WI-35

Report to

GREDE FOUNDRIES, INC.

Reedsburg, Wisconsin

for

STACK EMISSION TESTING

CUPOLA STACK SO1
2071 SCHNEIBLE S64

May 25, 2000

Front | Back Half

by

ENVIRONMENTAL TECHNOLOGY & ENGINEERING CORPORATION
13000 West Bluemound Road
Elm Grove, Wisconsin 53122
Phone 262-784-2434
Fax 262-784-2436

ETE

(1)

SUMMARY

On May 25, 2000 Environmental Technology & Engineering Corp. personnel performed stack emissions testing at the Grede Foundries, Inc. Reedsburg, Wisconsin facility. The tests were performed to document the emissions from various dust collectors at the plant. Tests were performed for particulate, PM10, lead, manganese, carbon monoxide, nitrogen dioxide, sulfur dioxide, and benzene on the cupola stack designated as SO1 as shown in the following table:

SO1 CUPOLA BAGHOUSE May 25, 2000

TEST NO.	PARTICULATE	PM10	LEAD	MANGANESE	SO2	BENZENE	CO	NOx
1	0.07 lb/hr	0. 07 lb/hr	<0.00025 lb/hr	0.00010 lb/hr	7.5 lb/hr	<0.04 lb/hr	126.0 lb/hr	5.8 lb/hr
2	0.10	0.10	<0.00025	0.00013	16.6	<0.04	24.2	7.6
3	0.06	0.06	<0.00025	0.00033	19.7	<0.04	37.6	7.9
AVERAGE	0.08 lb/hr	0.08 lb/hr	<0.00025 lb/hr	0.00019 lb/hr	14.6 lb/hr	<0.04 lb/hr	62.6 lb/hr	7.1 lb/hr

1.0 GENERAL

On May 25, 2000, Environmental Technology & Engineering Corp. (ETE) personnel performed stack emissions testing at the Grede Foundries Reedsburg, Wisconsin facility. The tests were performed in order to document the emissions from two (2) sources. Tests were performed on sources as follows:

STACK	PARAMETERS
Cupola Baghouse	Particulate*** PM10*** SO2*** CO*** NOx*** Benzene**
2071 Schneible Scrubber	Formaldehyde* VOC** Benzene** Carbon Monoxide**

* Required by existing permit.
** Required by proposed permit.
*** Informational tests.

Tom McManamy of Grede Foundries was responsible for assuring proper operating conditions throughout the testing. All testing was coordinated with Grede personnel to assure that it was performed during high melt rate periods. The field tests, corresponding laboratory analysis, and report preparation were performed by ETE personnel; Bill Dick was the test team leader.

The following sections of this report document the activities and results of the test program. The report presents all of the relevant data collected. Discussions on the interpretation of the data are provided where appropriate. The report, therefore, includes much necessary detail. The results, however, have been presented in the SUMMARY section at the beginning of this report for those readers not wishing to be burdened by the details.

2.0 RESULTS

All samples were collected and analyzed in accordance with EPA test methods. A sketch with the sampling location is included in APPENDIX C of this report. The methods were as follows:

Parameter	Reference Method
Front Half Particulate	EPA Method 5
Total Particulate	EPA Method 5 and Method 202
PM10	EPA Method 201A
Total VOC	EPA Method 18
NOx	EPA Method 7E
SO2	EPA Method 6
CO	EPA Method 10
Formaldehyde	EPA Method 011
Benzene	EPA Method 18

2.1 Cupola Baghouse SO1

Results of the individual particulate tests are included as Tables 2-1, 2-2, and 2-3. A summary of all test results is included as Table 2-4. All field and laboratory records are included in the APPENDIX.

TABLE 2-4

SO1 CUPOLA BAGHOUSE May 25, 2000

TEST NO.	PARTICULATE	PM10	LEAD	MANGANESE	SO2	BENZENE	CO	NOx
1	0.07 lb/hr	0. 07 lb/hr	<0.00025 lb/hr	0.00010 lb/hr	7.5 lb/hr	<0.04 lb/hr	126.0 lb/hr	5.8 lb/hr
2	0.10	0.10	<0.00025	0.00013	16.6	<0.04	24.2	7.6
3	0.06	0.06	<0.00025	0.00033	19.7	<0.04	37.6	7.9
AVERAGE	0.08 lb/hr	0.08 lb/hr	<0.00025 lb/hr	0.00019 lb/hr	14.6 lb/hr	<0.04 lb/hr	62.6 lb/hr	7.1 lb/hr

GREDE FOUNDRIES | CUPOLA BAGHOUSE | 25-May-00 | TABLE 2-1

TEST NO.	1	
BAROMETRIC PRESSURE	29.05	IN HG
TIP DIAMETER	0.305	IN
STACK DIAMETER	72	IN
STACK AREA	28.274	FT2
SAMPLING TIME PER POINT	2.5	MIN
NUMBER OF POINTS	24	
METER VOLUME	65.82	FT3
PITOT COEFFICIENT	0.84	
METER COEFFICIENT	1.007	
PARTICULATE COLLECTED	0.0006	GRAMS
WATER COLLECTED	28	ML
STATIC PRESSURE	-0.5	IN H2O

ORSAT RESULTS

CO2	O2	CO	N2
6.40%	14.60%	0.00%	79.00%

POINT	STACK TEMP DEG F	DELTA P IN H2O	ORIFICE DEL P IN H2O	METER TEMP DEG F	VELOCITY AFPS
1	270	0.44	3.00	72	44.08
2	255	0.52	3.50	75	47.43
3	270	0.56	3.80	78	49.73
4	265	0.65	4.50	79	53.40
5	268	0.65	4.50	80	53.51
6	270	0.65	4.50	81	53.58
7	272	0.70	4.80	82	55.68
8	275	0.76	5.20	84	58.14
9	280	0.76	5.20	85	58.33
10	280	0.70	4.80	88	55.98
11	276	0.62	4.20	89	52.54
12	272	0.52	3.50	92	47.99
13	280	0.50	3.40	95	47.31
14	255	0.64	4.50	96	52.62
15	265	0.64	4.50	99	52.98
16	272	0.70	4.80	100	55.68
17	275	0.76	5.20	102	58.14
18	280	0.76	5.20	103	58.33
19	272	0.66	4.50	105	54.07
20	270	0.66	4.50	107	53.99
21	268	0.62	4.20	108	52.26
22	265	0.60	4.10	110	51.30
23	275	0.50	3.40	111	47.15
24	270	0.44	3.00	111	44.08
AVERAGE	271		4.28	93	52.43

DRY STANDARD VOLUME	65.05	SCF
PERCENT WATER VAPOR	1.99	% VOL
FLOW RATE	88945	ACFM
	61074	DSCFM
	103778	M3/HR
PARTICULATE CONCENTRATION	0.0001	GR/DSCF
PARTICULATE EMISSION RATE	0.07	LB/HR
LB PART PER 1000 LB GAS	0.0003	
ISOKINETIC PERCENT	98.9	

4/6

Y

6

GREDE FOUNDRIES | CUPOLA BAGHOUSE | 25-May-00 | TABLE 2-2

TEST NO.	2	
BAROMETRIC PRESSURE	29.05	IN HG
TIP DIAMETER	0.305	IN
STACK DIAMETER	72	IN
STACK AREA	28.274	FT2
SAMPLING TIME PER POINT	2.5	MIN
NUMBER OF POINTS	24	
METER VOLUME	64.17	FT3
PITOT COEFFICIENT	0.84	
METER COEFFICIENT	1.007	
PARTICULATE COLLECTED	0.0008	GRAMS
WATER COLLECTED	26	ML
STATIC PRESSURE	-0.5	IN H2O

