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RESULTS OF THE APRIL 28, 1993 STATE AIR EMISSION COMPLIANCE TESTING ON THE NO. 4 AND 5 PELLETIZERS AT THE US STEEL PLANT IN MOUNTAIN IRON, MINNESOTA

Submitted to:

U.S. STEEL-MINNTAC
P.O. Box 417
Mountain Iron, Minnesota 55768

Attention:

Nick Brascugli

Reviewed by:

Daniel J. Despen
Manager
Stationary Source Testing Department

Report Number 3-8678
June 10, 1993
KE/kce

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ABBREVIATIONS

ACFM	actual cubic feet per minute
cc (ml)	cubic centimeter (milliliter)
DSCFM	dry standard cubic foot of dry gas per minute
DSML	dry standard milliliter
DEG-F (°F)	degrees Fahrenheit
DIA.	diameter
FP	finished product for plant
FT/SEC	feet per second
g	gram
GPM	gallons per minute
GR/ACF	grains per actual cubic foot
GR/DSCF	grains per dry standard cubic foot
g/dscm	grams per dry standard cubic meter
HP	horsepower
HRS	hours
IN.	inches
IN.HG.	inches of mercury
IN.WC.	inches of water
LB	pound
LB/DSCF	pounds per dry standard cubic foot
LB/HR	pounds per hour
LB/10^6BTU	pounds per million British Thermal Units heat input
LB/MMBTU	pounds per million British Thermal Units heat input
LTPD	long tons per day
MW	megawatt
mg/Nm^3	milligrams per dry standard cubic meter
ug/Nm^3	micrograms per dry standard cubic meter
microns (um)	micrometer
MIN.	minutes
ng	nanograms
ohm-cm	ohm-centimeter
PM	particulate matter
PPH	pounds per hour
PPM	parts per million
ppmC	parts per million carbon
ppm,d	parts per million, dry
ppm,w	parts per million, wet
ppt	parts per trillion
PSI	pounds per square inch
SQ.FT.	square feet
TPD	tons per day
ug	micrograms
v/v	percent by volume
w/w	percent by weight
<	≤ (when following a number)

Standard contitions are defined as 68°F (20°C) and 29.92 IN. of mercury pressure.

1 INTRODUCTION

On April 28, 1993, Interpoll Laboratories personnel conducted particulate and visible emission compliance tests on the No. 4 and 5 Pelletizers (Emission Points Nos. 8.21 and 8.22) at the US Steel Minntac Plant in Mountain Iron, Minnesota. On-site testing was performed by D. Brennan, S. Bainville and J. Bergstrom. Coordination between testing activities and plant operation was provided by Ray Potts of US Steel. The tests were not witnessed by a member of the MPCA.

The Step II Pelletizers 4 and 5 consist of traveling grates followed by rotary kilns. The pellets are heated in the kiln where they are hardened. After leaving the kiln, the pellets are air-cooled and loaded into railcars for shipment. During the tests the No. 4 Pelletizer was co-fired with natural gas and fuel oil and the No. 5 Pelletizer was fired with natural gas. Particulate emissions from the No. 4 and 5 Pelletizers are controlled by individual multiple throat venturi type wet scrubbers.

Particulate determinations were performed in accordance with EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1992). Previous data collected at the test sites was used to select of the appropriate nozzle diameter required for isokinetic sample withdrawal. An Interpoll Labs sampling train which meets or exceeds specifications in the above-cited reference was used to extract particulate samples by means of a heated glass-lined probe. Wet catch samples were collected in the back half of the Method 5 sampling train and analyzed as per Minnesota Rules Part 7005.0500.

Testing at each test location was conducted from four test ports oriented at 90 degrees on the respective stacks. The test ports in each case are located approximately 3 diameters downstream and approximately 4 diameters upstream of the nearest flow disturbance. A 24-point traverse was used to collect representative particulate samples. Each traverse

point was sampled 2.5 minutes to give a total sampling time of 60 minutes per run. Visible emissions determinations were performed by J. Bergstrom, an EPA-certified observer.

The important results of the test are summarized in Section 2. Detailed results are presented in Section 3. Field data and all other supporting information are presented in the appendices.

2 SUMMARY AND DISCUSSION

The results of the particulate emission compliance tests are summarized in Tables 1 and 2. As will be noted, the particulate concentration averaged 0.0092 GR/DSCF for the No. 4 Pelletizer and 0.0097 GR/DSCF for the No. 5 Pelletizer (dry + organic wet catch). Opacity averaged 11.3% for the No. 4 Pelletizer and 11.4% for the No. 5 Pelletizer.

No difficulties were encountered in the field or in the laboratory evaluation of the samples. On the basis of these facts and a complete review of the data and results, it is our opinion that the concentrations and emission rates reported herein are accurate and closely reflect the actual values which existed at the time the test was performed.

Table 1a Summary of the Results of the April 28, 1993 Particulate Emission Compliance Test on the No. 4 Pelletizer (Source No. 8.21) at the US Steel Minntac Plant in Mountain Iron, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		04-27-93	04-27-93	04-27-93
Time runs were done	(HRS)	1420/1525	1540/1645	1655/1758
Process rate	(LTON/HR)	505	495	495
Volumetric flow				
actual	(ACFM)	564667	626665	612350
standard	(DSCFM)	433690	486968	471755
Gas temperature	(DEG-F)	120	118	120
Moisture content	(%V/V)	10.06	9.35	9.71
Gas composition	(%V/V,dry)			
carbon dioxide		2.10	2.10	2.10
oxygen		18.40	18.40	18.50
nitrogen		79.50	79.50	79.40
Isokinetic variation	(%)	97.5	99.1	99.4
Particulate concentration				
actual	(GR/ACF)	.00650	.00916	.00568
standard	(GR/DSCF)	.00847	.0118	.00738
Part. emission rate	(LB/HR)	31.49	49.23	29.84

Note: Dry + Organic Wet Catch

Table 1b Summary of the Results of the April 28, 1993 Particulate Emission Compliance Test on the No. 4 Pelletizer (Source No. 8.21) at the US Steel Minntac Plant in Mountain Iron, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		04-27-93	04-27-93	04-27-93
Time runs were done	(HRS)	1420/1525	1540/1645	1655/1758
Process rate	(LTON/HR)	505	495	495
Volumetric flow				
actual	(ACFM)	564667	626665	612350
standard	(DSCFM)	433690	486968	471755
Gas temperature	(DEG-F)	120	118	120
Moisture content	(%V/V)	10.06	9.35	9.71
Gas composition	(%V/V,dry)			
carbon dioxide		2.10	2.10	2.10
oxygen		18.40	18.40	18.50
nitrogen		79.50	79.50	79.40
Isokinetic variation	(%)	97.5	99.1	99.4
Particulate concentration				
actual	(GR/ACF)	.00644	.00897	.00549
standard	(GR/DSCF)	.00839	.0115	.00712
Part. emission rate	(LB/HR)	31.18	48.19	28.80

Note: Dry Catch Only

Table 2a Summary of the Results of the April 28, 1993 Particulate Emission Compliance Test on the No. 5 Pelletizer (Source No. 8.22) at the US Steel Minntac Plant in Mountain Iron, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		04-28-93	04-28-93	04-28-93
Time runs were done	(HRS)	1820/1925	1935/2043	2045/2150
Process rate	(LTON/HR)	488	462	476
Volumetric flow				
actual	(ACFM)	571905	594540	580078
standard	(DSCFM)	452410	463696	456712
Gas temperature	(DEG-F)	114	117	115
Moisture content	(%V/V)	8.29	9.10	8.49
Gas composition	(%V/V,dry)			
carbon dioxide		2.10	2.20	2.00
oxygen		18.10	18.10	18.30
nitrogen		79.80	79.70	79.70
Isokinetic variation	(%)	97.7	100.7	100.1
Particulate concentration				
actual	(GR/ACF)	.00749	.00706	.00838
standard	(GR/DSCF)	.00947	.00905	.0106
Part. emission rate	(LB/HR)	36.72	35.97	41.67

Note: Dry + Organic Wet Catch

Table 2b Summary of the Results of the April 28, 1993 Particulate Emission Compliance Test on the No. 5 Pelletizer (Source No. 8.22) at the US Steel Minntac Plant in Mountain Iron, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		04-28-93	04-28-93	04-28-93
Time runs were done	(HRS)	1820/1925	1935/2043	2045/2150
Process rate	(LTON/HR)	488	462	476
Volumetric flow				
actual	(ACFM)	571905	594540	580078
standard	(DSCFM)	452410	463696	456712
Gas temperature	(DEG-F)	114	117	115
Moisture content	(%V/V)	8.29	9.10	8.49
Gas composition	(%V/V,dry)			
carbon dioxide		2.10	2.20	2.00
oxygen		18.10	18.10	18.30
nitrogen		79.80	79.70	79.70
Isokinetic variation	(%)	97.7	100.7	100.1
Particulate concentration				
actual	(GR/ACF)	.00680	.00618	.00782
standard	(GR/DSCF)	.00861	.00793	.00994
Part. emission rate	(LB/HR)	33.37	31.52	38.91

Note: Dry Catch Only

3 RESULTS

The results of all field and laboratory evaluations are presented in this section. Gas composition are presented first followed by the computer printouts of the particulate and opacity results. Preliminary measurements are given in the appendices.

The results have been calculated on a personal computer using programs written in Extended BASIC specifically for source testing calculations. EPA-published equations have been used as the basis of the calculation techniques in these programs. The particulate emission rates have been calculated using the product of the concentration times flow method.

