J. C. ...
TYPE FACILITY _____
POINT OF EMISSIONS _____

Hr.	Min.	Seconds				STEAM PLUME (check if applicable)		COMMENTS
		0	15	30	45	Attached	Detached	
10:49	0	0	0	0	0			
	1	0	0	0	0			
	2	0	0	0	0			
	3	0	0	0	0			
	4	0	0	0	0			
	5	0	0	0	0			
	6	0	0	0	0			
	7	0	0	0	0			
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	23	0	0	0	0			
	24	0	0	0	0			
	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			

FIGURE 9-2 OBSERVATION RECORD
(Continued)

PAGE 2 OF

COMPANY Amrad
LOCATION Baggen
TEST NUMBER 2
DATE 12/15/81

OBSERVER H. F. ...
TYPE FACILITY
POINT OF EMISSIONS

Hr.	Min.	Seconds				STEAM PLUME (check if applicable).		COMMENTS
		0	15	30	45	Attached	Detached	
11:08	0	0	0	0	0			
	1	0	0	0	0			
	2	0	0	0	0			
	3	0	0	0	0			
	4	0	0	0	0			
	5	0	0	0	0			
	6	0	0	0	0			
	7	0	0	0	0			
	8	0	0	0	0			
	9	0	0	0	0			
	10	0	0	0	0			
	11	0	0	0	0			
	12	0	0	0	0			
	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	21	0	0	0	0			
	22	0	0	0	0			
	23	0	0	0	0			
	24	0	0	0	0			
	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			

FIGURE 9-2 OBSERVATION RECORD
(Continued)

PAGE 3 OF 3

COMPANY Amper
LOCATION _____
TEST NUMBER 2
DATE 10/2/55

OBSERVER R. R. ...
TYPE FACILITY _____
POINT OF EMISSIONS _____

Hr.	Min.	Seconds				STEAM PLUME (check if applicable)		COMMENTS
		0	15	30	45	Attached	Detached	
12.00	0	0	0	0	0			
	1	0	0	0	0			
	2	0	0	0	0			
	3	0	0	0	0			
	4	0	0	0	0			
	5	0	0	0	0			
	6	0	0	0	0			
	7	0	0	0	0			
	8	0	0	0	0			
	9	0	0	0	0			
	10	0	0	0	0			
	11	5	5	10	0			
	12							
	13							
	14							
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FIGURE 9-2 OBSERVATION RECORD
(Continued)

PAGE 1 OF 1

COMPANY Amco
LOCATION
TEST NUMBER 3
DATE 10/17/89

OBSERVER H. C. Adams
TYPE FACILITY
POINT OF EMISSIONS

Hr.	Min.	Seconds					STEAM PLUME (check if applicable)		COMMENTS
		0	15	30	45		Attached	Detached	
1337	0	0	0	0	0				
	1	0	0	0	0				
	2	0	0	0	0				
	3	0	0	0	0				
	4	0	0	0	0				
	5	0	0	0	0				
	6	0	0	0	0				
	7	0	0	0	0				
	8	0	0	0	0				
	9	0	0	0	0				
	10	0	0	0	0				
	11	0	0	0	0				
	12	0	0	0	0				
	13	0	0	0	0				
	14	0	0	0	0				
	15	0	0	0	0				
	16	0	0	0	0				
	17	0	0	0	0				
	18	0	0	0	0				
	19	0	0	0	0				
	20	0	0	0	0				
	21	0	0	0	0				
	22	0	0	0	0				
	23	0	0	0	0				
	24	0	0	0	0				
	25	0	0	0	0				
	26	0	0	0	0				
	27	0	0	0	0				
	28	0	0	0	0				
	29	0	0	0	0				

FIGURE 9-2 OBSERVATION RECORD
(Continued)

PAGE 2 OF 2

COMPANY Ampro
LOCATION _____
TEST NUMBER 3
DATE 10/20/69

OBSERVER H. P. ...
TYPE FACILITY _____
POINT OF EMISSIONS _____

Hr.	Min.	Seconds				STEAM PLUME (check if applicable)		COMMENTS
		0	15	30	45	Attached	Detached	
1405	0	0	0	0	0			
	1	0	0	0	0			
	2	0	0	0	0			
	3	0	0	0	0			
	4	0	0	0	0			
	5	0	0	0	0			
	6	0	0	0	0			
	7	0	0	0	0			
	8	0	0	0	0			
	9	0	0	0	0			
	10	0	0	0	0			
	11	0	0	0	0			
	12	0	0	0	0			
	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	21	0	0	0	0			
	22	0	0	0	0			
	23	0	0	0	0			
	24	0	0	0	0			
	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			