ORSAT RESULTS

CO2	O2	CO	N2
7.80%	13.40%	0.00%	78.80%

POINT	STACK TEMP DEG F	DELTA P IN H2O	ORIFICE DEL P IN H2O	METER TEMP DEG F	VELOCITY AFPS
1	260	0.45	3.00	118	44.14
2	266	0.50	3.40	119	46.72
3	272	0.55	3.80	120	49.20
4	275	0.62	4.20	120	52.35
5	270	0.65	4.50	120	53.41
6	270	0.65	4.50	121	53.41
7	266	0.70	4.80	122	55.28
8	268	0.75	5.20	122	57.30
9	270	0.76	5.20	122	57.76
10	275	0.76	5.20	122	57.95
11	268	0.62	4.20	122	52.10
12	265	0.50	3.40	122	46.69
13	270	0.50	3.40	124	46.85
14	272	0.60	4.10	125	51.39
15	275	0.65	4.50	125	53.60
16	278	0.70	4.80	125	55.73
17	280	0.72	4.90	125	56.60
18	280	0.76	5.20	126	58.15
19	275	0.76	5.20	126	57.95
20	265	0.65	4.50	126	53.23
21	248	0.60	4.10	126	50.54
22	260	0.60	4.10	127	50.97
23	265	0.50	3.50	127	46.69
24	268	0.40	2.60	127	41.84
AVERAGE	269		4.26	123	52.08

DRY STANDARD VOLUME	63.42	SCF
PERCENT WATER VAPOR	1.89	% VOL
FLOW RATE	88346	ACFM
	60856	DSCFM
	103406	M3/HR
PARTICULATE CONCENTRATION	0.0002	GR/DSCF
PARTICULATE EMISSION RATE	0.10	LB/HR
LB PART PER 1000 LB GAS	0.0004	
ISOKINETIC PERCENT	96.8	

7/8

7

GREDE FOUNDRIES | CUPOLA BAGHOUSE | 25-May-00 | TABLE 2-3

TEST NO.	3	
BAROMETRIC PRESSURE	29.05	IN HG
TIP DIAMETER	0.305	IN
STACK DIAMETER	72	IN
STACK AREA	28.274	FT2
SAMPLING TIME PER POINT	2.5	MIN
NUMBER OF POINTS	24	
METER VOLUME	64.18	FT3
PITOT COEFFICIENT	0.84	
METER COEFFICIENT	1.007	
PARTICULATE COLLECTED	0.0005	GRAMS
WATER COLLECTED	26	ML
STATIC PRESSURE	-0.5	IN H2O

ORSAT RESULTS

CO2	O2	CO	N2
7.20%	14.00%	0.00%	78.80%

POINT	STACK TEMP DEG F	DELTA P IN H2O	ORIFICE DEL P IN H2O	METER TEMP DEG F	VELOCITY AFPS
1	255	0.45	3.00	125	44.04
2	260	0.52	3.60	125	47.50
3	262	0.55	3.80	125	48.92
4	265	0.60	4.10	126	51.20
5	272	0.65	4.50	126	53.55
6	275	0.70	4.80	126	55.69
7	275	0.72	4.90	126	56.48
8	280	0.75	5.20	125	57.84
9	260	0.75	5.20	124	57.05
10	264	0.75	5.20	124	57.21
11	270	0.60	4.10	124	51.38
12	272	0.50	3.40	124	46.97
13	272	0.50	3.40	125	46.97
14	270	0.62	4.20	125	52.23
15	265	0.64	4.50	125	52.88
16	265	0.72	4.90	124	56.09
17	245	0.75	5.20	124	56.45
18	255	0.78	5.40	124	57.98
19	260	0.65	4.50	124	53.11
20	268	0.65	4.50	124	53.40
21	282	0.60	4.10	123	51.80
22	280	0.60	4.10	123	51.73
23	272	0.50	3.40	123	46.97
24	265	0.45	3.00	123	44.34
AVERAGE	267		4.29	124	52.16

DRY STANDARD VOLUME	63.43	SCF
PERCENT WATER VAPOR	1.89	% VOL
FLOW RATE	88483	ACFM
	61132	DSCFM
	103876	M3/HR
PARTICULATE CONCENTRATION	0.0001	GR/DSCF
PARTICULATE EMISSION RATE	0.06	LB/HR
LB PART PER 1000 LB GAS	0.0002	
ISOKINETIC PERCENT	96.4	

3/5

X

8

3.0 TEST METHODS

3.1 Particulate & Metals

The equipment used to sample was the Western Precipitation Division of the Joy Manufacturing Company Emission Parameter Analyzer. Samples were collected and analyzed in accordance with procedures outlined in the "Modified Method 5 (17) Test Method for Condensable Particulate" as published by the DNR in the Air Management Operations Handbook. In addition, metals samples were collected in the same train using a method similar to the "Multiple Metals Train."

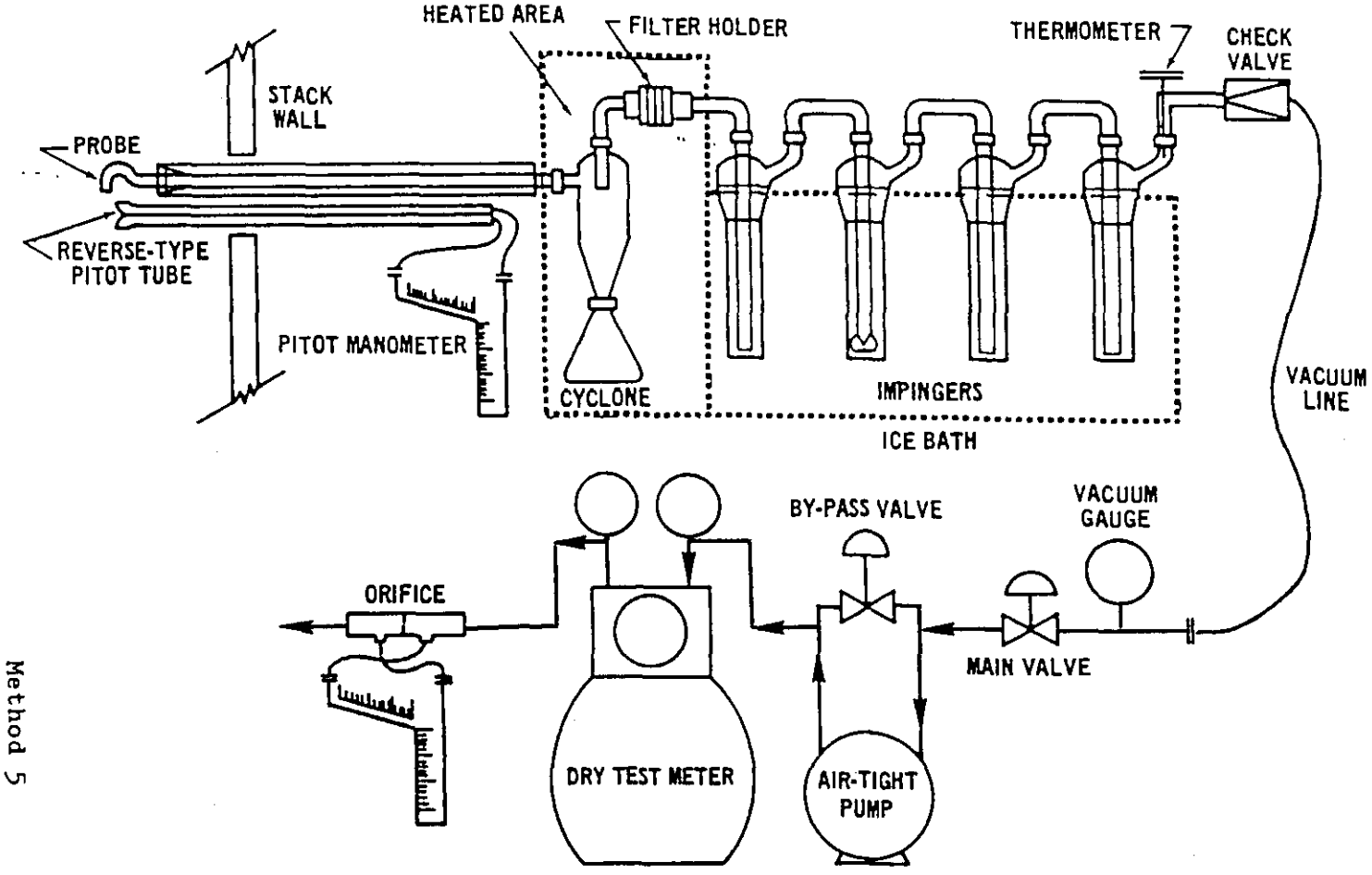
The sampling train consisted of a probe tip, an in-stack thimble holder with tared quartz thimble, and filter holder with a tared back up filter. A series of four impingers followed in an ice bath. The first was a modified Greenburg Smith impinger with 100 ml of distilled water; the second and third were Greenburg-Smith impingers each with 100 ml of 0.1 normal nitric acid in 10 % hydrogen peroxide; the fourth was also a modified Greenburg-Smith impinger containing a tared quantity of silica gel. The gas then passed through a vacuum pump, calibrated dry gas meter, and a calibrated orifice. A schematic drawing of the sampling train is included.