3.1 Results of Orsat and Moisture Determinations

Test No. 4
No. 4 Pelletizer Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	04-27-93	04-27-93	04-27-93
Dry basis (orsat)			
carbon dioxide.....	2.10	2.10	2.10
oxygen.....	18.40	18.40	18.50
nitrogen.....	79.50	79.50	79.40
Wet basis (orsat)			
carbon dioxide.....	1.89	1.90	1.90
oxygen.....	16.55	16.68	16.70
nitrogen.....	71.51	72.07	71.69
water vapor.....	10.06	9.35	9.71
Dry molecular weight.....	29.07	29.07	29.08
Wet molecular weight.....	27.96	28.04	28.00
Specific gravity.....	0.966	0.968	0.967
Water mass flow.....(LB/HR)	136003	140902	142283
FO	1.190	1.190	1.143

Test No. 5
No. 5 Pelletizer Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	04-28-93	04-28-93	04-28-93
Dry basis (orsat)			
carbon dioxide.....	2.10	2.20	2.00
oxygen.....	18.10	18.10	18.30
nitrogen.....	79.80	79.70	79.70
Wet basis (orsat)			
carbon dioxide.....	1.93	2.00	1.83
oxygen.....	16.60	16.45	16.75
nitrogen.....	73.18	72.45	72.94
water vapor.....	8.29	9.10	8.49
Dry molecular weight.....	29.06	29.08	29.05
Wet molecular weight.....	28.14	28.07	28.11
Specific gravity.....	0.972	0.970	0.971
Water mass flow.....(LB/HR)	114761	130185	118808
FO	1.333	1.273	1.300

3.2 Results of Particulate Loading Determinations

Test No. 4
No. 4 Pelletizer Stack

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	04-27-93	04-27-93	04-27-93
Time run start/end.....(HRS)	1420/1525	1540/1645	1655/1758
Static pressure.....(IN.WC)	-0.80	-0.80	-0.80
Cross sectional area (SQ.FT)	153.94	153.94	153.94
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	111.0	74.0	70.0
desiccant.....(GRAMS)	19.0	7.0	12.0
total.....(GRAMS)	130.0	81.0	82.0
Total particulate material..			
.....collected(grams)	0.0301	0.0283	0.0172
Gas meter coefficient.....	0.9920	0.9970	0.9970
Barometric pressure..(IN.HG)	28.12	28.12	28.12
Avg. orif.pres.drop..(IN.WC)	3.12	1.36	1.28
Avg. gas meter temp..(DEF-F)	97.1	89.2	89.5
Volume through gas meter....			
at meter conditions...(CF)	61.57	40.97	39.82
standard conditions.(DSCF)	54.83	37.02	35.96
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.247	.190	.190
Avg.stack gas temp ..(DEG-F)	120	118	120
Volumetric flow rate.....			
actual.....(ACFM)	564667	626665	612350
dry standard.....(DSCFM)	433690	486968	471755
Isokinetic variation.....(%)	97.5	99.1	99.4
Particulate concentration...			
actual.....(GR/ACF)	0.00650	0.00916	0.00568
dry standard.....(GR/DSCF)	0.00847	0.01179	0.00738
Particle mass rate...(LB/HR)	31.490	49.229	29.845

Test No. 5
No. 5 Pelletizer Stack

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	04-28-93	04-28-93	04-28-93
Time run start/end.....(HRS)	1820/1925	1935/2043	2045/2150
Static pressure.....(IN.WC)	-0.88	-0.88	-0.88
Cross sectional area (SQ.FT)	153.94	153.94	153.94
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	55.0	68.0	60.0
desiccant.....(GRAMS)	10.0	8.0	9.0
total.....(GRAMS)	65.0	76.0	69.0
Total particulate material..			
.....collected(grams)	0.0208	0.0210	0.0242
Gas meter coefficient.....	0.9970	0.9970	0.9970
Barometric pressure..(IN.HG)	28.12	28.12	28.12
Avg. orif.pres.drop..(IN.WC)	1.22	1.26	1.19
Avg. gas meter temp..(DEF-F)	84.0	83.0	77.8
Volume through gas meter....			
at meter conditions...(CF)	37.16	39.18	38.03
standard conditions.(DSCF)	33.89	35.80	35.08
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.190	.190	.190
Avg.stack gas temp ..(DEG-F)	114	117	115
Volumetric flow rate.....			
actual.....(ACFM)	571905	594540	580078
dry standard.....(DSCFM)	452410	463696	456712
Isokinetic variation.....(%)	97.7	100.7	100.1
Particulate concentration...			
actual.....(GR/ACF)	0.00749	0.00706	0.00838
dry standard.....(GR/DSCF)	0.00947	0.00905	0.01064
Particle mass rate...(LB/HR)	36.723	35.972	41.669

3.3 Results of Opacity Observations

Test No. 3
No. 4 Pelletizer

Results of Opacity Observations ---------- EPA Method 9

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	0.00
5	0.0223	7.92
10	0.0458	58.33
15	0.0706	33.33
20	0.0969	0.42
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00
Avg Opac11.31	Avg OD 0.0524	Time average

Observer: J. Bergstrom
Cert. Date: 04-01-93
Date of Observation: 04-28-93
Time of Observation: 1425-1525

Test No. 4
No. 5 Pelletizer

Results of Opacity Observations ---------- EPA Method 9

PERCENT OPACITY	OPTICAL DENSITY	RELATIVE FREQUENCY (%)
0	0.0000	0.00
5	0.0223	0.00
10	0.0458	71.67
15	0.0706	28.33
20	0.0969	0.00
25	0.1249	0.00
30	0.1549	0.00
35	0.1871	0.00
40	0.2219	0.00
45	0.2596	0.00
50	0.3010	0.00
55	0.3468	0.00
60	0.3979	0.00
65	0.4559	0.00
70	0.5229	0.00
75	0.6021	0.00
80	0.6690	0.00
85	0.8239	0.00
90	1.0000	0.00
95	1.3010	0.00
99	2.0000	0.00
Avg Opac11.42	Avg OD 0.0528	Time average

Observer: J. Bergstrom
Cert. Date: 04-01-93
Date of Observation: 04-28-93
Time of Observation: 1820-1920

APPENDIX A

SAMPLING EQUIPMENT CALIBRATION DATA

P_s = Absolute pressure of stack gas, IN.HG.

P_{std} = Standard absolute pressure, 29.92 IN. HG.

A_a = Actual volumetric stack gas flow rate, ACFM

$Q_{s,d}$ = Dry volumetric stack gas flow rate corrected to standard conditions, DSCFM

RH = Relative humidity, %

T_{db} = Dry bulb temperature of stack gas, ^{o}F

T_{wb} = Wet bulb temperature of stack gas, ^{o}F

$T_{m(avg)}$ = Absolute average dry gas meter temperature, ^{o}R

$T_{s(avg)}$ = Absolute average stack temperature, ^{o}F

T_{std} = Standard absolute temperature, 528 ^{o}F (68 ^{o}F)

θ = Total sampling time, min.

V_{lc} = Total volume of liquid collected in impingers and silica gel, ml

V_m = Volume of gas sample as measured by dry gas meter, CF

$V_{m(std)}$ = Volume of gas sample measured by the dry gas meter corrected to standard conditions, DSCF

$V_{w(std)}$ = Volume of water vapor in the gas sample corrected to standard conditions, SCF

$\bar{V}_s$ = Average actual stack gas velocity, FT/SEC

v_{Ptdb} = Vapor pressure at T_{db}, IN. HG.

vp_{twb} = Vapor pressure at T_{wb}, IN. HG

$\overline{\Delta H}$ = Average pressure differential across the orifice meter, IN. WC.

ΔP = Velocity pressure of stack gas, IN. WC.

γ = Dry test meter correction coefficient, dimensionless

ρ = Actual gas density, LB/ACF

CALCULATION EQUATIONS

METHOD 3

$$\%EA = \frac{100(\%O_2 -).5\%\ CO)}{0.264\%\ N_2 - \%O_2 + 0.5\%\ CO}$$

$$M_d = 0.44(\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2 + \%CO)$$

$$M_s = M_d\ (I - B_{ws}) + 0.18\ B_{ws}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

CALCULATION EQUATIONS

METHOD 5

$$V_{m(std)} = 17.65\ V_m\ Y\ \left(\frac{P_{bar} + \overline{\Delta H}/13.6}{T_{m(avg)}}\right)$$

$$V_{w(std)} = 0.0472\ V_{Is}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

$$I = 0.0944\ \left(\frac{T_{s(avg)}\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (1 - B_{ws})}\right)$$

$$C_s = \frac{15.43\ M_p}{V_{m(std)}}$$

$$C_a = \frac{272.3\ M_p\ P_s}{T_{s(avg)}\ (V_{w(std)} + V_{m(std)})}$$

$$(\dot{m}_p)_1 = 8.5714 \times 10^{-3}\ C_s\ Q_{s,d}$$

$$(\dot{m}_p)_2 = \frac{1.3228 \times 10^{-1}\ M_p\ A}{\theta\ A_n}$$

$$\dot{m}_p = \frac{(\dot{m}_p)_1 + (\dot{m}_p)_2}{2}$$

SYMBOLS

A = Cross sectional area of stack, SQ. FT.

A_n = Cross sectional area of nozzle, SQ. FT.

B_{ws} = Water vapor in gas stream, proportion by volume

C_p = Pitot tube coefficient, dimensionless

C_a = Concentration of particulate matter in stack gas, wet basis, GR/ACF

C_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, GR/DSCF

EA = Excess air, percent by volume

γ = Dry test meter correction factor, dimensionless

G_d = Specific gravity (relative to air), dimensionless

I = Isokinetic variation, percent by volume

M_d = Molecular weight of stack gas, dry basis, g/g - mole.

$\dot{m}_g$ = Mass flow of wet flue gas, LB/HR

$\dot{m}_p$ = Particulate mass flow, LB/HR

M_s = Molecular weight of stack gas, wet basis, g/g, mole.

M_p = Total amount of particulate matter collected, g

P_{bar} = Atmospheric pressure, IN. HG. (uncompensated)

P_g = Stack static gas pressure, IN. WC.

P_s = Absolute pressure of stack gas, IN.HG.

P_{std} = Standard absolute pressure, 29.92 IN. HG.

A_a = Actual volumetric stack gas flow rate, ACFM

$Q_{s,d}$ = Dry volumetric stack gas flow rate corrected to standard conditions, DSCFM

RH = Relative humidity, %

T_{db} = Dry bulb temperature of stack gas, ^{o}F

T_{wb} = Wet bulb temperature of stack gas, ^{o}F

$T_{m(avg)}$ = Absolute average dry gas meter temperature, ^{o}R

$T_{s(avg)}$ = Absolute average stack temperature, ^{o}F

T_{std} = Standard absolute temperature, 528 ^{o}F (68 ^{o}F)

θ = Total sampling time, min.

V_{lc} = Total volume of liquid collected in impingers and silica gel, ml

V_m = Volume of gas sample as measured by dry gas meter, CF

$V_{m(std)}$ = Volume of gas sample measured by the dry gas meter corrected to standard conditions, DSCF

$V_{w(std)}$ = Volume of water vapor in the gas sample corrected to standard conditions, SCF

$\bar{V}_s$ = Average actual stack gas velocity, FT/SEC

vp_{tdb} = Vapor pressure at T_{db}, IN. HG.

vp_{twb} = Vapor pressure at T_{wb}, IN. HG

$\overline{\Delta H}$ = Average pressure differential across the orifice meter, IN. WC.

ΔP = Velocity pressure of stack gas, IN. WC.

γ = Dry test meter correction coefficient, dimensionless

ρ = Actual gas density, LB/ACF

APPENDIX I

MPCA TEST PLAN

Minnesota Pollution Control Agency
Division of Air Quality
Stack Testing Protocol

Date: 3/9/93 Test Date: 3/30/93-4/1/93

The folloving is a summary of the testing requirements for the U.S. Steel facility in Mountain Iron, Minnesota.

I. Test Methods

A. EPA Method 1 for the location of sampling ports and points. Location of the sampling ports must be approved before the test.

Check for cyclonic flov must be done whenever there is a cyclonic type of device directly upstream of the sampling location. Correction of cyclonic flov by straightening vanes must also be verified by checking the cyclonic flov before the test.

If the location does not meet the minimum requirements in Method 1, the testing firm must conduct the flov pattern evaluation and testing according to the alternative procedures in part 2.5 of EPA Method 1 (Three-dimensional directional probe).

B. EPA Method 2 for velocity and volumetric flov rate. Three determinations: one measurement concurrently with each test run for pollutant.