APPENDIX 6
CALIBRATION DATA

Gilbert/Commonwealth Inc.
Testing Services Group
METER BOX CALIBRATION

DATE: 11/3/89

METER BOX NUMBER: 2793

BAROMETRIC PRESS. (Pb) = 30.13 in. Hg

CALIBRATED BY: YOUNG

GAS VOLUME			TEMPERATURES				Time min.	Yi	delta HHi
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	Dry Gas Meter					
					Inlet (Tdi) deg. F	Outlet (Tdo) deg. F	Average (Td) deg. F		
0.5	5.000	5.041	70	85.5	79	82.3	12.33	1.01	1.72
1.0	5.000	5.135	70	96	82.5	89.3	8.72	1.01	1.69
1.5	10.000	10.350	70	97	84.5	90.8	14.87	1.00	1.82
2.0	10.000	10.418	70	99	86	92.5	13.17	1.00	1.88
3.0	10.000	10.422	70	101.5	87.5	94.5	11.00	1.00	1.98
4.0	10.000	10.447	70	95.5	81	88.3	9.60	0.98	1.98
AVERAGE Yi								1.00	

FORMULAS

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

$$\text{delta HHi} = \frac{0.921}{(Ka) (Km)}$$

$$Km = \frac{1}{Qn} \frac{(Pb) (29)}{V1 (Tdo+460) (\text{delta H})}$$

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

Gilbert/Commonwealth Inc.
Testing Services Group
METER BOX CALIBRATION

DATE: 10/15/89

METER BOX NUMBER: 2793

BAROMETRIC PRESS. (Pb) = 30.35 in. Hg

CALIBRATED BY: YOUNG

Orifice Manometer Setting (delta H) In. H2O	GAS VOLUME		TEMPERATURES					Time min.	Yi	delta H0i
	Net Test Meter (Vn) cu. ft.	Dry Gas Meter (Vd) cu. ft.	Net Test Meter (Tn) deg. F	Dry Gas Meter						
				Inlet (Tdi) deg. F	Outlet (Tde) deg. F	Average (Td) deg. F				
0.5	5.000	4.984	71.5	76.5	73	74.8	12.45	1.01	1.75	
1.0	5.000	5.068	71.5	85.5	77.5	81.5	9.13	1.00	1.85	
1.5	10.000	10.255	71.5	91	80	85.5	15.20	1.00	1.90	
2.0	10.000	10.353	71.5	95.5	82.5	89.5	13.28	0.99	1.92	
3.0	10.000	10.474	71.5	97.5	84.5	91.0	11.10	0.98	1.97	
4.0	10.000	10.309	71.5	88	77	82.5	9.72	0.98	2.04	
AVERAGE Yi								0.99		