The temperatures of the stack gas stream, as well as strategic locations within the sampling devices, were monitored by RTDs and read directly from a gauge on the control unit.

The initial gas stream velocity was obtained from a preliminary traverse using an "S" type pitot tube. The initial moisture was estimated from previous tests of similar processes. This data, along with the stack temperature, was used to set a nomograph so that rapid calculations of isokinetic sampling conditions could be made.

The principle of the method was to collect the sample representative of the exhaust by adjusting the sample collection velocity to match the exhaust gas stream velocity at the point of collection. The velocity at the point of collection was measured with an "S" type pitot tube attached to the probe and the collection velocity was matched to the stack gas velocity by adjusting the flow as indicated by the calibrated orifice.

At the completion of the test, the impinger contents were measured and weighed for determination of the actual moisture content of the exhaust gas stream. The probe tip, probe, and glassware preceding the filter were washed with acetone and placed in a tared beaker and evaporated at room temperature. The filter and beaker were then desiccated to the tared humidity conditions and weighed. The impinger water was analyzed in accordance the "Modified Method 5 for Condensible Particulate" published by the DNR in the Air Management Operations Handbook. The combined weight of the filter catch, the washing residue and the condensible particulate was used for the determination of emission rates and emission concentrations.



Particulate sampling train.

The thimble, front half washings, back half residues, and nitric acid solutions were then combined and analyzed by atomic absorption for metals. A computer was used to calculate the stack velocities, emission concentrations, emission rates and volumetric flow rates using the field and laboratory data.

Analysis of sampling solutions (distilled water, acetone, and methylene chloride) was performed to obtain blank values for use in the calculations. All test results were then blank corrected.

3.2 Carbon Monoxide

Sampling for carbon monoxide was performed in accordance with the procedures outlined in EPA Method 1O - "Determination of Carbon Monoxide Emissions from Stationary Sources" - as published in the Federal Register. Time integrated bag samples were extracted from the exhaust gas stream and analyzed for carbon monoxide concentration using a Horiba nondispersive infrared analyzer (NDIR). The analyzer was calibrated with span gas and zero gas prior to and following each hour of testing. The calibration gas was introduced into a Tedlar bag through the sampling apparatus, similar to the exhaust gas sampled. The calibration span gases for the analyzer were 600 and 200 ppm CO in nitrogen.

3.3 Formaldehyde

Sampling for formaldehyde was performed in accordance with EPA Method 011. Samples were drawn from the exhaust gas stream onto DNPH coated solid sorbent tubes (SEP-PAKS) using an SKC pump with a stroke counter to measure the sample volume. At the completion of the tests the tubes were analyzed by HPLC at the Wisconsin State Laboratory of Hygiene in accordance with documented procedures.

The compound concentrations were then used in conjunction with the exhaust gas flow rates to determine organic compound emission rates in units of pounds per hour (lb/hr).

3.4 VOC & Benzene

Sampling for VOCs and benzene emissions was performed in accordance with EPA Method 18 - "Measurement of Gaseous Organic Compound Emissions by Gas Chromatography," Absorption Tube Procedures. Samples were drawn from the exhaust gas stream onto activated charcoal sampling tubes (two placed in series) using an SKC low-flow pump equipped with a stroke counter to measure the sample volume. At the completion of the tests the tubes were desorbed and analyzed by NIOSH Method 1500 using a gas chromatograph equipped with a flame ionization detector.

Standard concentrations of the benzene were prepared by injecting known quantities onto a tube and then desorbing and analyzing the tube in the same manner as the samples. The concentrations of the exhaust gas stream were then determined by comparing the response of the standards to the response to the exhaust duct samples. Sample retention times and peak areas were used to quantify both the benzene emissions and the VOC emissions. Sample volumes were calculated following calibration of the pump stroke counters using standard soap bubble/burette methods.

The compound concentrations were then used in conjunction with the exhaust gas flow rates to determine organic compound emission rates in units of pounds per hour (lb/hr).

3.5 Sulfur Dioxide Emissions

Samples were collected and analyzed in accordance with the procedures outlined in EPA Method 6 (40 CFR, Part 60, Appendix A).

The sampling train consisted of a stainless steel probe with a glass wool plug serving as a filter. A series of four midget impingers followed in an ice bath. The first impinger contained 15 milliliters (ml) of 80% isopropyl alcohol, the second and third each contained 15 ml of 3% hydrogen peroxide, and the fourth was dry to serve as a trap for carry-over of any liquid. This train separates out sulfuric acid and sulfur trioxide in the first impinger and sulfur dioxide is collected in the second and third impingers. The gas then passed through a water trap and silica gel tube to trap all water vapor prior to the sampling pump and dry gas meter. A schematic of the sampling train is included as Figure 3-2.

The principle of the method was to collect a representative sample of the exhaust gas stream by placing the probe at a single point in the duct and sampling for a 60 minute period concurrent with the particulate sampling at a nominal sampling rate of 1 liter per minute. At the completion of each test, a leak check was performed and ambient air was purged through the sampling train for approximately 15 minutes.

The first impinger contents were then discarded while the second and third impinger contents were combined along with the washings from the connected tubing. Aliquots of this solution were diluted with known quantities of isopropyl alcohol and titrated with barium perchlorate using thorin indicator. From the quantity of titrant required the weight of sulfur dioxide was calculated. This information was combined with the volume of gas sampled to determine the sulfur dioxide concentration. The emission rates were then calculated using these concentrations and the volumetric flow rate.

3.6 Nitrogen Oxides

Integrated bag samples were collected and analyzed in accordance with the procedures outlined in EPA Method 7E (4O CFR, Part 6O, Appendix A).

A Thermo Environmental Instruments Inc. (TECO) Model 1O-S chemiluminescent NO/NOx analyzer was used to obtain a continuous reading of the NOx concentration in the exhaust gas stream. Prior to entering the analyzer, the stack gas was dried using a four impinger condenser as described in paragraph 3.1 of this section of the report; a filter followed the silica gel impinger to protect the analyzer from particulate matter contamination. The EPA protocol gases used to calibrate the analyzer were introduced into the sampling train ahead of this condenser and filter .A NO2 to NO conversion efficiency test was performed prior to the start of the stack sampling. Two concentrations of EPA protocol calibration gas were introduced to the analyzer prior to and after each of the three 1 hour test periods.

3.7 Non Particulate Test Calculations

The calculations used to determine the emission rates were as follows:

A. Emission Concentration (EC), milligrams per cubic meter

EC = (mg)/(Vm m3)

where: mg = milligrams of compound found in sample, corrected for "blank" values and desorption efficiency (the ratio of milligrams of compound recovered from sampling media to milligrams of compound injected directly into desorbing solution

B. Emission Rate (ER), pounds

ER = EC x Qm x (1/453600)

where: Qm = stack gas flow rate, std. cubic meters per hour
1/453600 = pound per milligrams factor

APPENDIX A

Field and Laboratory Data
Cupola Stack S01

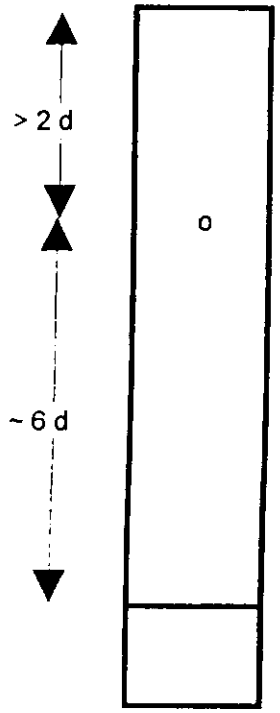
GREDE FOUNDRIES
REEDSBURG CUPOLA BAGHOUSE

DIAMETER = 72"

SAMPLE POINT LOCATION

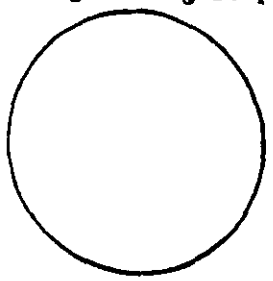
POINT	DISTANCE inches
1	1.5
2	4.8
3	8.5
4	12.7
5	18.0
6	25.6
7	46.4
8	54.0
9	59.3
10	63.5
11	67.2
12	70.5

SAMPLE PORT LOCATION

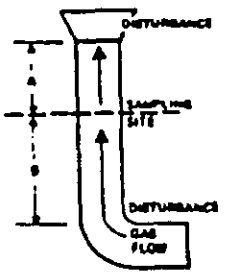


Technology & Engineering Corp.