C. EPA Method 4 for the determination of moisture in the flue gases. Three determinations: one measurement concurrently with each test for pollutant.

D. EPA Method 5 for the determination of total particulate matter (TSP). Three one hour determinations are required for each emission point and condensible compounds will be analyzed as per Minn. Rules 7005.0500. The results will be reported as (i) dry catch only and (ii) dry catch plus vet catch for all emission points. The sampling time for each run must be at least 60 minutes and the sampling rate must be at least 0.9 DSCM/Hr (0.53 DSCF/min).

E. EPA Method 201 or 201A for the determination of particulate matter of less than 10 microns diameter (PM10) Three determinations of at least one hour are required for each emission point.

F. EPA Method 202 for the determination of condensible particulate matter, to be performed in conjunction with Method 201 or 201A.

G. EPA Method 9 for the determination of opacity, as amended in Minn. Rules part 7005.1860. One hour of opacity readings is required, to be performed concurrently with one test run for total particulate matter.

Note: The final version of the test plan and protocol shall be included in the test report.

TEST PLAN FOR USS Minntac

I. GENERAL INFORMATION

A. Permittee: USS

B. AQD File No.: 26A

C. Permittee contact person and telephone number: Nick Brascugli 218-749-7485

Permittee's mailing address: P.O. Box 417, Mountain Iron, MN 55768

D. MPCA permitting engineer: Patrick O'Neill

E. Drawings showing location of sampling ports is included.

F. Testing schedules and testing firm: March 30 - April 1, Interpoll Labs Kathy Eickstedt

II. PROCESS UNIT INFORMATION

A. STEP I&II Course Crusher Scrubbers, Emission Point No. 4.3

Pollutant: Total Suspended Particulate matter, PM-10 and Opacity

Steady State Process: Yes

Applicable regulations: 40 CFR 52.21
Minn. Rules Part 7005.0480 Subp.1.B.
Special Condition 2.2 of Air Emission Permit No. 26A-92-I/O-2

Test Methods: EPA Methods 1,2,4,5,9
201 and 202 or 201A and 202
As specified in 40 CFR Part 60 Appendix A

Reason for testing: Initial compliance

B. STEP I&II Course Crusher Scrubbers, Emission Point No. 4.4

Pollutant: Total Suspended Particulate matter, PM-10 and Opacity

Steady State Process: Yes

Applicable regulations: 40 CFR 52.21
Minn. Rules Part 7005.0480 Subp.1.B.
Special Condition 2.2 of Air Emission Permit No. 26A-92-I/O-2

Test Methods: EPA Methods 1,2,4,5,9
201 and 202 or 201A and 202
As specified in 40 CFR Part 60 Appendix A

Reason for testing: Initial compliance

C. STEP III Course Crusher Scrubbers, Emission Point No. 4.7

Pollutant: Total Suspended Particulate matter, PM-10 and Opacity

Steady State Process: Yes

Applicable regulations: 40 CFR 52.21
Minn. Rules Part 7005.0480 Subp.1.B.
Special Condition 2.2 of Air Emission Permit No. 26A-92-I/O-2

Test Methods: EPA Methods 1,2,4,5,9
201 and 202 or 201A and 202
As specified in 40 CFR Part 60 Appendix A

Reason for testing: Initial compliance

D. STEP ~~III~~ II Palletizer 4 Scrubbers, Emission Point No. 8.21

Pollutant: Total Suspended Particulate matter, PM-10 and Opacity

Steady State Process: Yes

Applicable regulations: 40 CFR 52.21
Minn. Rules Part 7005.0480 Subp.1.B.
Special Condition 2.2 of Air Emission Permit No. 26A-92-I/O-2

Test Methods: EPA Methods 1,2,3,4,5,9
201 and 202 or 201A and 202
As specified in 40 CFR Part 60 Appendix A

Reason for testing: Initial compliance

E. STEP ~~III~~ II Palletizer 5 Scrubbers, Emission Point No. 8.22

Pollutant: Total Suspended Particulate matter, PM-10 and Opacity

Steady State Process: Yes

Applicable regulations: 40 CFR 52.21
Minn. Rules Part 7005.0480 Subp.1.B.
Special Condition 2.2 of Air Emission Permit No. 26A-92-I/O-2

Test Methods: EPA Methods 1,2,3,4,5,9
201 and 202 or 201A and 202
As specified in 40 CFR Part 60 Appendix A

Reason for testing: Initial compliance

III. EMISSION POINT INFORMATION.

A. Emission Points No. 4.3,4.4,and 4.7 capture and exhaust emission from the course crushers

B. Emission Points No. 8.21 and 8.22 control emissions from two pelletizers

IV. TEST PLAN

A. Operating conditions during tests

1. All pollution control equipment must be operated as is done during normal operations. This includes pressure drop across the scrubbers and water flow rate.

2. Pelletizers 4 and 5 shall be operted within 10% of their design capacity.

B. Operating Data to Be Recorded during the Test

Operating conditions of each process/source tested and its associated pollution control equipment must be documented in the test report. No test report will be accepted without complete documentation of process conditions during the test. Documentation of operating conditions includes:

1. Raw material input and product output

   a. Number of coarse crushers that are and are not used during the test

   b. The amount of material crushed or the long tons of pellets produced in each of the pelletising lines that are supplied by these crushers for each test run.

   c. For Emission Points No.s 8.21 and 8.22 the type of fuel used and the amount of fuel used during each test run shall be recorded. The amount of pellets shall also be recorded during each run.

2. Pollution control equipment

   Wet Scrubbers - Pressure drop and scrubber water flow rate.

3. Description and date of last maintenance work done before the test.

4. Record keeping of operational parameters as measured throughout the entire test. For continuous recorders, please provide properly labelled copies of strip charts. For records of discrete data, please provide data taken at 15 minute intervals.

5. Calculations

6. Certification of the data by a responsible party.

7. Brief explanation of how the parameters are measured. Indicate if it is a routine measurement, or a special procedure followed for purposes of the test only.

Enclosed is a copy of "Exhibit C", which describes the general requirements for performance testing. Please review it, to make sure that all the requirements are documented in your test report. Some of these general requirements have already been specifically addressed in this letter as they apply to your particular case.

INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job U S STEEL/MINTAC Date 4-26-93

Operator [redacted] Module No. 3

Instructions: Operate the control module at a flow rate equal to ^H@ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 28.17 in. Hg. τ = .9940 ^H@ 1.77 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(615.00)	[redacted]	
2.5	617.50	55	52
5.0	619.54	59	52
7.5	621.23	60	53
10	623.11	61	53
[redacted]	V_m=7.57	Avg(t_m)=56.0	°F

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{\tau\ V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(\quad)(\quad)}\left[\frac{(\ 56\ ) + 460}{(28.17)}\right]^{0.5} \quad 4.2725$$

Y_{cn} = 1.0239

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

S-432

INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job U.S STEEL / MINTAC Date 4-27-93

Operator SCOTT BAINVILLE Module No. 6

Instructions: Operate the control module at a flow rate equal to ^H@ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 28.17 in. Hg. τ = .9970 ^H@ 1.81 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(780.60)	[redacted]	
2.5	752.55	50	48
5.0	754.52	53	49
7.5	756.42	54	50
10	758.37	56	50
[redacted]	V_m=7.77	Avg(t_m)= 51.25 °F	

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{\tau V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(.9970)(7.77)}\left[\frac{(51.25) + 460}{(28.17)}\right]^{0.5}$$

$$Y_{cn} = .9822$$

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

S-432

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: May 3, 1993

Meter Box No. : 3 (Rockwell Dry Test Meter Serial No. 35302)

Date of Last Calibration: April 19, 1993
Calibration Technician: D. Van Hoever
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
April 26, 1993	3-8678	1615.60	1727.41	111.81	864.51

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: April 30, 1993

Meter Box No. : 6 (Rockwell Dry Test Meter Serial No. 712852)

Date of Last Calibration: March 1, 1993
Calibration Technician: D. Van Hoever
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
March 18, 1993	3-8381	275.90	373.85	97.95	97.95
April 8, 1993	3-8520	374.60	516.40	141.80	239.75
April 14, 1993	3-8569	516.85	749.60	232.75	472.50
April 27, 1993	3-8678	750.60	1177.67	427.07	899.57

* Total volume through meter since last calibration.

Date 4/19/93

Bar. Press. 28.85 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Control Module No. 5
Serial No. DTH 35302
Wet Test Meter No. AL-20
Technician D. BRENNAN

ΔH (in. WC)		Gas Volume Wet Test Meter (ft^3)	* Cal. Index Y (%)	* Diff. Wet Test Meter ΔP_w (in.WC)	Gas Volume Dry test meter (ft^3)		Gas temperatures			Time θ (min/sec)	Meter Coeff. Y	Orifice Const. ΔH@	C_f	
nominal	actual				V_{d1}	V_{df}	Wet Test t_w (°F)	Dry Test t_{d1} (°F)	Dry Test t_{do} (°F)					
0.5	.50	2	99.85	0.01	589.500	591.522	71.0	80	72	4:54	.9956	1.74		
1.2	1.2	3	99.91	0.025	592.000	595.040	71.0	82	73	4:45	.9884	1.74		omit — 10-6000
2.0	2.0	3	99.93	0.055	575.000	578.011	71.0	77	68	3:41	.9932	1.76		
3.3	3.3	5	100.00	0.09	578.500	583.517	71.0	80	70	4:51	.9955	1.80		
4.7	4.7	5	100.02	0.12	584.000	589.032	71.0	83	72	4:07	.9938	1.83		
1.2	1.2	3	99.81	.025	600.000	603.060	71.0	84	75	4:45	.9921	1.73		
											AVG-	.9940	1.77	

Positive leak check performed by D. BRENNAN
Meter was in tolerance ■
Meter was not in tolerance ☐; readjusted linkage
Meter was not in tolerance ☐; changed dry test meters

Approved by [signature] Date 4/20/93

* Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

Date 3/1/93

Bar. Press. 29.05 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Control Module No. 6
Serial No. DTM 712852
Wet Test Meter No. AL-20
Technician D. Van Hoever