FORMULAS

$$Yi = \frac{(Vn) (Pb) (Td+460)}{(Vd) (Pb + (H/13.6)) (Tn+460)}$$

$$\text{delta H0i} = \frac{0.921}{(Kn) (Pn)}$$

$$Kn = \frac{1}{Gn} \frac{(Pb) (29)}{Vd (Td+460) (\text{delta H})}$$

$$Gn = \frac{(Vd) (Td+460)}{(\text{Time}) (Td+460)}$$

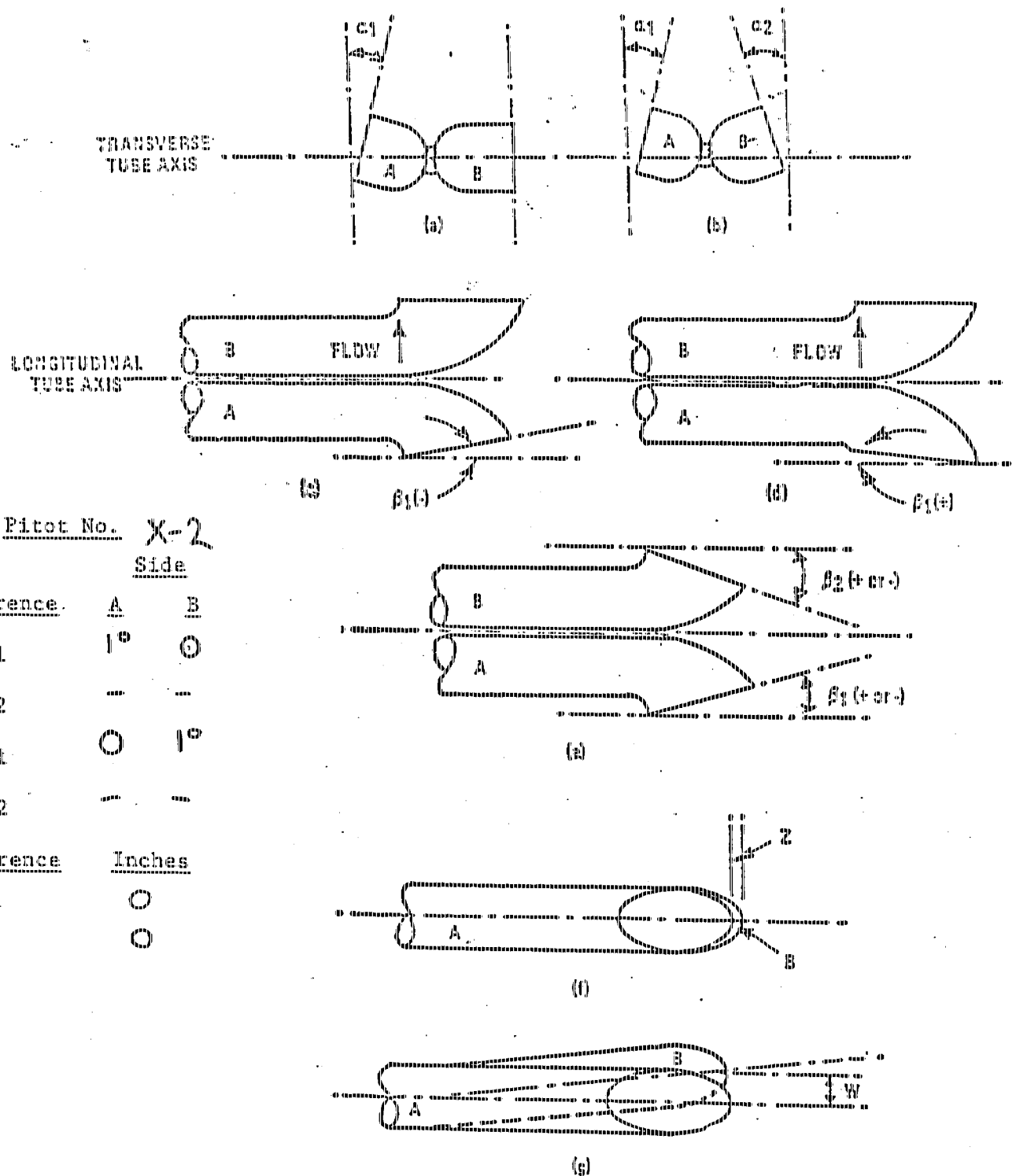


Figure 2-3. Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect the baseline value of $\bar{C}_p(s)$ so long as α_1 and $\alpha_2 < 10^\circ$, β_1 and $\beta_2 < 5^\circ$, $z < 0.32$ cm (1/8 in.) and $w < 0.08$ cm (1/32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

GILBERT ASSOCIATES, INC. ENGINEERS AND CONSULTANTS READING, PA.	CLIENT	FILING CODE	
	PROJECT	W.O.	PAGE
		ENGINEER	
		DATE	
SYSTEM		REVIEWED BY	
CALCULATION FOR	Pot Meter-Thermocouple Calibration 		
	Pot Meter #	2	
	Thermocouple Type	K	
	Ice Bath Temperature °F	39	
	Certified Mercury Bulb °F	33	
	Ambient Temperature °F	70	
	Certified Mercury Bulb °F	70	
	Boiling H ₂ O °F		
	Certified Mercury Bulb °F		
	Hot Synthetic Oil °F	368	
	Certified Mercury Bulb °F	366	
	Remarks:		