PARTICULATE FIELD DATA



CROSS SECTION



PLANT GRAFTE
DATE 5-25-00
LOCATION REEDS BLDG
OPERATOR WJO
STACK NO. CUPOLA
RUN NO. 1
SAMPLE BOX NO. 4A
METER BOX NO. 1

AMBIENT TEMPERATURE 60
BAROMETRIC PRESSURE 29.05
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 7'+
NOZZLE DIAMETER, in. 5/16
STACK DIAMETER, in. 72
PROBE HEATER SETTING -
HEATER BOX SETTING

METER ΔH
C FACTOR
PROCESS WEIGHT RATE

ORSAT RESULTS
CO2 6.4
O2 14.6
CO
N2

LEAK CHECKS
Pre OK
Pitot OK
Post OK
Pitot OK

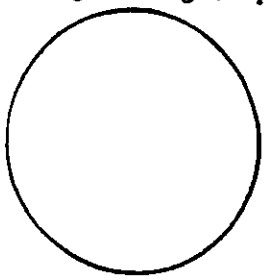
GT-318

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s) ($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{IN}}$), °F	OUTLET ($T_{m_{OUT}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER F	PUMP VACUUM in. Hg gauge	VELOCITY fps
A1	0835		270	44	3.60		891.00		72		35		
2	37+		255	52	3.50		93.4		75				
3	40	-0.5	270	.56	3.80		960		78				
4	42+		265	.60	4.50		98.7		79			7	
5	45		268	.60	4.50		901.5		80				
6	47+		270	.60	4.50		04.5		81		38		
7	50		272	.70	4.80		07.4		82				
8	52+		275	.76	5.20		102		84				
9	55		280	.76	5.20		13.3		85				
10	57		280	.70	4.80		16.4		86				
11	00		276	.62	4.20		19.3		87				
12	02		272	.50	3.50		22.1		92		40	5	
B1	3 07+		280	.50	3.90		24.5		95		40		
2	10		255	.64	4.50		27.0		96				
3	12+		261	.64	4.50		29.9		97				
4	15	-0.5	278	.70	4.80		32.7		100				
5	17-		275	.76	5.20		35.5		102		45	8	
6	20		280	.76	5.00		38.4		103				
7	22-		272	.61	4.30		41.3		105				
8	25		270	.66	4.50		44.1		107				
9	27-		268	.62	4.20		46.9		108		48		
10	30		265	.60	4.10		49.5	(1658?)	110				
11	32+		275	.50	3.42		52.1		111				
12	35		270	.44	3.00		54.5						
	35-2130						95680						

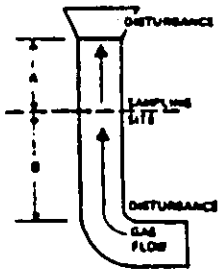
X

Technology & Engineering Corp.

PARTICULATE FIELD DATA



CROSS SECTION



PLANT Greene
DATE 5-21-00
LOCATION Ramp Base
OPERATOR WJD
STACK NO. Corex
RUN NO. 2
SAMPLE BOX NO. 5B
METER BOX NO. 1

AMBIENT TEMPERATURE 65
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 7'+
NOZZLE DIAMETER, in. 5/16
STACK DIAMETER, in. 72
PROBE HEATER SETTING
HEATER BOX SETTING

METER ΔH
C FACTOR
PROCESS WEIGHT RATE

ORSAT RESULTS
CO2 7.8
O2 13.4
CO
N2

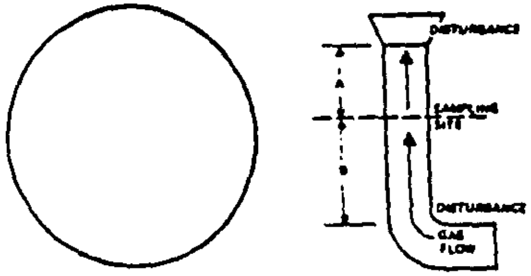
LEAK CHECKS
Pre
Pitot
Post
Pitot

@ 319

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD ($\sqrt{P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (Vm), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{IN}}$), °F	OUTLET ($T_{m_{OUT}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER F	PUMP VACUUM in. Hg gauge	VELOCITY fps
A1	0950		260	.40	3.00		958.09		118		35	5	
2	55+		266	.50	3.90		65.4		119				
3	5	-0.95	272	.55	3.80		72.9		120				
4	5		275	.62	4.80		65.4		120				
5	00		270	.60	4.50		68.1		120		38		
6	05+		270	.65	4.50		70.9		121				
7	01		266	.70	4.80		737		122				
8	1:1+		268	.75	5.20		76.5		122			7	
9	15		270	.76	5.20		79.4		122				
10	12+		275	.76	5.20		82.4		122				
11	15		268	.60	4.20		85.3		122				
12	17+		265	.50	3.40		87.9		122		40		
B1	2422+		270	.50	3.90		90.3		124		40		
2	25		272	.60	4.10		92.9		125				
3	27+		275	.65	4.50		95.9		125				
4	30	-0.50	278	.70	4.80		98.3		125				
5	32+		280	.72	4.90		1001.1		125				
6	35		280	.76	5.20		03.9		126				
7	37+		275	.76	5.20		06.8		126		42	I	
8	40		265	.60	4.50		09.8		126				
9	42+		260	.60	4.10		12.5		126				
10	45		260	.60	4.10		15.1		127				
11	47+		265	.50	3.50		17.7	64.17	127				
12	50		260	.60	4.10		20.1		127		45		
	1252+						1022.1						

Environmental
Technology &
Engineering Corp.

PARTICULATE FIELD DATA



CROSS SECTION

PLANT [illegible]
DATE 5-23-00
LOCATION [illegible]
OPERATOR WJD
STACK NO. Cupola
RUN NO. 3
SAMPLE BOX NO. 4C
METER BOX NO. 1

AMBIENT TEMPERATURE
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 3
PROBE LENGTH, in. 7'+
NOZZLE DIAMETER, in. 3/16
STACK DIAMETER, in. 72
PROBE HEATER SETTING -
HEATER BOX SETTING -

METER ΔH
C FACTOR
PROCESS WEIGHT RATE

ORSAT RESULTS
CO_2 7.2
O_2 14.0
CO
N_2

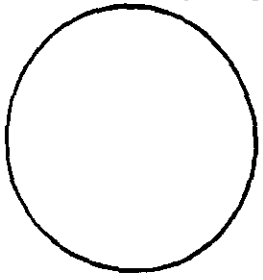
6 320

LEAK CHECKS
Pre .01
Pitot .01
Post .02
Pitot .02

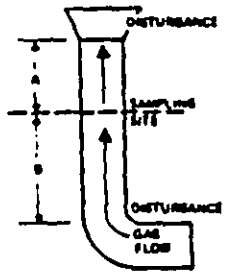
TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	1100		255	.45		3.00		023.00		125		35	5	
2	02+		260	.52		3.[illegible]		25.0		125				
3	05	-0.55	262	.55		3.80		27.3		125				
4	07+		265	.60		4.10		29.9		126				
5	10		270	.65		4.50		32.5		126				
6	12+		275	.70		4.88		35.3		126		38	6	
7	15		275	.72		4.90		38.2		126				
8	17+		280	.75		5.20		41.1		125				
9	20		260	.75		5.20		44.1		124				
10	22+		264	.75		5.2[illegible]		47.1		124				
11	25		270	.60		4.10		50.1		124				
12	27		272	.55		3.40		52.7		124		40	5	
1	27/32+		272	.50		3.40		55.1		125				
2	35		270	.62		4.20		57.4		125				
3	37+	-0.50	265	.64		4.50		60.1		125				
4	40		265	.72		4.90		62.9		124				
5	42+		245	.75		5.20		65.7		124		42	7	
6	45		255	.78		5.40		68.7		124				
7	47+		260	.65		4.50		71.7		124				
8	50		268	.65		4.5		74.4		124				
9	52+		282	.60		4.10		77.2		123				
10	55		280	.62		4.10		79.8		123				
11	57+		272	.50		3.40		82.6	64.18	123				
12	60		265	.45		3.00		84.9		123		45	5	
	1230							087.18						

Technology &
Engineering Corp.