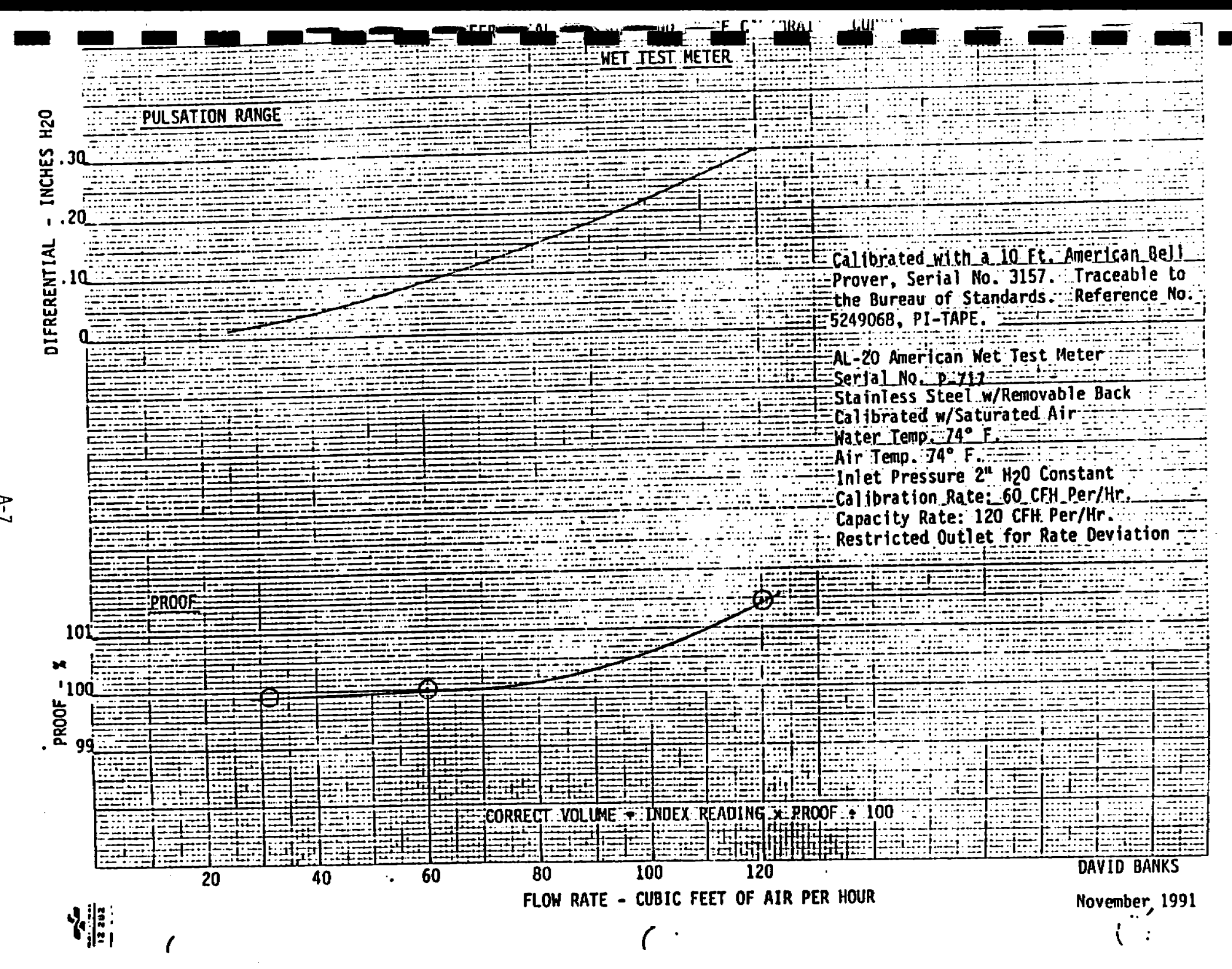
ΔH (in. WC)		Gas Volume Wet Test Meter (ft^3)	* Cal. Index Φ (%)	* Diff. Wet Test Meter ΔP_w (in.WC)	Gas Volume Dry test meter (ft^3)		Gas temperatures			Time θ (min/sec)	Meter Coeff. Y	Orifice Const. ΔH@	C_f
							Wet Test	Dry Test					
nominal	actual				V_{di}	V_{df}	t_w (°F)	t_{di} (°F)	t_{do} (°F)				
0.5	.5	2	99.85	0.01	273.01	275.01	72.3	75	73	4:58	1.000*	1.79	
1.2	1.2	3	99.91	0.025	268.005	271.01	72.4	74	73	4:52	.9964	1.83	
2.0	2.0	3½	99.93	0.055	265.49	267.505	72.3	80	75	2:29	.9963	1.78	
3.3	3.3	5	100.00	0.09	255.47	259.47	72.6	76	74	3:54	.9959	1.81	
4.7	4.7	5	100.02	0.12	259.8	264.99	72.2	80	75	4:06	.9960	1.82	
		8	8	4	8	4	7	8	8	11	11/11	.9970	1.81

Positive leak check performed by [signature]
Meter was in tolerance ☒
Meter was not in tolerance ☐; readjusted linkage
Meter was not in tolerance ☐; changed dry test meters

Approved by [signature] Date 3/1/93

* Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

S0102RR 11/91


WET TEST METER
PULSATION RANGE
DIFRERENTIAL - INCHES H20
.30
.20
.10
0
Calibrated with a 10 Ft. American Bell Prover, Serial No. 3157. Traceable to the Bureau of Standards. Reference No. 5249068, PI-TAPE.
AL-20 American Wet Test Meter
Serial No. P-711
Stainless Steel w/Removable Back
Calibrated w/Saturated Air
Water Temp. 74° F.
Air Temp. 74° F.
Inlet Pressure 2" H2O Constant
Calibration Rate: 60 CFH Per/Hr.
Capacity Rate: 120 CFH Per/Hr.
Restricted Outlet for Rate Deviation
PROOF
101
100
99
PROOF - %
CORRECT VOLUME = INDEX READING x PROOF ÷ 100
20
40
60
80
100
120
FLOW RATE - CUBIC FEET OF AIR PER HOUR
DAVID BANKS
November, 1991

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 4-27-93 Nozzle Number 7-3
Technician: Scott Bainville

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.190
2	.190
3	.188
Average:	.190

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 4-27-93 Nozzle : PM10-2
Technician: Ed Trowbridge

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.146
2	.146
3	.145
Average:	.146

Interpoll Laboratories, Inc.

Temperature Measurement Device
Calibration Sheet

Unit under test:
Vendor Beckman Industrial
Model HD 110T
Range 0-2000 °F
Date of Calibration 2-8-93
Serial Number 10913005 (PDT-19)
Thermocouple Type K
Technician Mark Kuehler

Method of Calibration:

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☒ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100 °F) ± 1 degree (for negative temperatures add ± 2 degrees. The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation Δt (°F)	Deviation (%)
0	0 ~~004~~	-004	4	.87
100	100	92	8	1.43
200	200	195	5	.76
300	300	294	6	.79
400	400	391	9	1.05
500	500	491	9	.94
600	600	593	7	.66
700	700	694	6	.52
800	800	799	1	.08
900	900	901	1	.07
1000	1000	1006	6	.41
1100	1100	1110	10	.64
1200	1200	1216	16	.96
1300	1300	1316	16	.91
1400	1400	1421	21	1.13
1500	1500	1519	19	.97
1600	1600	1620	20	.97
1700	1700	1716	16	.74
1800	1800	1814	14	.62
1900	1900	1907	7	.30
2000				
2100				
		Averages:	10.05	0.74

OF = off scale response by unit under test (°F)
% dev = 100 Δt / (460 + t)

☒ Unit in tolerance
☐ Unit was not in tolerance; recalibrated - See new calibration sheet.

S-433

Interpoll Laboratories, Inc.

Temperature Measurement Device Calibration Sheet

Unit under test: #28

Vendor: BECKMAN

Model: HD 110T — Serial Number: 92052 1132

Range: 0 – 1900 °F — Thermocouple Type: K

Date of Calibration: 3-5-93 — Technician: E. TROWBRIDGE

Method of Calibration:

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☒ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100 °F) ± 1 degree (for negative temperatures add ± 2 degrees. The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation Δt (°F)	Deviation (%)
0	0	1	+ 1	.22
100	100	98	- 2	.36
200	200	201	+ 1	.15
300	300	299	- 1	.13
400	400	396	- 4	.46
500	500	496	- 4	.42
600	600	598	- 2	.19
700	700	699	- 1	.08
800	800	804	+ 4	.32
900	900	906	+ 6	.44
1000	1000	1012	12	.82
1100	1100	1115	15	.96
1200	1200	1221	21	1.26
1300	1300	1322	22	1.25
1400	1400	1426	26	1.39
1500	1500	1524	24	1.22
1600	1600	1625	25	1.21
1700	1700	1721	21	.97
1800	1900	1819	19	.84
1900	1900	1912	12	.51
2000				
2100				
		Averages:	11.15	.66

OF = off scale response by unit under test (°F)

% dev = 100 Δt / (460 + t)

☒ Unit in tolerance

☐ Unit was not in tolerance; recalibrated - See new calibration sheet.

S-433

(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. 23-6

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .461 IN.

Alignment:

4. α_1 <10° 1
5. α_2 <10° 1

6. B_1 <5° 1
7. B_2 < 5° 2

8. Z <.125" .02
9. W <.0625" .02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.00 IN.
12. Pitot to thermocouple (parallel to probe) 3.00 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☒ Meets all EPA design criteria thus C_p = 0.84

☐ Does not meet EPA design criteria - thus calibrate in wind tunnel
C_p = _____

Date of Inspection: 4-7-93

Inspected by: [signature]

CFR Title 40 Part 60 Appendix A Method 2

(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. 23-8

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .460 IN.

Alignment:

4. α_1 <10° 0
5. α_2 <10° 0

6. B_1 <5° 2
7. B_2 < 5° 1

8. Z <.125" .02
9. W <.0625" .02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .755 IN.
11. Pitot to probe sheath 3.00 IN.
12. Pitot to thermocouple (parallel to probe) 3.00 IN.
13. Pitot to thermocouple (perpendicular to probe) .750 IN.

☒ Meets all EPA design criteria thus C_p = 0.84

☐ Does not meet EPA design criteria - thus calibrate in wind tunnel
C_p = _____

Date of Inspection: 4-7-93

Inspected by: [signature]

CFR Title 40 Part 60 Appendix A Method 2

INTERPOLL LABORATORIES
(612)786-6020

ET's

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 2-19-93

Technician [signature]

Mercury Column Barometer No. LAS #1

Aneroid Barometer No. Q1002008

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjsted Mercury Barometer Read	Initial Aneriod Barometer Read	Difference (P_{ba}-P_{bm})
29.180	72°F	.115	29.065	29.06	.005

Has this barometer shown any consistent problems with calibration? Yes/No. If yes, explain. No

Has problem been alleviated? Yes/No. How?

*Note

Aneroid barometers will be calibrated periodically against a mercury column barometer. The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20-30 minutes before calibrating. Aneriod barometer will be calibrated to the adjusted mercury barometer readings.

S-312

Scott B.