FILING CODE

APPENDIX 7

COMPUTER PRINTOUT

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

GILBERT/COMMONWEALTH, INC.
TESTING SERVICES GROUP
ISOKINETIC SAMPLING SUMMARY SHEET

Client: ANPEL

Plant: KITTOWN

Unit Tested: DRYER

Pollut: PARTICULATES & FLOW

Sampling Location: STACK

DATE

RUN NUMBER

1

2

DN - NOZZLE DIAMETER, IN.	0.300	0.300
PR - BAROMETRIC PRESS, IN. OF H ₂ O	30.40	30.40
TT - NET SAMPLING TIME, MIN.	84.0	84.0
VN - VOLUME METERED, ACF	62.105	57.998
TM - AVG. METER TEMP., DEG. F	74	86
PM - AVG. DELTA P, IN. OF H ₂ O	1.858	1.758
Y - GAS METER CALIB. FACTOR	1.00	1.00
WMSTD - STD. GAS VOL., SCF	62.688	57.200
VM - TOTAL WATER COLLECTED, ML.	234	247
WM - PERCENT MOISTURE	15.0	16.9
MO - MOLE FRACTION DRY	0.85	0.83
%CO ₂ - PERCENT CO ₂ DRY	2.3	2.3
%O ₂ - PERCENT O ₂ DRY	17.6	17.2
MWD - DRY MOLECULAR WEIGHT	29.06	29.06
MM - WET MOLECULAR WEIGHT	27.41	27.19
WEA - PERCENT EXCESS AIR	494.4	424.5
AS - STACK AREA, SQ. IN.	1,809.6	1,809.6
PST - STATIC PRESS., IN. OF H ₂ O	0.96	1.00
TS - STACK TEMP., DEG. F	160	195
CP - PITOT COEFFICIENT	0.84	0.84
VS - STACK GAS VELOCITY, ACFM	2,005	2,038
RMS - STD. DEV. OF VEL.	10.8	9.4
QS - STACK GAS FLOW, DSCFM	18,667	17,544
QA - STACK GAS FLOW, ACFM	25,289	25,708
RI - ISOKINETIC RATIO	102.0	93.1
GR/DSCF, PARTICULATE LOADING	0.068	0.059
LB/HR, PARTICULATE EMISSIONS	10.80	8.93
AVG. GR/DSCF EMISSION RATE		0.063

	PODER	TOTAL
Weight, mg ::	274.9	496.6
GR/DSCF ::	0.068	0.122
LBS/LB ::	10.00	19.52

GILBERT/COMMONWEALTH, INC.
TESTING SERVICES GROUP
ISOKINETIC SAMPLING ANALYSIS

Client: ANPEL

Plant: KUTITONN, PA

Unit Tested: DRYER

Pollutant: PARTICULATES & FLOW

Sampling Location: STACK

Run No: A-2 Date: 10/24/89 Start: 1249 End: 1425

DATA

DN: 0.300 PG: 30.40 PST: 1.00 AS: 1,009.6
O2%: 17.2 CO2%: 2.3 N2%: 80.5 Wd: 247
GAS METER Y-FACTOR: 1.00 E.A.F.: 424.5

SAMPLE POINT	TIME AT POINT	GAS METER	VELOCITY HEAD	STACK TEMP.	METER IN	TEMP. OUT	PM ORIFICE	SDE	O2	CO	VEL
B-1	3.5	398.702	0.200	167	70	72	1.000	13.25	17.3		1,984
2	3.5	401.200	0.230	191	75	72	1.470	12.24	17.1		1,832
3	3.5	403.500	0.210	156	81	73	1.320	11.37	17.2		1,703
4	3.5	405.000	0.210	217	84	73	1.320	11.92	17.1		1,785
5	3.5	407.900	0.210	241	87	74	1.320	12.13	17.3		1,816
6	3.5	410.200	0.220	225	88	74	1.240	12.20			1,838
7	3.5	412.500	0.200	189	90	75	1.530	13.48			2,018
8	3.5		0.330	263	93	76	2.100	15.45			2,312
9	3.5	417.600	0.380	254	95	77	2.300	16.47			2,455
10	3.5	420.400	0.400	130	97	78	2.530	15.36			2,300
11	3.5	423.100	0.400	126	99	79	2.530	15.31			2,292
12	3.5	425.400	0.410	110	100	80	2.600	15.39			2,305
A-1	3.5	429.325	0.300	230	81	79	1.900	14.39			2,154
2	3.5		0.260	250	89	79	1.620	13.66			2,046
3	3.5	435.400	0.250	246	94	80	1.300	13.29			1,989
4	3.5	436.000	0.230	233	95	81	1.200	12.62			1,890
5	3.5	439.100	0.220	226	96	82	1.210	12.28			1,839
6	3.5	441.200	0.250	194	99	83	1.400	12.79			1,914
7	3.5	443.700	0.290	179	102	84	1.720	13.61			2,038
8	3.5	446.500	0.300	163	104	85	1.800	13.67			2,047
9	3.5	448.900	0.290	166	104	86	1.810	13.47			2,017
10	3.5	451.300	0.300	164	105	87	1.850	13.68			2,048
11	3.5	454.000	0.320	169	105	88	2.000	14.19			2,124
12	3.5	456.700	0.330	170	106	89	2.000	14.42			2,159
		459.573									