PARTICULATE FIELD DATA



CROSS SECTION



PLANT GREDE
DATE 5-25-00
LOCATION REEDSBURG
OPERATOR WJD
STACK NO. CUPOLA
RUN NO. 1
SAMPLE BOX NO. 1
METER BOX NO. 2

AMBIENT TEMPERATURE
BAROMETRIC PRESSURE
ASSUMED MOISTURE, %
PROBE LENGTH, in.
NOZZLE DIAMETER, in. 1/4
STACK DIAMETER, in. 72
PROBE HEATER SETTING -
HEATER BOX SETTING -

METER ΔH
C FACTOR
PROCESS WEIGHT RATE

ORSAT RESULTS
CO2
O2
CO
N2

LEAK CHECKS
Pre
Pitot
Post
Pitot

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD ($\sqrt{P_s}$) ($\sqrt{\ }$ $\sqrt{\ }$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft^3	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{IN}}$), °F	OUTLET ($T_{m_{OUT}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	0845					0.7	7515.00						
	1105						7615						
	1145						7690.						

61

LABORATORY DATA SHEET
PARTICULATE WITH METHOD 202 BACKHALF ANALYSIS

JOB NAME Gerdau Reedsburg - Cupola DATE OF TEST 5-25-00

JOB NO. _____ TEST ENGINEER WJD

RUN NO. 1 STACK Cupola

SAMPLE BOX 4 FILTER NUMBER T-318

BEAKERS: FH Acetone 1 BH MetCl 1 BH Water A

WATER COLLECTED

Impinger No.	Final Wt (g)	Initial Wt (g)	Water Collected (g)
1	118	100	18
2	104	100	4
3	102	100	2
Sil Gel	657	653	4
		WATER TOTAL -	28

PARTICULATE COLLECTED

	Blank	Final Wt (g)	Tare Wt (g)	Net Wt Gain (g)
Filter		1.2099	1.2097	0.0002
FH Wash	0.0002	106.3243	106.3239	0.0002
			FRONT HALF TOTAL -	0.0004
Extract	0.0005	68.5765	68.5760	0.0000
Water	0.0003	119.0700	119.0695	0.0002
			BACK HALF TOTAL -	0.0002
			TOTAL PARTICULATE -	0.0006

Comments:

2.0

X

90

LABORATORY DATA SHEET
PARTICULATE WITH METHOD 202 BACKHALF ANALYSIS

JOB NAME Grede Reedsburg DATE OF TEST 5-25-00

JOB NO. _____ TEST ENGINEER WJD

RUN NO. 2 STACK Cupola

SAMPLE BOX 4B FILTER NUMBER T-319

BEAKERS: FH Acetone 2 BH MetCl 2 BH Water B

WATER COLLECTED

Impinger No.	Final Wt (g)	Initial Wt (g)	Water Collected (g)
1	113	100	13
2	106	100	6
3	102	100	2
Sil Gel	651	646	5
		WATER TOTAL -	26

PARTICULATE COLLECTED

	Blank	Final Wt (g)	Tare Wt (g)	Net Wt Gain (g)
Filter		1.2282	1.2279	0.0003
FH Wash	0.0002	110.5602	110.5596	0.0004
			FRONT HALF TOTAL -	0.0007
Extract	0.0005	89.1230	89.1525	0.0000
Water	0.0002	120.8915	120.8912	0.0001
			BACK HALF TOTAL -	0.0001
			TOTAL PARTICULATE -	0.0008

Comments:

LABORATORY DATA SHEET
PARTICULATE WITH METHOD 202 BACKHALF ANALYSIS

JOB NAME Grede Reedsburg DATE OF TEST 5-25-00

JOB NO. _____ TEST ENGINEER WJD

RUN NO. 3 STACK Cupola

SAMPLE BOX 4c FILTER NUMBER T-320

BEAKERS: FH Acetone 3 BH MetCl 3 BH Water C

WATER COLLECTED

Impinger No.	Final Wt (g)	Initial Wt (g)	Water Collected (g)
1	116	100	16
2	104	100	3
3	104	100	4
Sil Gel	664	661	3
		WATER TOTAL -	26

PARTICULATE COLLECTED

	Blank	Final Wt (g)	Tare Wt (g)	Net Wt Gain (g)
Filter		1.0665	1.0665	0.0000
FH Wash	0.0002	94.1875	94.1870	0.0003
			FRONT HALF TOTAL -	0.0003
Extract	0.0005	68.6508	68.6502	0.0001
Water	0.0003	110.2900	110.2896	0.0001
			BACK HALF TOTAL -	0.0002
			TOTAL PARTICULATE -	0.0005

Comments:

FIELD SAMPLING DATA

Facility_____ Contact_____
Address_____ Test Date_____
_____ Witnesses_____
_____

Process Description _____
_____
_____

Stack Number _____ Analyte _____ Pump #_____

SAMPLING DATA

SO_2 1.031 sec 4 VOC/Benz .417

Sample ID	Time	Meter Rdg/ Rotameter	Flow Rate	Minutes	Volume
C-SO_2-1	0840	997.44/72	____	790.931	GB-1
	0910	995.12/82	____	814989	
	____	2.58/7	____	24058	9.91
CSO_2-2	0950	995.12/82	____	814989	C-B1
	1050	998.71/88	____	839468	____
	____	2.82/95	____	24479	____
CSO_2-3	1120	998.71/90	____	839468	C B3
	____	002.16/90	____	863287	____
	____	3.12/90	____	25819	____