INTERPOLL LABORATORIES
(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 2-19-93

Technician [signature]

Mercury Column Barometer No. 45#1

Aneroid Barometer No. _____

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjsted Mercury Barometer Read	Initial Aneriod Barometer Read	Difference (P_{ba}-P_{bm})
29.180	72°F	.115	29.065	29.190	+.125

Has this barometer shown any consistent problems with calibration? Yes/No. If yes, explain. No

Has problem been alleviated? Yes/No. How? _____

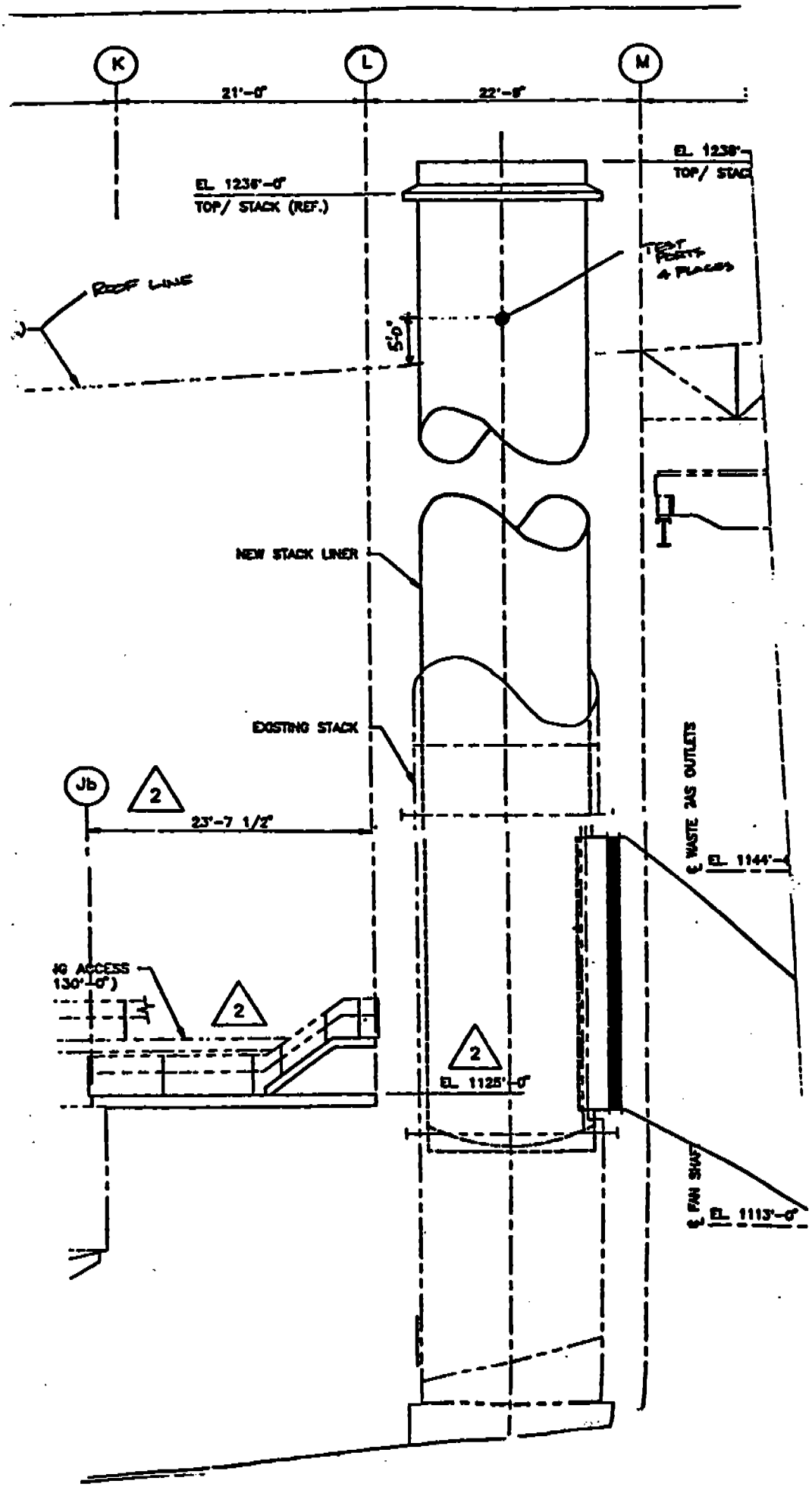
*Note

Aneroid barometers will be calibrated periodically against a mercury column barometer. The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20-30 minutes before calibrating. Aneriod barometer will be calibrated to the adjusted mercury barometer readings.

S-312

APPENDIX B

LOCATION OF TEST PORTS


K
L
M
21'-0"
22'-8"
EL. 1238'-0"
TOP/ STACK (REF.)
EL. 1238'-
TOP/ STAC
TEST PORTS 4 PLACES
ROOF LINE
5'-0"
NEW STACK LINER
EXISTING STACK
Jb
2
23'-7 1/2"
WASTE GAS OUTLETS
EL. 1144'-
IG ACCESS
130'-0")
2
2
EL. 1125'-0"
FAN SHAFT
EL. 1113'-0"

USS
Minnesota Ore Operations
P. O. Box 417
Mt. Iron, MN 55768

To: Interpoll Laboratories, Inc.
4500 Ball Road NE
Circle Pines, MN 55014-1819

Attention: Kathy Eickstadt

Date: May 14, 1993

From: Raymond Potts

Subject: Interpoll Stack Tests
Minntac Agglomerator April 1993

Enclosed is data relating to Interpoll's stack tests on April 27 and 28 at the Minntac Agglomerator (Pelletizer). A summary of the data is enclosed along with copies of logs and process overviews upon which the summary is based. If you have any questions or require more data, feel free to call me at 218-749-7598.

Raymond Potts
Agglomerator Metallurgist

pc: Jane Kingston, USS

Minntac Agglomerator Operating Data Summary
Interpoll Testing – April 1993

Test #	Date	Source Run	Source line #	Time	Fuel Rates: Natural gas SMCF/hr Kiln Burner	Fuel Rates: Natural gas SMCF/hr Grate Burners	Fuel Rates: Natural gas SMCF/hr Total	Fuel Rates: Wood Tons hour	Fuel Rates: Fuel oil Gals hour	Solids Rates: Green Ball Feed Rate	Solids Rates: Bent. lbs/ton	Solids Rates: Flux Ratio**	Water Rates: Grn Ball % H2O
1	27–Apr–93	1	3	0835–1100	89.2	33.7	122.9	2.2	0	294	15.1	0.077	***9.8
1	27–Apr–93	2	3	1205–1335	95.9	33.2	129.1	2.2	0	289	15.1	0.077	***9.8
1	27–Apr–93	3	3	1420–1545	93.4	32.6	126.0	2.2	0	293	15.0	0.077	***9.8
2	27–Apr–93	1	3	1000–1136	91.6	33.2	124.8	2.2	0	292	15.6	0.077	***9.8
2	27–Apr–93	2	3	1210–1345	95.9	33.2	129.1	2.2	0	289	15.1	0.077	***9.8
2	27–Apr–93	3	3	1415–1549	93.4	32.6	126.0	2.2	0	293	15.0	0.077	***9.8
4	28–Apr–93	1	4	1420–1525	0.0	87.1	87.1	0	*760	505	17.0	0.079	***9.8
4	28–Apr–93	2	4	1540–1645	0.0	95.1	95.1	0	*760	495	16.8	0.079	***9.8
4	28–Apr–93	3	4	1655–1758	0.0	100.4	100.4	0	*760	495	16.7	0.079	***9.8
5	28–Apr–93	1	5	1820–1925	154.1	74.8	228.9	0	0	488	16.3	0.079	***9.8
5	28–Apr–93	2	5	1935–2043	156.4	83.8	240.2	0	0	462	16.6	0.079	***9.8
5	28–Apr–93	3	5	2045–2150	151.4	91.4	242.8	0	0	476	18.0	0.079	***9.8

*Estimated – meter not working
**Ratio of dry long tons of flux to dry long tons concentrate
***Estimated – no samples taken

Floppy #46 Filename Interpol

TEST # 4

(12:30)

	GAS SMCF	GAS TEMP	GAS PRESS	GAS MBTU/T	COAL TONS	COAL MBTU/T	OIL GALLONS	OIL MBTU/T	WOOD TONS	WOOD MBTU/T	TOTAL MBTU/T	PHB GAS SMCF
LINE 3	150.4	43.5	19.8	687.4	0.0	0.0	0.0	0.0	0.0	0.0	687.4	32.8
LINE 4	198.6	41.3	23.3	531.3	0.0	0.0	0.0	0.0	0.0	0.0	521.8	81.0
LINE 5	116.9	46.6	21.0	1964.6	0.0	0.0	0.0	0.0	0.0	0.0	1964.6	0.0
LINE 6	0.0	66.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
LINE 7	233.1	45.8	18.4	590.6	0.0	0.0	0.0	0.0	0.0	0.0	590.6	76.4
UTIL	0.0	73.4	13.0									
CTAILS	0.0											
TOTAL	699.1			667.8	0.0	0.0	0.0	0.0	0.0	0.0	663.5	190.2
TURBINE	681.4	31.3	98.3									
T PULSE	694.0											

USS MINNTAC GAS CONSUMPTION 28-APR-1993 13104146.42

	HOUR	24 HOUR
MAIN TURBINES	716.5	783.6

FUEL CONSUMPTION HOUR 28-APR-1993 (13131)49.27

	GAS SMCF	GAS TEMP	GAS PRESS	GAS MBTU/T	COAL TONS	COAL MBTU/T	OIL GALLONS	OIL MBTU/T	WOOD TONS	WOOD MBTU/T	TOTAL MBTU/T	PHB GAS SMCF
LINE 3	149.2	43.6	19.8	675.2	0.0	0.0	0.0	0.0	0.0	0.0	675.2	32.9
LINE 4	154.1	46.2	23.8	21129.7	0.0	0.0	-21264.8	-7851.9	0.1	-6749.9	-7301.6	85.7
LINE 5	201.5	43.1	20.9	3372.7	0.0	0.0	0.0	0.0	0.0	0.0	3372.7	0.0
LINE 6	0.0	66.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LINE 7	235.4	45.9	18.4	596.7	0.0	0.0	0.0	0.0	0.0	0.0	596.7	76.4
UTIL	0.0	75.1	13.0									
CTAILS	0.0											
TOTAL	740.1			1084.6	0.0	0.0	-21264.8	-7851.9	0.1	-6749.9	-2091.2	195.0
TURBINE	724.3	30.3	98.2									
T PULSE	739.0											

USS MINNTAC GAS CONSUMPTION 28-APR-1993 14104146.34

	HOUR	24 HOUR
MAIN TURBINES	675.8	1446.4

	TOT PRD TONS	PRODUCT LTPH	GRN BALL TOT TONS	BALL DRM TOT TONS	BENT PER PRD TON1	BENT PER PRD TON2	BENT PER PRD TON3	BENT PER PRD TON4	BENT PER PRD TON5	BENT PER LBS/TON	BENTONIT TOT LBS
LINE 3	1759.47	220.62	2285.02	2293.76	17.20	13.49	10.25	11.62		17.10	29975.00
LINE 4	3062.29	383.95	3977.00	3964.50	14.32	11.87	13.70	12.00	11.67	15.05	50259.00
LINE 5	1241.63	155.69	1612.50	3654.40	15.15	10.67	1.43	8.00	17.85	6.89	16726.00
TOT/AVG	6063.38	209.81	7874.52	9912.66							96960.00

	GRATE OPR HRS	LN3-DRUM OPR HRS	LN4-DRUM OPR HRS	LN5-DRUM OPR HRS	FILT HRS 4-1TO4-5	FILT HRS 5-1TO5-5	FILT HRS 2-1TO2-5	FILT HRS 2-6TO2-7
UNIT 1		7.98	7.98	2.78	4.47	7.93	0.00	0.00
UNIT 2		7.98	7.98	2.78	2.93	0.00	0.00	0.00
UNIT 3	7.98	7.98	7.98	2.77	2.25	7.98	0.00	
UNIT 4	7.98	7.98	7.98	2.39	0.00	7.98	0.00	
UNIT 5	2.42		7.98	2.40	6.49	7.98	0.00	
TOT/AVG	18.39	31.94	39.92	13.11	16.14	31.88	0.00	0.00