RESULTS	TT	VM	PIT	TS	TM	PM	SDE	O2	CO	VEL
	84.0	57.998	0.202	195	86	1.756	13.61	17.2	ERR	2,038
	net	net	avg	avg	avg	avg	avg	avg	avg	avg
	PM=	30.53	VMSTD=	57.200	VMGAS=	11.634	100=	16.9	RMS OF VELOCITIES =	9.4
	MD=	0.83	MDD=	29.06	MD=	27.19	PS=	30.47		

PARTICULATE EMISSIONS

	PAPER	TOTAL
STACK GAS VELOCITY =		
STACK GAS VOLUME =	17,544 DSCFM	
STACK GAS VOLUME =	25,708 ACFM	
STACK GAS VOLUME =	0.702-04 LBS/HR	
ISOKINETIC RATIO =	93.1	
Weight, mg =	220.7	500.8
GR/DSCF =	0.059	0.135
LBS/HR =	8.93	20.27

GILBERT/COMMONWEALTH, INC.
 TESTING SERVICES GROUP
 ISOKINETIC SAMPLING SUMMARY SHEET

Client: AMPEL

Plant: KUTZTOWN, PA

Unit Tested: BAGGING SYSTEM

Pollut: PARTICULATES & FLOW

Sampling Location: BAGHOUSE STACK

DATE	B-3	B-2	B-1
RUN NUMBER			
DN - NOZZLE DIAMETER, IN.	0.300	0.300	0.300
PB - BAROMETRIC PRESS., IN. OF H2O	30.13	30.18	30.20
TT - NET SAMPLING TIME, MIN.	95.0	96.0	96.0
VM - VOLUME METERED, ACF	71.615	66.393	66.144
TM - AVG. METER TEMP., DEG. F	101	98	82
PM - AVG. DELTA H, IN. OF H2O	1.856	1.754	1.824
Y - GAS METER CALIB. FACTOR	1.00	1.00	1.00
VMSTD - STD. GAS VOL., SCF	68.187	63.603	65.396
VW - TOTAL WATER COLLECTED, ML.	19	16	21
XM - PERCENT MOISTURE	1.3	1.2	1.5
MD - MOLE FRACTION DRY	0.99	0.99	0.99
%CO2 - PERCENT CO2 DRY	0.0	0.0	0.0
%O2 - PERCENT O2 DRY	20.9	20.9	20.9
MWD - DRY MOLECULAR WEIGHT	28.84	28.84	28.84
MW - WET MOLECULAR WEIGHT	28.70	28.71	28.67
SEA - PERCENT EXCESS AIR	-118750.0	-118750.0	-118750.0
AS - STACK AREA, SQ. IN.	304.0	304.0	304.0
PST - STATIC PRESS., IN. OF H2O	0.14	0.12	0.13
TS - STACK TEMP., DEG. F	80	78	60
CP - PITOT COEFFICIENT	0.84	0.84	0.84
VS - STACK GAS VELOCITY, AFPM	1,522	1,470	1,401
RMS - STD. DEV. OF VEL.	14.7	13.6	13.7
QS - STACK GAS FLOW, DSCFM	3,136	3,045	2,997
QA - STACK GAS FLOW, ACFM	3,226	3,114	2,969
%I - ISOKINETIC RATIO	97.1	93.2	97.5
GR/DSCF, PARTICULATE LOADING	0.151	0.150	0.107
LBS/HR, PARTICULATE EMISSIONS	5.12	3.91	2.76
AVG. GR/DSCF EMISSION RATE		0.149	