FLOW DATA

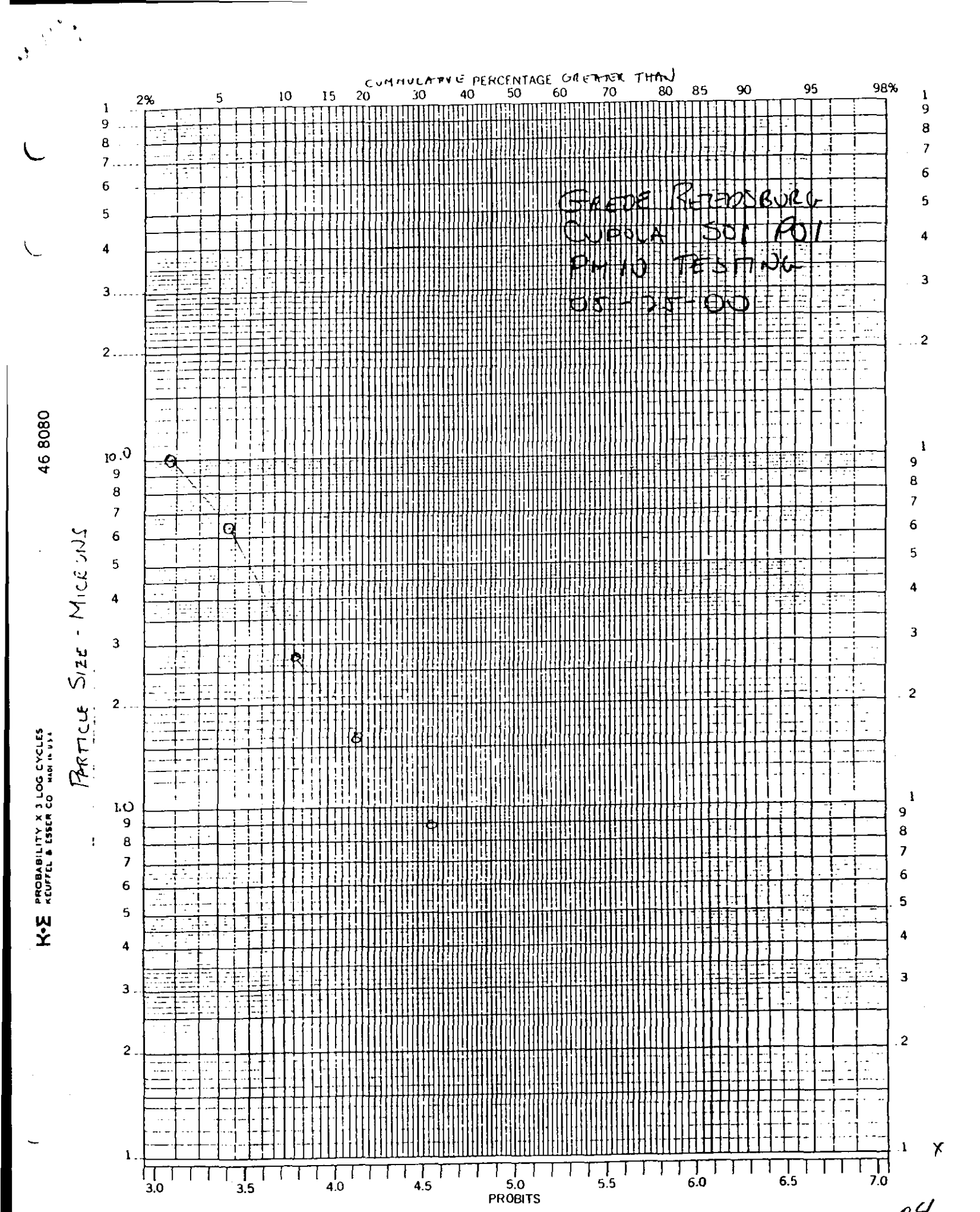
Diam = _____
L x W = _____
Cp = _____
Est Moist ____

Point	Run 1 Del P	Run 1 Del P	Run 2 Del P	Run 2 Del P	Run 3 Del P	Run 3 Del P
1	_____	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	_____	_____
3	_____	_____	_____	_____	_____	_____
4	_____	_____	_____	_____	_____	_____
5	_____	_____	_____	_____	_____	_____
6	_____	_____	_____	_____	_____	_____
7	_____	_____	_____	_____	_____	_____
8	_____	_____	_____	_____	_____	_____
9	_____	_____	_____	_____	_____	_____
10	_____	_____	_____	_____	_____	_____
11	_____	_____	_____	_____	_____	_____
12	_____	_____	_____	_____	_____	_____

	Run 1	Run 2	Run 3
Ps	_____	_____	_____
T	_____	_____	_____
CO2	_____	_____	_____
O2	_____	_____	_____
N2	_____	_____	_____

COMMENTS _____
_____
_____

ENVIRONMENTAL TECHNOLOGY & ENGINEERING CORP.
13020 West Bluemound Road Elm Grove, Wisconsin 53122
414-784-2434


CUMULATIVE PERCENTAGE GREATER THAN
2% 5 10 15 20 30 40 50 60 70 80 85 90 95 98%
GRADE REDSBURG
CUPOLA SOT #01
PM10 TESTING
05-25-00
PARTICLE SIZE - MICRONS
10.0
1.0
PROBITS
3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0
PROBABILITY X 3 LOG CYCLES
KEUFFEL & ESSER CO
46 8080
K&E

24

GREDE REEDSBURG
CUPOLA BAGHOUSE **5/25/00**

PM10 TESTING

STAGE	FINAL g	TARE g	GAIN g	CUMULATIVE g	CUT SIZE microns	% GREATER THAN	% LESS THAN	CUT SIZE microns
							97.2	10.0
0	0.1519	0.1518	0.0001	0.0001	10.0	2.8	94.4	6.2
1	0.1360	0.1359	0.0001	0.0002	6.2	5.6	88.9	2.8
3	0.1509	0.1507	0.0002	0.0004	2.8	11.1	80.6	1.6
4	0.1372	0.1369	0.0003	0.0007	1.6	19.4	66.7	0.9
5	0.1507	0.1502	0.0005	0.0012	0.9	33.3	30.6	0.4
7	0.1366	0.1353	0.0013	0.0025	0.4	69.4	0.0	0.0
F	0.2075	0.2064	0.0011	0.0036	0.0	100.0		
			0.0036					

25

GREDE 5-25-00

CUPOLA

TEST	NO_x	CO
1	13.3 ppm	413 ppm
2	17.5 ppm	91 ppm
3	18 ppm	141 ppm

SO_2 TITRATIONS

$mg\ SO_2 = 32.03(V_t - V_{tb})\ N_t\left(\frac{V_s}{V_a}\right)$

SAMPLE No	V_{sol}	V_a	V_t	V_{tb}	N_t		$mg\ SO_2$		
C-SO_2-Blk	21			0.15	.0115				
C-SO_2-1	21	3.0	1.10	.15	.0115				
C-SO_2-2	20	3.0	3.10	.15	.0115				
C-SO_2-3	21	3.0	3.25	.15	.0115				

GREDE REEDSBURG
CUPOLA STACK
SO2 LAB RESULTS

Sample no.	Vol.Solution ml	Vol. Aliq. ml	Vol.Titrant ml	Vol.Tit. Bl. ml	N. Titrant	mg. SO2	mg/m3	Meter Vol. ft3	Meter GAMA	Mater T deg F	Pb in Hg	Meter Std. scf	Std m3	Flow Rate m3/hr	Emission Rate lb/hr
1	21.0	3.0	1.10	0.15	0.0115	2.449	32.79	2.68	1.031	77	29.05	2.638	0.075	103779	7.50
2	20.0	3.0	3.10	0.15	0.0115	7.244	72.86	3.62	1.031	65	29.05	3.511	0.099	103406	16.61
3	21.0	3.0	3.25	0.15	0.0115	7.993	95.88	3.42	1.031	90	29.05	3.267	0.093	103676	19.67
AVG							83.84								14.59

28 x

GREDE REEDSBURG
CUPOLA BAGHOUSE EMISSIONS
25-May-00

		TEST 1	TEST 2	TEST 3	AVERAGE
C O					
	ppm	473.0	91.0	141.0	235.0
	mg/m3	550.7	105.9	164.2	273.6
	lb/hr	126.0	24.2	37.6	62.6
NOx					
	ppm	13.3	17.5	18.0	16.3
	mg/m3	25.4	33.5	34.4	31.1
	lb/hr	5.8	7.6	7.9	7.1
SO2					
	mg/m3	32.8	72.9	85.9	63.8
	lb/hr	7.5	16.6	19.7	14.6
FLOW					
	dscfm	61075	60856	61132	61021
	m3/hr	103778	103406	103876	103687

X

GAS CHROMATOGRAPH ANALYSIS SHEET
METHOD 18 DATA

CLIENT: Grede Reedsburg
PROCESS/STACK: Cupola Baghouse

CALIBRATION FACTORS

PARAMETER	STD ug	STD AREA	FACTOR
Benzene	4.3	70921	0.000061
RECOVERY FACTOR	1.00		

TEST			
1	PUMP	SKC4	
	PUMP CAL	0.412	cc/count
	PUMP COUNTS	24058	counts
	SAMPLE VOLUME	9.91	std liters
	PEAK AREA	-30000	
	WT OF COMPOUND	-1.82	ug
	BENZENE CONCENTRATION	-0.18	mg/m3
	STACK FLOW RATE	103778	m3/hr
	BENZENE EMISSION RATE	-0.042	lb/hr
TEST			
2	PUMP	SKC4	
	PUMP CAL	0.412	cc/count
	PUMP COUNTS	24479	counts
	SAMPLE VOLUME	10.09	std liters
	PEAK AREA	-30000	
	WT OF COMPOUND	-1.82	ug
	BENZENE CONCENTRATION	-0.18	mg/m3
	STACK FLOW RATE	103406	m3/hr
	BENZENE EMISSION RATE	-0.041	lb/hr
TEST			
3	PUMP	SKC4	
	PUMP CAL	0.412	cc/count
	PUMP COUNTS	23819	counts
	SAMPLE VOLUME	9.81	std liters
	PEAK AREA	-30000	
	WT OF COMPOUND	-1.82	ug
	BENZENE CONCENTRATION	-0.19	mg/m3
	STACK FLOW RATE	103876	m3/hr
	BENZENE EMISSION RATE	-0.042	lb/hr
AVERAGE	BENZENE EMISSION RATE	-0.042	lb/hr

Y

30

S-F ANALYTICAL LABORATORIES, INC
A Subsidiary of Sommer-Frey Laboratories, Inc.