	RECLAIM HRS	TON FROM RECLAIM	G.B. CON REJ TONS	OPR HRS ALL FILT	BALL DRM TOT HRS	FILT TPH ALL FILT	TON FILT ALL FILT	TON FROM CONC	TONS TO STK-PILE	OUTSIDE TEMP
UNIT 1		0.00	0.00		31.94	4451.93	35494.00	0.00	0.00	51.89
UNIT 2		0.00	0.00	48.02	53.04	0.00	0.00		0.00	
TOT/AVG		0.00	0.00			4451.93	35494.00		0.00	

	GAS STD MCF	PH BURNR GAS SMCF	TURBINE GAS SMCF
LINE 3	1185.79	264.80	5411.68
LINE 4	1358.30	694.80	
LINE 5	1156.66	172.00	
TOT/AVG	3700.75	1131.40	5411.68

FUEL CONSUMPTION HOUR 28-APR-1993 14:32:52.93

	GAS SMCF	GAS TEMP	GAS PRESS	GAS MBTU/T	COAL TONS	COAL MBTU/T	OIL GALLONS	OIL MBTU/T	WOOD TONS	WOOD MBTU/T	TOTAL MBTU/T	PHB GAS SMCF
LINE 3	148.3	44.1	19.8	677.2	0.0	0.0	0.0	0.0	0.0	0.0	677.2	33.4
LINE 4	83.3	72.5	0.0	-8110.0	0.0	0.0	-22989.0	-8114.2	0.0	0.0	-8114.1	85.3
LINE 5	198.8	43.2	20.9	2265.8	0.0	0.0	0.0	0.0	0.1	1821.0	2263.3	0.0
LINE 6	0.0	67.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LINE 7	236.5	46.3	18.4	599.2	0.0	0.0	0.0	0.0	0.0	0.0	599.2	76.3
UTIL	0.0	73.9	13.0									
CTAILS	0.0											
TOTAL	668.9			968.1	0.0	0.0	-22989.0	-8114.2	0.1	1821.0	-2327.3	195.1
TURBINE	650.3	32.6	98.6									
T PULSE	649.0											

FUEL CONSUMPTION SHIFT 28-APR-1993 14:32:52.93

	GAS SMCF	GAS TEMP	GAS PRESS	GAS MBTU/T	COAL TONS	COAL MBTU/T	OIL GALLONS	OIL MBTU/T	WOOD TONS	WOOD MBTU/T	TOTAL MBTU/T	PHB GAS SMCF
LINE 3	1185.8	43.7	19.8	672.9	0.0	0.0	0.0	0.0	0.0	0.0	673.9	264.6
LINE 4	1358.3	47.2	23.4	683.6	0.0	0.0	-43594.8	-7589.0	8.5	499.3	-1586.9	694.8

INTERPOLL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job US STEEL/MINTAC

Source NO. 4 PRECIPITATOR STACK

Test 4 Run 0 Date 4-27-93

Stack dimen. 168 IN.

Dry bulb 119 °F Wet bulb ___ °F

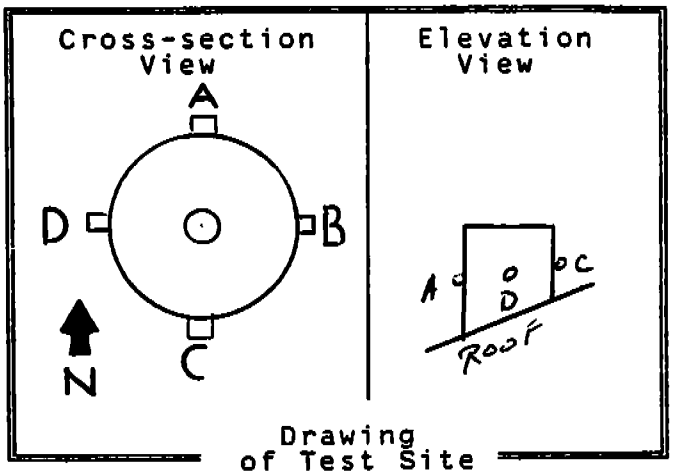
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.

Barometric pressure 28.17 in Hg

Static pressure -0.81 in WC

Operators SCB + JTB

Pitot No 23-8 Cp .840



Drawing of Test Site

Traverse Point No.		Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
			Port length: 18 in.		Time start:	hrs
A	1	.021	3.53	21.53		
	2	.067	11.26	29.26		
	3	.118	19.82	37.82		
	4	.177	29.24	47.24		
	5	.250	42.00	60.00		
	6	.356	59.81	77.81		
B	1					
	2					
	3					
	4					
	5					
	6					
C	1					
	2					
	3					
	4					
	5					
	6					
D	1					
	2					
	3					
	4					
	5					
	6					

Temp. meas. device & S/N: DIGITAL TC / PDT29 | Time end: hrs

C-1 P or nothing = neg. manometer; S= expanded; E=electronic S-3921

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job US Steel / MINTAC Date 4-27-93 Test 4 Run #1
Source No. 4 Pelletizer STACK No. of traverse points 24
Method 5 Filter holder: GLASS Filter type: GLASS Fiber

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0.00 cfm at 0 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5102

Recovery solvent(s)
☐ acetone
☐ other(s)

No. of probe wash bottles:
Sample recovered by:

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1	598	497	111
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant	1316	1297	19
Total			130

Integrated Gas Sampling Data:

Bag Pump No. 23B Box No. 26 Bag No. 1
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 00 cc/min at 15 in. Hg.
Time start: 1420 (HRS) Time end: 1525 (HRS)
Sampling rate: 400 cc/min Operator: SCB
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job US Steel / Minntac
Source No. 4 Pelletizer Stack
Date 6-22-93 Test 4 Run 1

Operators S-B + J B
Meter Box No. 6 ΔH@ 1.81 IN WC
Gasmeter coeff. .9920

Pitot No. 23.8 Cp .840
Bar. Press. 28.72 inHg H2O 15 %
Nozzle No. 2-4 Nozzle Dia .247 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	(120)	(913.00)											
B 6	2.5	915.66	1.10	3.36	5.64	5	120	257	240	46	80	78	17.9
5	5	918.37	1.15	3.55	8.38	5	119				84	80	17.7
4	7.5	921.19	1.20	3.73	1.19	5	119	275	248	46	85	80	17.7
3	10	923.90	1.15	3.57	3.93	5	120				86	81	17.7
2	12.5	926.45	1.10	3.42	6.62	5	120	251	252	46	88	82	17.7
1	15	929.30	1.10	3.43	9.33	5	120				89	83	17.9
C 6	17.5	931.48	0.68	2.13	1.46	4	120	250	253	46	90	83	17.9
5	20	933.74	0.60	1.88	3.47	4	120				91	84	17.9
4	22.5	935.55	0.63	1.98	5.53	4	120	252	256	47	92	84	17.7
3	25	937.35	0.57	1.86	7.53	4	120				92	85	17.7
2	27.5	939.56	0.60	1.89	9.54	4	120	251	250	46	92	85	17.5
1	30	941.66	0.80	2.52	1.87	4	120				92	85	17.7
D 6	32.5	944.29	1.05	3.30	4.52	5	120	252	256	44	93	86	17.9
5	35	947.00	1.00	3.15	7.14	5	120				94	87	17.9
4	37.5	949.89	1.10	3.47	9.85	6	120	256	258	45	95	87	17.7
3	40	952.62	1.10	3.47	2.58	6	120				95	87	17.7
2	42.5	955.12	0.95	3.00	5.12	6	120	255	258	45	95	88	17.9
1	45	957.60	0.95	3.00	7.67	6	120				95	88	17.9
A 6	47.5	960.51	1.20	3.78	0.52	6	120	255	257	45	95	88	17.9
5	50	963.39	1.20	3.78	3.37	6	120				96	89	17.9
4	52.5	966.28	1.25	3.95	4.29	6	120	255	258	46	97	89	18.0
3	~~55~~	969.20	1.20	3.79	9.15	6	120				97	90	18.0
2	57.5	971.94	1.15	3.64	1.95	6	120	256	258	47	98	90	17.9
1	60	974.57	1.00	3.17	4.57	6	120				98	90	18.0
	(1505)												
	θ = 60	Vm 61.57		ΔH 3.12							Avg. = 92.1		

S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job BUSSteel / MinnTac Date 4-28-95 Test 4 Run 2
Source No. 4 Pelletizer Stack No. of traverse points 27
Method 1-5 Filter holder: Glass Filter type: Glass Fiber

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Posttest: 0.00 cfm at 15 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5101

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: SCB

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	274	200	74
Impinger No. 3			
Condenser			
Desiccant	1407	1400	7
Total			81

Integrated Gas Sampling Data:

Bag Pump No. 23B Box No. 26 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 00 cc/min at 15 in. Hg.
Time start: 1540 (HRS) Time end: 1645 (HRS)
Sampling rate: 400 cc/min Operator: SCB
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job US Steel / Minntac
Source No. 4 Pelletizer Stack
Date 6-28-93 Test 4 Run 2

Operators SLB + JB
Meter Box No. 6 ^H@ 1.81 IN WC
Gasmeter coeff. .9970

Pitot No. 23-8 Cp .840
Bar. Press. 28.12 inHg H2O 10 %
Nozzle No. 2-3 Nozzle Dia .150 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Stack (°F)	Probe (°F)	Oven (°F)	Impg. (°F)	Gas/In (°F)	Gas/Out (°F)	Oxygen (xv/v)
	(1540)	(974.45)											
A 4	2.5	976.73	1.30	1.44	6.71	4	120	251	258	46	89	88	18.0
5	5	978.57	1.50	1.65	8.60	4	121				92	87	18.0
4	7.5	980.52	1.55	1.71	0.52	4	121	252	258	46	93	88	18.0
3	10	982.56	1.60	1.77	2.48	3	121				94	89	18.0
2	12.5	984.53	1.60	1.77	4.43	3	121	252	258	46	94	87	18.0
1	15	986.38	1.55	1.72	6.36	3	121				95	90	18.2
D 4	17.5	988.00	1.15	1.28	8.02	3	121	256	260	47	97	91	18.3
5	20	989.62	1.10	1.22	9.66	3	121				95	90	18.1
4	22.5	991.36	1.15	1.28	1.32	3	120	255	258	46	95	90	18.1
3	25	992.90	1.05	1.17	2.92	3	120				94	91	17.9
2	27.5	994.58	1.05	1.17	4.51	3	120	252	256	46	94	90	17.7
1	30	995.95	1.00	1.04	5.95	3	108				92	87	17.7
C 6	32.5	997.54	1.05	1.21	7.55	3	108	252	256	45	92	87	17.7
5	35	999.02	0.95	1.07	9.07	3	107				91	87	17.7
4	37.5	1000.65	0.94	1.06	0.59	3	107	251	257	46	92	87	17.7
3	40	1002.17	1.00	1.13	2.15	3	109				93	88	17.9
2	42.5	1003.72	0.98	1.09	3.69	3	118	252	257	46	93	88	17.7
1	45	1005.15	0.83	0.92	5.10	2	119				93	88	17.7
B 6	47.5	1006.26	1.26	1.38	6.21	3	120	251	255	46	93	88	17.7
5	50	1008.73	1.50	1.66	8.72	3	120				93	88	17.9
4	52.5	1010.64	1.50	1.66	0.62	3	120	252	254	44	94	89	18.0
3	55	1012.46	1.35	1.50	2.42	3	120				95	89	17.9
2	57.5	1014.23	1.30	1.44	4.19	3	120	251	254	46	96	90	18.0
1	60	1015.92	1.20	1.33	5.89	3	121				96	90	18.0
	(1645)												
	θ = 60	Vm = 40.97		^H = 1.32							Avg. = 89.2		