GILBERT/COMMONWEALTH, INC.
 TESTING SERVICES GROUP
 ISOKINETIC SAMPLING ANALYSIS

Client: AMFEL

Plant: KUTTOWN, PA

Unit Tested: BAGGING OPERATION

Pollutant: PARTICULATES & FLOW

Sampling Location: STACK

Run No: B-1 Date: 10/25/89 Starts: 830 End: 1011

DATA

DN: 0.300 PB: 30.20 PST: 0.13 AS: 304.0
 OZ%: 20.9 COZ%: 0.0 N2%: 79.1 VM: 21
 GAS METER Y-FACTOR: 1.00 E.A.%: *****

SAMPLE POINT	TIME AT POINT	GAS METER	VELOCITY HEAD	STACK TEMP.	METER IN	TEMP. OUT	PM ORIFICE	SDE	O2	CO	VEL
A-1	4.0	460.456	0.100	52	50	49	0.900	7.16			1.04E
1	4.0	462.500	0.110	53	56	49	0.990	7.51			1.100
2	4.0	464.800	0.140	54	63	49	1.270	8.48			1.242
2	4.0	466.900	0.165	54	70	52	1.490	9.21			1.343
3	4.0	470.200	0.220	56	80	56	1.930	10.65			1.560
3	4.0	472.700	0.220	56	82	56	1.930	10.65			1.560
B-1	4.0	475.549	0.140	57	82	62	1.270	8.51			1.246
1	4.0	478.100	0.140	58	85	66	1.000	8.52			1.247
2	4.0	481.000	0.200	58	90	68	7.000	10.18			1.490
2	4.0	483.500	0.200	58	92	69	1.820	10.18			1.490
3	4.0	486.800	0.260	58	94	72	1.820	11.61			1.699
3	4.0	489.700	0.250	59	97	74	2.350	11.39			1.668
C-1	4.0	492.956	0.180	60	94	77	1.700	9.67			1.416
1	4.0	495.900	0.180	61	95	78	0.280	9.68			1.418
2	4.0	498.900	0.230	62	99	80	1.900	10.96			1.604
2	4.0	501.800	0.230	62	100	80	1.950	10.96			1.604
3	4.0	505.300	0.280	63	104	83	1.600	12.10			1.772
3	4.0	508.700	0.260	64	107	84	1.900	11.67			1.709
D-1	4.0	511.906	0.140	65	104	86	1.300	8.57			1.255
1	4.0	514.500	0.140	66	105	86	1.300	8.58			1.256
2	4.0	517.400	0.180	67	105	86	1.680	9.74			1.426
2	4.0	520.100	0.200	67	106	89	1.830	10.27			1.503
3	4.0	523.600	0.250	67	110	89	2.280	11.48			1.681
3	4.0	526.600	0.250	68	111	90	2.280	11.49			1.682
		529.657						0.00			ERR

RESULTS	TT	VM	PIT	TS	TM	PM	SDE	O2	CO	VEL
	96.0	66.144	0.194	60	82	1.824	9.57	ERR	ERR	1.459
	net	net	avg	avg	avg	avg	avg	avg	avg	avg
	PSM=	30.33	VNSTD=	65.396	VNEAS=	0.989	SM=	1.5	RMS OF VELOCITIES =	13.7
	MD=	0.99	MND=	28.84	MW=	28.67	PS=	30.21		

PARTICULATE EMISSIONS

		FADER	TOTAL
STACK GAS VELOCITY =	1.401 ACFM		
STACK GAS VOLUME =	2.997 DSCFM		
STACK GAS VOLUME =	1.969 ACFM		
STACK GAS VOLUME =	1.33E+04 LBS/HR	Weight, mg =	456.2
ISOKINETIC RATIO =	97.5	SM/DSCF =	0.197
		LBS/HR =	2.76
			2.80

GILBERT/COMMONWEALTH, INC.
TESTING SERVICES GROUP
ISOKINETIC SAMPLING ANALYSIS

Client: AMPEL

Plant: KUTZTOWN, PA

Unit Tested: BAGGING SYSTEM

Pollutant: PARTICULATES & FLOW

Sampling Location: STACK

Run No: B-2 Date: 10/25/89 Start: 1041 End: 1226

DATA

DN: 0.300 PB: 30.18 PST: 0.12 AS: 304.0
O2%: 20.9 CO2%: 0.0 N2%: 79.1 VW: 16
GAS METER Y-FACTOR: 1.00 E.A.Z: *****

SAMPLE POINT	TIME AT POINT	GAS METER	VELOCITY HEAD	STACK TEMP.	METER IN	TEMP. OUT	PM ORIFICE	SDE	O2	CO	VEL
A-1	4.0	529.907	0.110	73	84	84	1.020	7.66			1,121
1	4.0	532.100	0.100	74	88	87	0.920	7.31			1,070
2	4.0	634.400	0.140	74	92	87	1.300	8.65			1,266
2	4.0	536.800	0.160	74	97	88	1.500	9.24			1,353
3	4.0	539.700	0.210	75	104	89	1.920	10.50			1,551
3	4.0	542.700	0.210	75	105	89	1.920	10.50			1,551
B-1	4.0	545.542	0.150	75	103	89	1.400	8.96			1,311
1	4.0	548.200	0.150	76	105	90	1.400	8.97			1,312
2	4.0	551.000	0.230	77	104	91	2.090	11.11			1,627
2	4.0	554.100	0.220	77	105	92	1.980	10.87			1,591
3	4.0	557.400	0.250	78	108	93	2.280	11.60			1,698
3	4.0	560.500	0.250	78	110	94	2.280	11.60			1,698
C-1	4.0	563.678	0.150	79	106	98	1.400	8.99			1,316
1	4.0	566.300	0.150	79	108	98	1.400	8.99			1,316
2	4.0	569.400	0.210	80	110	98	1.920	10.65			1,559
2	4.0	572.000	0.200	80	111	99	1.840	10.39			1,521
3	4.0	575.800	0.260	79	114	99	2.390	11.84			1,733
3	4.0	578.300	0.250	80	115	100	2.290	11.62			1,701
D-1	4.0	581.737	0.130	80	109	84	1.210	8.38			1,226
1	4.0	584.300	0.150	80	110	85	1.400	9.00			1,317
2	4.0	586.800	0.200	80	110	86	1.840	10.39			1,521
2	4.0	589.800	0.190	81	112	87	1.650	9.87			1,444
3	4.0	593.000	0.270	81	114	88	2.450	12.09			1,769
3	4.0	596.300	0.250	80	115	89	2.280	11.62			1,701
		599.485									