Environmental Technology & Engineering
Attn: William Dick
13000 West Bluemound Road
Elm Grove, WI 53122-2655

Received Date: 6/2/00
Report Date: 6/5/00

- Analytical Results -

Test	Result	Units	MDL	Analysis Date	By	Method
Lab #: 00A03271-001	Sample ID: GC-1 06/02/00					
Lead	1.1	ug	1	6/5/00	GGG	EPA29
Manganese	4.9	ug	0.1	6/5/00	GGG	EPA29
Lab #: 00A03271-002	Sample ID: GC-2 06/02/00					
Lead	<1	ug	1	6/5/00	GGG	EPA29
Manganese	5.1	ug	0.1	6/5/00	GGG	EPA29
Lab #: 00A03271-003	Sample ID: GC-3 06/02/00					
Lead	<1	ug	1	6/5/00	GGG	EPA29
Manganese	6.7	ug	0.1	6/5/00	GGG	EPA29
Lab #: 00A03271-004	Sample ID: GC Blank 06/02/00					
Lead	<1	ug	1	6/5/00	GGG	EPA29
Manganese	4.1	ug	0.1	6/5/00	GGG	EPA29

Gary G. Geipel
Senior Analyst

6125 West National Avenue, P.O. Box 14513, Milwaukee, Wisconsin 53214
(414) 475-6700 FAX: (414) 475-7216
Toll-Free: 800-300-6700

GREDE FOUNDRY
METALS RESULTS

CUPOLA **TEST 1**

Parameter	Micrograms	Concentration ug/m3	Emission Rate lb/hr
Lead	-2	-1.09	-0.00025
Manganese	0.8	0.43	0.00010
Sample Volume	65.05 ft3		
	1.84 m3		
Flow Rate	61074 dscfm		
	103777 m3/hr		

CUPOLA **TEST 2**

Parameter	Micrograms	Concentration ug/m3	Emission Rate lb/hr
Lead	-2	-1.11	-0.00025
Manganese	1.0	0.56	0.00013
Sample Volume	63.42 ft3		
	1.80 m3		
Flow Rate	60856 dscfm		
	103407 m3/hr		

CUPOLA **TEST 3**

Parameter	Micrograms	Concentration ug/m3	Emission Rate lb/hr
Lead	-2	-1.10	-0.00025
Manganese	2.6	1.42	0.00033
Sample Volume	64.43 ft3		
	1.82 m3		
Flow Rate	61132 dscfm		
	103875 m3/hr		

X

National Emission Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries - Background Information for Proposed Standards

(This page is intentionally blank)

EPA-453/R-02-013
December 2002

National Emission Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries-- Background Information for Proposed Standards

Prepared by:
RTI International
Research Triangle Park, NC

Prepared for:
Kevin Cavender, Project Leader
Emission Standards Division

Contract No. 68-D01-73
Work Assignment No. 1-14

U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Emission Standards Division
Metals Group
Research Triangle Park, NC

APPENDIX D

SOURCE TEST PARTICULATE MATTER DATA FOR CUPOLA BAGHOUSES

D.1 SOURCE TEST PARTICULATE MATTER DATA FOR CUPOLA BAGHOUSES

This appendix presents the individual sampling run data for the source tests available to characterize the control performance for baghouses applied to cupolas (Chapter 4). Summary test data are given in Table D-1 along with information on melting rates and capacities and a description of the control systems and the processes they serve.

The data in Table D-1 represent a range of cupola sizes and types of baghouses. The design melting rates range from 3.5 to 80 tons per hour, and ventilation rates range from 30,000 to 195,000 actual cubic feet per minute. The cupolas include both recuperative and non-recuperative, and both above and below charge take off. The baghouses include both negative and positive pressure operating modes and employ both shaker and pulse jet cleaning systems. Some were installed about 30 years ago, and some are relatively new (rebuilt). The design air-to-cloth ratios cover a range of 1.68 to 5.1 feet per minute. No information is available on the ages of the bags in service when the tests were conducted.

The reported results were checked to ensure the weights of PM from the filter and the probe catch were above detection limits. When the reported catch was less than 3 mg, a detection limit value of 3 mg and the sample volume were used to estimate the detection limit in gr/dscf. Values calculated in this manner are reported as “less than” (<).

TABLE D-1. PM SOURCE TEST RESULTS FOR BAGHOUSES SERVING CUPOLAS

Foundry WI-35 (tested March 1998)									
Run	PM (gr/dscf)	PM (lb/hr)	Flow (dscfm)	Flow (acfm)	Temp (°F)	Air:cloth ratio (ft/min)	Melt rate (tph)	Cupola information	Baghouse information
1	<0.0006	<0.4	75,974	107,297	271	1.7		45 tph capacity, afterburner, recuperative, above charge takeoff	Installed 1998, negative pressure, pulse jet, horizontally-supported bags, 10.8 oz Nomex fabric, air:cloth = 2.4 ft/min, design for 280°F and 148,000 acfm
2	<0.0006	<0.4	75,412	107,145	273	1.7			
3	<0.0006	<0.4	74,847	105,854	274	1.7			
Avg	<0.0006	<0.4	75,411	106,765	273	1.7			
Foundry WI-35 (tested November 1998)									
Run	PM (gr/dscf)	PM (lb/hr)	Flow (dscfm)	Flow (acfm)	Temp (°F)	Air:cloth ratio (ft/min)	Melt rate (tph)		
1	<0.0007	<0.4	59,651	86,905	279	1.4	40		
2	<0.0008	<0.4	56,350	81,221	270	1.3	40		
3	<0.0008	<0.4	57,002	82,220	271	1.3	42.5		
Avg	<0.0008	<0.4	57,668	83,449	273	1.3	41		
Foundry WI-35 (tested May 2000)									
Run	PM (gr/dscf)	PM (lb/hr)	Flow (dscfm)	Flow (acfm)	Temp (°F)	Air:cloth ratio (ft/min)	Melt rate (tph)		
1	<0.0007	<0.4	61,074	88,945	271	1.4			
2	<0.0007	<0.4	60,856	88,346	269	1.4			
3	<0.0007	<0.4	61,132	88,483	267	1.4			
Avg	<0.0007	<0.4	61,021	88,591	269	1.4			