S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job US Steel / MINNTAC
Source No. 4 Precipitator STACK
Method 17 Filter holder: GLASS

Date 4-28-93 Test 4 Run 3
No. of traverse points 24
Filter type: GLASS Fiber

Sample Train Leak Check:

Pretest: 0.02 cfm at 15 in. Hg. (vac)
Postest: 0.00 cfm at 15 in. Hg. (vac)

Particulate Catch Data:

No.s of filters used: ~~#30~~ 5183

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: SCB

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	568	498	70
Impinger No. 3			
Condenser			
Desiccant	1362	1350	12
Total			82

Integrated Gas Sampling Data:

Bag Pump No. 231 Box No. 24 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 00 cc/min at 15 in. Hg.
Time start: 1655 (HRS) Time end: 1758 (HRS)
Sampling rate: 400 cc/min Operator: SCB
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job US Steel (MINNTAC)
Source No. 4 Recuperator Stack
Date 4-28-93 Test 4 Run 3

Operators SCB + JB
Meter Box No. 6 ΔH 1.81 IN WC
Coefficient .9990

Pitot No. 23-8 Cp .840
Bar. Press. 28.12 inHg H2O 10 x
Nozzle No. 3-3 Nozzle Dia .420 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dev. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (x v/v)
	(1655)	(1016.10)											
B 6	2.5	1017.70	1.10	1.21	7.72	3	120	251	248	44	89	87	18.3
5	5	1019.39	1.15	1.27	9.37	3	120				91	88	17.3
4	7.5	1021.15	1.30	1.44	1.13	3	120	251	252	45	92	88	18.1
3	10	1022.98	1.40	1.55	2.96	3	121				92	88	18.4
2	12.5	1024.74	1.30	1.43	4.72	3	121	251	250	45	93	88	18.4
1	15	1026.39	1.15	1.27	6.38	3	121				94	88	18.5
C 6	17.5	1027.88	0.93	1.03	7.87	3	121	252	256	46	94	89	18.5
5	20	1029.46	1.00	1.11	9.42	3	121				93	88	18.2
4	22.5	1030.90	1.00	1.10	0.97	3	121	252	256	46	93	88	18.2
3	25	1032.52	0.97	1.07	2.49	3	121				94	88	18.3
2	27.5	1033.98	0.93	1.03	3.99	3	121	251	256	45	93	88	18.1
1	30	1035.46	0.84	0.93	5.41	3	120				93	88	17.9
D 6	32.5	1037.00	1.10	1.22	7.03	3	120	251	255	46	92	87	17.9
5	35	1038.66	1.10	1.22	8.65	3	120				90	86	18.0
4	37.5	1040.24	1.05	1.16	0.23	3	120	252	256	44	91	88	18.0
3	40	1041.88	1.10	1.21	1.85	3	121				92	86	18.0
2	42.5	1043.35	0.93	1.03	3.34	3	120	251	258	45	92	86	18.0
1	45	1044.90	0.93	1.03	4.83	3	120				92	86	18.0
A 6	47.5	1046.55	1.20	1.32	6.52	3	120	252	257	45	92	87	18.1
5	50	1048.32	1.35	1.49	8.31	3	120				91	86	18.2
4	52.5	1050.20	1.60	1.76	0.26	4	120	252	257	45	90	86	18.2
3	55	1052.19	1.60	1.76	2.21	4	120				91	86	18.2
2	57.5	1054.10	1.55	1.71	4.13	4	120	252	256	46	91	86	18.1
1	60	1055.92	1.35	1.49	5.92	4	120				91	86	18.1
	(1758)												
	θ = 60	Vm = 39.82		ΔH 1.28							Avg. = 89.5		

S-0037R

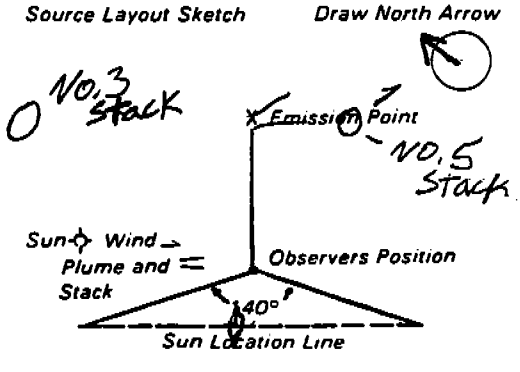
Interpoll Laboratories
(612)786-6020

Visible Emissions Form

TEST #3

SOURCE NAME: U.S. Steel - Minntac
ADDRESS: P.O. Box 417
CITY: Mountain Iron | STATE: MN | ZIP: 55768
PHONE: | SOURCE ID NUMBER:
PROCESS EQUIPMENT: No.4 Pelletizer | OPERATING MODE: 100%
CONTROL EQUIPMENT: | OPERATING MODE:
DESCRIBE EMISSION POINT: START Round metal Stack STOP ✓
HEIGHT ABOVE [redacted] LEVEL: START 30' STOP ✓ | HEIGHT RELATIVE TO OBSERVER: START 10' STOP ✓
DISTANCE FROM OBSERVER: START 100' STOP ✓ | DIRECTION FROM OBSERVER: START NE STOP ✓
DESCRIBE EMISSIONS: START Wh to Br-Billowy STOP ✓
EMISSION COLOR: START Wh to Br STOP ✓ | PLUME TYPE: CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT: NO ☑ YES ☐ | IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: START Exit Point STOP ✓
DESCRIBE BACKGROUND: START Sky to some clouds STOP ✓
BACKGROUND COLOR: START Blue STOP ✓ | SKY CONDITIONS: START Part. CL to STOP ✓
WIND SPEED: START 12-15 mph STOP ✓ | WIND DIRECTION: START NW STOP ✓
AMBIENT TEMP: START 65° STOP 65° | WET BULB TEMP: | RH, percent: 47

Source Layout Sketch — Draw North Arrow



OBSERVATION DATE: 4-28-93 | START TIME: 1425 | STOP TIME: 1525

SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45
1	15	15	15	10	31	15	15	15	15
2	10	15	15	10	32	10	10	10	10
3	10	10	15	15	33	10	10	10	15
4	20	15	15	15	34	10	10	10	10
5	15	15	10	10	35	10	10	10	15
6	10	10	10	10	36	15	15	10	10
7	15	15	15	15	37	15	15	15	10
8	10	10	15	15	38	10	10	10	10
9	10	10	10	10	39	15	15	15	10
10	15	15	10	10	40	15	10	10	15
11	10	10	10	15	41	10	10	15	15
12	10	10	10	15	42	15	10	10	15
13	10	10	10	15	43	10	10	15	15
14	10	10	10	10	44	15	15	10	10
15	10	10	15	15	45	10	10	10	10
16	15	15	10	10	46	15	15	10	10
17	15	10	10	10	47	15	15	10	10
18	10	10	15	15	48	15	15	10	10
19	10	10	10	10	49	10	10	10	10
20	10	10	10	10	50	10	10	10	15
21	15	15	15	10	51	10	10	10	10
22	10	10	10	10	52	10	10	10	10
23	15	15	15	10	53	5	5	5	5
24	10	10	15	10	54	10	5	10	5
25	10	10	10	10	55	5	10	10	10
26	10	15	15	15	56	10	10	5	5
27	15	15	15	15	57	5	5	10	5
28	15	15	10	10	58	5	5	10	10
29	10	15	15	10	59	10	5	10	5
30	15	10	10	10	60	5	5	5	10

AVERAGE OPACITY FOR HIGHEST PERIOD: 13.333
NUMBER OF READINGS ABOVE 20% WERE: 0
RANGE OF OPACITY READINGS: 5 MINIMUM — 20 MAXIMUM
OBSERVER'S NAME (PRINT): JEFF BERGSTROM
OBSERVER'S SIGNATURE: Jeff Bergstrom | DATE: 4-28-93
ORGANIZATION: Interpoll Lab
CERTIFIED BY: E.J.A. Minneapolis MN | DATE: 4-1-93
VERIFIED BY: | DATE:

COMMENTS:

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE | TITLE | DATE

INTERPOLL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job US Steel / MINNTAC

Source No. 5 Pelletizer Stack

Test 5 Run 0 Date 4-28-93

Stack dimen. 168 IN.

Dry bulb ____ °F Wet bulb ____ °F

Manometer: ☒ Reg. ☐ Exp. ☐ Elec.

Barometric pressure 28.12 in Hg

Static pressure -.88 in WC

Operators S. Bainville & D. VanHoever

Pitot No. V23-8 C_p .84

Cross-section View	Elevation View

Drawing of Test Site

Traverse Point No.	Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
		Port length: in.		Time start: hrs	
Temp. meas. device & S/N:				Time end: hrs	

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job US Steel / MINNTAC — Date 4-28-93 Test 5 Run 1
Source NO. 5 Precipitator Stack — No. of traverse points 24
Method 1-5 Filter holder: Glass — Filter type: Glass Fiber

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0.01 cfm at 15 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5119

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: SCB

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	563	508	55
Impinger No. 3			
Condenser			
Desiccant	1344	1334	10
Total			65

Integrated Gas Sampling Data:

Bag Pump No. 23B Box No. 17 Bag No. 1
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 00 cc/min at 15 in. Hg.
Time start: 820 (HRS) Time end: 1725 (HRS)
Sampling rate: 400 cc/min Operator: SCB
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: US Steel / Minntac
Source: No 5 Precipitator Stack
Date: 4-28-93 Test 5 Run 1