RESULTS	TT	VN	PIT	TS	TM	PM	SDE	O2	CO	VEL
	96.0	66.393	0.191	76	98	1.754	10.04	ERR	ERR	1,470
	net	net	avg	avg	avg	avg	avg	avg	avg	avg
PSM=	30.31	VMSTD=	63.603	VWGAS=	0.754	2N=	1.2	RMS OF VELOCITIES =		13.6
MD=	0.99	MWD=	28.94	MW=	28.71	PS=	30.19			

PARTICULATE EMISSIONS

STACK GAS VELOCITY =	1.470 ACFM	PAPER	TOTAL
STACK GAS VOLUME =	3,049 DSCFM	WEIGHT, MG =	626.3
STACK GAS VOLUME =	3,114 ACFM	GR/DSCF =	0.180
STACK GAS VOLUME =	1,378+04 LBS/Hr	LBS/Hr =	0.98
ISOKINETIC RATIO =	50.2		

GILBERT/COMMONWEALTH, INC.
TESTING SERVICES GROUP
ISOKINETIC SAMPLING ANALYSIS

Client: ANPEL

Plant: KUTZTOWN, PA

Unit Tested: BAGGING SYSTEM

Pollutant: PARTICULATES & FLOW

Sampling Location: STACK

Run No: B-3 Date: 10/25/89 Start: 1307 End: 1449

DATA

DN: 0.300 PB: 30.13 PST: 0.14 AS: 304.0
O2%: 20.9 CO2%: 0.0 N2%: 79.1 VW: 19
GAS METER Y-FACTOR: 1.00 E.A.X: *****

SAMPLE POINT	TIME AT POINT	GAS METER	VELOCITY HEAD	STACK TEMP.	METER IN	TEMP. OUT	PM ORIFICE	SDE	O2	CO	VEL
A-1	4.0	599.707	0.110	78	85	87	1.010	7.69			1,127
1	4.0	602.100	0.100	78	90	88	0.910	7.33			1,075
2	4.0	604.200	0.160	79	98	83	1.400	9.29			1,361
2	4.0	606.800	0.160	78	100	88	1.480	9.28			1,359
3	4.0	609.800	0.230	78	104	88	2.100	11.12			1,630
3	4.0	612.800	0.220	78	107	89	1.970	10.88			1,554
B-1	4.0	615.712	0.150	78	104	90	1.380	8.98			1,316
1	4.0	618.300	0.160	79	106	91	1.460	9.29			1,361
2	4.0	621.300	0.220	79	109	92	1.980	10.89			1,596
2	4.0	624.000	0.220	79	110	92	1.980	10.89			1,596
3	4.0	627.800	0.280	80	112	94	2.530	12.30			1,802
3	4.0	630.900	0.250	80	114	95	2.250	11.62			1,702
D-1	4.0	634.014	0.170	80	108	96	1.580	9.58			1,404
1	4.0	637.000	0.150	81	110	96	1.390	9.01			1,320
2	4.0	639.700	0.230	80	112	97	2.090	11.14			1,533
2	4.0	642.700	0.240	80	113	97	2.180	11.38			1,668
3	4.0	646.200	0.280	81	115	97	2.550	12.31			1,803
3	4.0	649.600	0.280	82	116	98	2.550	12.32			1,805
D-1	4.0	652.920	0.140	82	110	99	1.290	8.71			1,275
1	4.0	655.600	0.150	81	110	99	1.380	9.01			1,320
2	4.0	658.300	0.200	82	112	99	1.820	10.41			1,526
2	4.0	661.200	0.200	82	114	99	1.820	10.41			1,526
3	4.0	664.600	0.300	81	116	100	2.730	12.74			1,867
3	4.0	667.700	0.300	81	117	100	2.730	12.74			1,867
671.322											