Foundry IN-01 (tested March 2000)									
Run	PM (gr/dscf)	PM (lb/hr)	Flow (dscfm)	Flow (acfm)	Temp (°F)	Air:cloth ratio (ft/min)	Melt rate (tph)	Cupola information	Baghouse information
1	0.00086	0.43	58,178	81,782	259		69.5	75 tph capacity, afterburner, below charge takeoff	New baghouse, pulse jet, horizontally-supported bags
2	0.00079	0.42	61,481	87,303	270		61.8		
3	0.00069	0.39	65,454	95,494	293		68.6		
Avg	0.00078	0.41	61,704	88,193	274		66.6		
Foundry MI-26 (tested December 1995)									
Run	PM (gr/dscf)	PM (lb/hr)	Flow (dscfm)	Flow (acfm)	Temp (°F)	Air:cloth ratio (ft/min)	Melt rate (tph)	Cupola information	Baghouse information
1	0.0012	0.22	20,987				10	15 tph capacity, afterburner, above charge takeoff	Installed 1995, positive pressure, shaker, fiberglass fabric, air:cloth = 0.75 ft/min, design for 500°F and 25,700 acfm
2	0.0023	0.40	20,987						
3	0.0017	0.29	21,029						
Avg	0.0017	0.30	21,001						
Foundry NC-05 (tested February 2000)									
Run	PM (gr/dscf)	PM (lb/hr)	Flow (dscfm)	Flow (acfm)	Temp (°F)	Air:cloth ratio (ft/min)	Melt rate (tph)	Cupola information	Baghouse information
1	0.0019	1.15	65,932	102,298	288	2.3	62.9	70 tph capacity, afterburner, above charge takeoff	New baghouse, negative pressure, pulse jet, air:cloth = 1.76 ft/min, design for 350°F and 79,000 acfm
2	0.0027	1.69	64,883	105,026	292	2.3	59.8		
3	0.0019	1.14	64,879	102,995	296	2.3	65.3		
Avg	0.0022	1.33	65,231	103,440	292	2.3	62.7		

Foundry NJ-3 (tested August 1991)									
Run	PM (gr/dscf)	PM (lb/hr)	Flow (dscfm)	Flow (acfm)	Temp (°F)	Air:cloth ratio (ft/min)	Melt rate (tph)	Cupola information	Baghouse information
1	0.0048	12.7	306,488	390,656	213	3.5	87	2 cupolas with 64 tph capacity (only one operates at a time), afterburner, recuperative, below charge takeoff	Installed 1974, positive pressure, shaker, fiberglass fabric, air:cloth = 1.75 ft/min, design for 500°F and 195,000 acfm, controls melting
2	0.0055	11.2	238,254	305,489	217	2.7	67		
3	0.0026	3.5	159,297	211,491	241	1.9	88		
Avg	0.0043	8.9	234,680	304,017	224	2.7	81		
Foundry NJ-3 (tested September 1997)									
Run	PM (gr/dscf)	PM (lb/hr)	Flow (dscfm)	Flow (acfm)	Temp (°F)	Air:cloth ratio (ft/min)	Melt rate (tph)		
1	0.0012	3.06	219,000	263,000	175	2.4	80		
2	0.0023	1.89	220,100	282,000	216	1.9	90		
3	0.0014	2.99	240,200	316,000	235	2.8	75		
Avg	0.0016	2.6	226,433	287,000	209	2	82		
Foundry IN-34 (tested September 1997)									
Run	PM (gr/dscf)	PM (lb/hr)	Flow (dscfm)	Flow (acfm)	Temp (°F)	Air:cloth ratio (ft/min)	Melt rate (tph)	Cupola information	Baghouse information
1	0.0026	0.71	32,100	45,000	231	1.2	53	80 tph capacity, afterburner, recuperative, below charge takeoff	Installed 1997, negative pressure, pulse jet, Nomex, air:cloth = 1.8 ft/min, design for 320°F and 70,000 acfm, controls melting and charging
2	<0.0003	<0.14	49,700	69,600	253	1.8	41		
3	0.0011	0.46	48,500	68,200	254	1.8	47		
Avg	<0.0013	<0.5	40,300	56,600	243	1.5	50		

Foundry VA-8 (tested January 1998)									
Run	PM (gr/dscf)	PM (lb/hr)	Flow (dscfm)	Flow (acfm)	Temp (°F)	Air:cloth ratio (ft/min)	Melt rate (tph)	Cupola information	Baghouse information
1	0.0039	1.64	48,697	70,363	278	2.6	49	2 cupolas with 65 tph capacity (only one operates at a time), afterburner, recuperative, below charge takeoff	Installed 1997, negative pressure, pulse jet, Nomex, air:cloth = 3.74 ft/min, design for 375°F and 100,000 acfm, controls melting and charging
2	0.0028	1.14	47,588	69,934	281	2.6	51		
3	0.0026	1.08	48,934	72,472	283	2.7	53		
Avg	0.0031	1.29	48,407	70,923	281	2.6	51		
Foundry FL-6 (tested February 1998)									
Run	PM (gr/dscf)	PM (lb/hr)	Flow (dscfm)	Flow (acfm)	Temp (°F)	Air:cloth ratio (ft/min)	Melt rate (tph)	Cupola information	Baghouse information
1	0.0028	0.52	21,976	35,420	246	0.9	17.7	22 tph capacity, afterburner, recuperative, above charge takeoff	Installed 1998, negative pressure, reverse air, fiberglass fabric, air:cloth = 1.68 ft/min, design for 460°F and 65,000 acfm, controls melting and charging
2	0.0031	0.67	25,178	42,114	266	0.7	19.8		
3	0.0051	1.11	25,288	41,495	272	0.7	25.1		
Avg	0.0037	0.77	24,147	39,676	261	0.8	20.9		
Foundry IA-19 (tested February 1998)									
Run	PM (gr/dscf)	PM (lb/hr)	Flow (dscfm)	Flow (acfm)	Temp (°F)	Air:cloth ratio (ft/min)	Melt rate (tph)	Cupola information	Baghouse information
1	0.0026	0.92	41,861	58,271	245	4.2	13.5	20 tph capacity, afterburner, recuperative, below charge takeoff	Installed 1992, negative pressure, pulse jet, Nomex felt fabric, air:cloth = 5.1 ft/min, design for 450°F and 70,000 acfm, controls melting, charging, tapping
2	0.0015	0.58	46,281	63,363	233	4.6	13.5		
3	0.0022	0.90	46,811	64,433	238	4.7	13.5		
Avg	0.0021	0.80	44,984	62,022	239	4.5	13.5		

Foundry IN-35 (tested November 1997)									
Run	PM (gr/dscf)	PM (lb/hr)	Flow (dscfm)	Flow (acfm)	Temp (°F)	Air:cloth ratio (ft/min)	Melt rate (tph)	Cupola information	Baghouse information
1	0.0044	1.71	45,055	66,407	213	4.1		22 tph capacity, afterburner, nonrecuperative, above charge takeoff	Installed 1997, positive pressure, pulse jet, Tuflex fabric, air:cloth = 4.65 ft/min, design for 400°F and 75,000 acfm, controls melting
2	0.0043	1.68	44,780	66,018	215	4.1			
3	0.0043	1.66	44,773	66,532	212	4.1			
Avg	0.0043	1.69	44,869	66,319	213	4.1			
Foundry SD-1 (tested March 1995)									
Run	PM (gr/dscf)	PM (lb/hr)	Flow (dscfm)	Flow (acfm)	Temp (°F)	Air:cloth ratio (ft/min)	Melt rate (tph)	Cupola information	Baghouse information
1	0.0058	0.72	14,580	20,403	227	2.7	4.3	3.5 tph capacity, no afterburner, nonnonrecuperative, above charge takeoff	Installed 1994, negative pressure, pulse jet, 16 oz Nomex fabric, air:cloth = 3.96 ft/min, design for 400°F and 30,000 acfm, controls melting and charging
2	0.0035	0.48	16,008	21,992	216	2.9	4.3		
3	0.0047	0.62	15,336	21,567	231	2.9	6.4		
Avg	0.0046	0.61	15,308	21,321	225	2.8	5.0		
Foundry WI-49/50 (tested September 1995)									
Run	PM (gr/dscf)	PM (lb/hr)	Flow (dscfm)	Flow (acfm)	Temp (°F)	Air:cloth ratio (ft/min)	Melt rate (tph)	Cupola information	Baghouse information
1	0.0044	1.2	30,852	59,684	338	3.0	29.7	2 cupolas, 30 tph capacity, afterburner, recuperative, above charge takeoff	Installed 1994, negative pressure, pulse jet, woven fiberglas fabric, air:cloth = 2.4 to 3.7 ft/min, design for 450°F and 50,000 to 70,000 acfm, controls melting
2	0.0047	1.2	30,826	59,347	332	3.0	28.4		
3	0.0060	1.5	29,750	60,281	339	3.0	24.4		
Avg	0.0050	1.3	30,476	59,771	336	3.0	27.5		