RESULTS	TT	VN	PIT	TS	TM	PM	SDE	O2	CO	VEL	
	96.0	71.615	0.204	80	101	1.856	10.39	ERR	ERR	1,522	
	net	net	avg	avg	avg	avg	avg	avg	avg	avg	
PSM=	30.27	VMSTD=	68.197	VWGAS=	0.895	WM=	1.3	RMS OF VELOCITIES =			14.7
MD=	0.99	MWD=	28.84	MW=	28.70	PS=	30.14				

PARTICULATE EMISSIONS

STACK GAS VELOCITY = 1,522 ACFM
STACK GAS VOLUME = 3,116 DSCFM
STACK GAS VOLUME = 3,226 ACFM
STACK GAS VOLUME = 1,415+04 LBS/H
ISOKINETIC RATIO = 57.1

WATER TOTAL
Weight, kg = 855.6
GR/DSCF = 0.27
LBS/H = 57.1

APPENDIX 8
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 ₂ O	Orifice ΔH , In. H ₂ O	Dry Gas Temp °F In Out		Stack Static Pressure In. H ₂ O	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, ft³

5. TM = Average Dry Gas Temperature at Meter, °F

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

6. PM = Average Orifice Pressure Drop, inches H₂O

$$PM = Avg. \Delta H$$

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 H₂O Silica gel + ml Imp. H₂O = ml

9. Volume of water vapor at standard conditions^b, SCF

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

10. Percent moisture in stack gas

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

11. Mole fraction of dry gas

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

12. Molecular weight of dry stack gas

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

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

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

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

$$\text{NOTE: PST in. Hg.} = \frac{\text{PST in. H}_2\text{O}}{13.6}$$

16. TS = Average Stack Temperature, °F

$$TS = \text{Average TS}$$

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

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

18. Stack gas velocity at stack conditions, fpm

$$VS = 5130 \times Cp \times \text{Avg}(SDE) \times \left[\frac{1}{PS \times MW} \right]^{1/2} = \text{FPM} \quad \begin{array}{l} Cp = \text{pitot tube} \\ \text{coefficient} \end{array}$$

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

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

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

$$Q_a = \frac{0.05667 \times Q_s (TS + 460)}{PS \times MD} = \text{ACFM}$$

21. Percent isokinetic

$$ZI = \frac{1.032 \times (TS + 460) \times VMSTD}{VS \times TT \times PS \times MD \times (DN)^2}$$

NOTES: ^aDry standard cubic feet at 69°F, 29.92 in. Hg.

^bStandard conditions at 68°F, 29.92 in. Hg.

^cDry standard cubic feet per minute at 68°F, 29.92 in. Hg.

II. Calculations for grain loading and emission rates

22. Particulate, gr/DSCF

$$\text{gr/DSCF} = 0.0154 \times \frac{\text{mg}}{\text{VMSTD}}$$

23. Particulate at stack conditions, gr/ACF

$$\text{gr/ACF} = \frac{17.65 \text{ gr/DSCF} \times \text{PS} \times \text{MD}}{(\text{TS} + 460)}$$

24. Particulate, lb/hr conc. method

$$\text{lb/hr} = 0.00857 \times \text{gr/DSCF} \times \text{QS}$$

25. Particulate lb/hr area method = $0.132 \times \frac{\text{rms particulate} \times \text{AS}}{\left(\frac{\text{DN}^2}{2}\right) \times \text{TT}}$

26. Particulate, combustion

$$\frac{\text{lb/hr}}{10^6 \text{ BTU/hr}}$$

27. Particulate, process lb/ton

$$\text{lb/ton} = \frac{\text{lb/hr}}{\text{tons/hr}}$$

28. Particulate, lb/MMBTU, F-Factor Method "

Using O_2 "

$$\frac{0.0154 \times \text{mg} \times \text{F-Factor} \times 20.9}{7000 \times \text{VMSTD} \times (20.9 - \% \text{O}_2)}$$

Using CO_2 :

$$\frac{0.0154 \times \text{mg} \times \text{F-Factor} \times 100}{7000 \times \text{VMSTD} \times \% \text{CO}_2}$$

29. F-Factor, dsct/mmBtu

O_2 Format:

$$\text{F-Factor} = \frac{10^6 (3.64(\% \text{H}) + 1.53(\% \text{C}) + 0.57(\% \text{S}) + 0.14(\% \text{N}) - 0.46(\% \text{O}_2))}{\text{GCV}}$$

CO_2 Format:

$$\frac{10^6 (0.321)(\% \text{C})}{\text{GCV}}$$