Operators: SCB & JB
Meter Box No.: 6 ΔH@ 1.81 IN WC
Coefficient coeff.: .9970

Pitot No.: 23-8 Cp .840
Bar. Press.: 28.12 inHg H2O 6 %
Nozzle No.: 2-3 Nozzle Dia .196 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xx/x)
	(1820)												
D 6	2.5	1057.70	0.98	1.18	7.78	3	103	249	251	44	80	80	17.7
5	5	1039.25	0.98	618	9.36	3	102				81	80	17.7
4	7.5	1060.96	0.98	1.18	0.94	3	102	248	253	44	82	80	17.7
3	10	1062.53	1.05	1.27	2.58	3	102				83	81	17.9
2	12.5	1064.27	1.10	1.30	4.25	3	115	248	254	44	86	81	17.9
1	15	1065.88	1.05	1.24	5.88	3	115				86	82	17.9
A 6	17.5	1067.60	1.20	1.42	7.62	3	115	248	254	43	85	82	17.9
5	20	1069.41	1.25	1.48	9.40	3	114				86	82	17.7
4	22.5	1071.24	1.35	1.60	1.24	3	116	248	255	43	87	82	17.7
3	25	1073.26	1.55	1.83	3.22	3	116				87	83	17.7
2	27.5	1075.00	1.30	1.54	5.04	3	116	249	255	43	88	83	17.7
1	30	1076.75	1.15	1.36	6.75	3	116				88	83	17.5
C 6	32.5	1078.10	0.75	0.89	8.13	3	116	249	256	42	89	83	17.5
5	35	1079.62	0.83	0.99	9.59	2	115				88	83	17.7
4	37.5	1080.90	0.70	0.83	0.93	2	115	249	252	42	88	83	17.5
3	40	1082.32	0.88	1.04	2.42	3	117				88	83	17.5
2	42.5	1083.87	0.80	0.95	3.85	2	117	252	258	45	88	83	17.4
1	45	1085.18	0.70	0.83	5.18	2	118				87	82	17.5
B 6	47.5	1086.78	1.05	1.24	6.81	3	118	251	256	46	87	82	17.5
5	50	1088.39	0.95	1.12	8.36	3	118				86	82	17.4
4	52.5	1089.95	0.98	1.15	9.93	3	118	253	257	47	87	82	17.3
3	55	1091.45	1.05	1.24	1.56	3	117				86	82	17.2
2	57.5	1093.20	1.10	1.30	3.23	3	117	254	253	44	86	82	17.0
1	60	1094.86	1.05	1.24	4.86	3	117				86	82	17.0
	(1925)												
	θ = 60	Vm = 37.16		ΔH = 1.22							Avg. = 84		

C-11

S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job US Steel Fairfax Date 11-28-93 Test 5 Run 2
Source No. 5 Pelletizer Stack No. of traverse points 24
Method 1-5 Filter holder: Glass Filter type: Glass Fiber

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0.00 cfm at 10 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5120

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 2
Sample recovered by: SLB

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	268	200	68
Impinger No. 3			
Condenser			
Desiccant	1370	1362	8
Total			76

Integrated Gas Sampling Data:

Bag Pump No. 23B Box No. 17 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 00 cc/min at 15 in. Hg.
Time start: 1935 (HRS) Time end: 2043 (HRS)
Sampling rate: 400 cc/min Operator: SLB
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job USSteel Mintac — Operators ScB + JB — Pitot No. 23-8 — Cp .840
Source No. 5 Pelletizer Stack — Meter Box No. 6 — ^H@ 1.81 IN WC — Bar. Press. 28.12 inHg — H2O x
Date 4-28-93 — Test 5 — Run 2 — Gasmeter coeff. .9970 — Nozzle No. 7-3 — Nozzle Dia .190 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Des. Vol. (cf)	VAC. inHg	Stack (°F)	Probe (°F)	Oven (°F)	Impg. (°F)	Gas/In (°F)	Gas/Out (°F)	Oxygen (xv/v)
	(1935)	(1095.25)											
B 6	2.5	1096.87	1.00	1.14	6.81	2	117	253	247	43	80	79	17.7
5	5	1098.31	.99	1.12	98.35	2	117				80	78	17.7
4	7.5	1099.88	1.10	1.24	99.97	2.5	116	253	252	43	81	79	17.9
3	10	1101.57	1.20	1.36	01.67	2.5	117				83	79	17.7
2	12.5	1103.25	1.15	1.30	03.34	2.0	117	250	254	44	84	80	17.5
1	15	1104.89	1.0	1.14	04.89	2	117				86	80	17.9
C 6	17.5	1106.35	.95	1.08	06.41	2	117	249	251	45	84	80	17.7
5	20	1107.92	.99	1.13	07.96	2	116				86	80	17.5
4	22.5	1109.46	.88	1.00	09.43	2	117	251	253	46	86	80	17.9
3	25	1111.08	1.10	1.25	11.06	2.5	117				86	80	17.9
2	27.5	1112.51	.92	1.04	12.55	2	118	252	250	46	87	80	18.1
1	30	1113.92	.80	.91	13.95	2	119				87	80	17.9
D 6	32.5	1115.58	.98	1.12	15.50	2	116	250	254	44	85	80	17.9
5	35	1117.05	1.0	1.14	17.05	2.5	117				87	81	17.9
4	37.5	1118.62	1.05	1.20	18.65	2.5	117	253	257	45	87	81	17.9
3	40	1120.29	1.10	1.25	20.29	3	117				88	81	17.9
2	42.5	1121.99	1.15	1.31	21.97	3	118	253	258	46	88	81	17.2
1	45	1123.55	.95	1.08	23.49	2.5	118				88	81	17.9
A 6	47.5	1125.20	1.15	1.31	25.17	3	116	251	255	47	87	81	18.0
5	50	1126.84	1.10	1.25	26.80	3	117				87	81	17.9
4	52.5	1128.73	1.50	1.71	28.71	3	117	252	257	47	88	81	17.9
3	55	1130.61	1.55	1.77	30.66	3.5	117				88	81	18.0
2	57.5	1132.54	1.50	1.71	32.57	3.5	117	253	258	47	88	81	18.0
1	60	1134.43	1.40	1.60	34.42	3.5	117				88	81	18.0
	(2043)												
	θ = 60	Vm = 39.18		^H = 1.26							Avg. = 83		

(1038)

S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job US STEEL / MINNTAC Date 4-28-93 Test 5 Run 3
Source NO. 5 PELLETIZER STACK No. of traverse points 24
Method 1-5 Filter holder: GLASS Filter type: GLASS FIBER

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0.00 cfm at 10 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 5121

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: SCB

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	558	498	60
Impinger No. 3			
Condenser			
Desiccant	1515	1506	9
Total			69

Integrated Gas Sampling Data:

Bag Pump No. 23B Box No. 17 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 00 cc/min at 15 in. Hg.
Time start: 2045 (HRS) Time end: 2150 (HRS)
Sampling rate: 400 cc/min Operator: SCB
S/N of O_2 Analyzer used to monitor train outlet: 2

CF-023

Interpoll Laboratories
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EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job US Steel / Minntac
Team Leader SLB
Date Submitted 4-29-93
Test No. 4
Date of Analysis 4-29-93

Source No. 4 Pelletizer
Test Site Stack
Date of Test 4-27-93
No. of Runs Completed 3
Technician B. Doyle

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
4/1	8678-32	1	0.00	2.10	20.50	2.10	18.40	1.19
		2	0.00	2.10	20.50	2.10	18.40	1.19
	☐ B ☐ F	Avg				2.10	18.40	
4/2	-36	1	0.00	2.10	20.50	2.10	18.40	1.19
		2	0.00	2.10	20.50	2.10	18.40	1.19
	☐ B ☐ F	Avg				2.10	18.40	
4/3	-40	1	0.00	2.10	20.60	2.10	18.50	1.14
		2	0.00	2.10	20.60	2.10	18.50	1.14
	☐ B ☐ F	Avg				2.10	18.50	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

LSC 04 PP

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EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job: U.S. Steel / Minntac
Team Leader: SLB
Date Submitted: 4-29-93
Test No.: 5
Date of Analysis: 4-29-93

Source: No. 5 Pelletizer
Test Site: Stack
Date of Test: 4-28-93
No. of Runs Completed: 3
Technician: [illegible]

Test/Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
5/1		1	0.00	2.10	20.20	2.10	18.10	1.33
	8678-44	2	0.00	2.10	20.20	2.10	18.10	1.33
	☑ B ☐ F	Avg				2.10	18.10	
5/2		1	0.00	2.20	20.30	2.20	18.10	1.27
	-48	2	0.00	2.20	20.30	2.20	18.10	1.27
	☑ B ☐ F	Avg				2.20	18.10	
5/3		1	0.00	2.00	20.30	2.00	18.30	1.30
	-52	2	0.00	2.00	20.30	2.00	18.30	1.30
	☑ B ☐ F	Avg				2.00	18.30	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☐ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

LSC 04 pp

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EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job: US Steel/Minntac
Team Leader: SCB
Date Submitted: 4-28-93
Test No.: 4
Date of Analysis: 5-5-93

Source: No. 4 Pelletizer
Test Site: Stack
Date of Test: 4-27-93
No. of Runs Completed: 3
Technician: B. Drake

0	Test ____ Run 0 Field Blank Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
1	Test 4 Run 1 Log Number 8678-31 Comments ____	Dish No. 106 Dish Tare Wt. 43.0171 g Dish+Sample Wt. 43.0178 g Sample Wt. 0.0007 g
2	Test 4 Run 2 Log Number -35 Comments ____	Dish No. 110 Dish Tare Wt. 49.7365 g Dish+Sample Wt. 49.7375 g Sample Wt. 0.0010 g
3	Test 4 Run 3 Log Number -39 Comments ____	Dish No. 605 Dish Tare Wt. 49.6846 g Dish+Sample Wt. 49.6856 g Sample Wt. 0.0010 g
4	Test ____ Run ____ Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
5	Test ____ Run ____ Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g

Blank Solvent Wt. 0.0004 g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0003	0.0006	0.0006		

LSC-03.GF

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EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job: US Steel / Minntac
Team Leader: SLB
Date Submitted: 4-28-93
Test No.: 4
Date of Analysis: 4-30-93
Transport Leakage [X] None [ ] _____ ml

Source: No. 4 Pelletizer
Test Site: Stack
Date of Test: 4-28-93
No. of Runs Completed: 3
Technician: B Duler
Solvent: Acetone

0	Test ____ Run 0 Field Blank Log Number ____ Vol. of Solvent ____ ml *Solvent Residue 2.0 ug/ml	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
1	Test 4 Run 1 Vol. of Solvent 160 ml Log Number 8678-24 Comments ____	Dish No. 518 Dish Tare Wt. 48.1026 g Dish+Sample Wt. 48.1125 g Sample Wt. 0.0094 g
2	Test 4 Run 2 Vol. of Solvent 180 ml Log Number -33 Comments ____	Dish No. 521 Dish Tare Wt. 50.5957 g Dish+Sample Wt. 50.6101 g Sample Wt. 0.0144 g
3	Test 4 Run 3 Vol. of Solvent 140 ml Log Number -37 Comments ____	Dish No. 611 Dish Tare Wt. 50.0094 g Dish+Sample Wt. 50.0137 g Sample Wt. 0.0043 g
4	Test ____ Run ____ Vol. of Solvent ____ ml Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
5	Test ____ Run ____ Vol. of Solvent ____ ml Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g

*Solvent Residue ___ ug/ml = [(Sample Wt. ____ g)(10⁶)]/Vol. of Sol. ____ ml
EPA-M5 Acetone Residue Blank Spec. < 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0096	0.0140	0.0040		

D-4

LSC-01YR

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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job: U.S. Steel / Minntac
Team Leader: SLB
Date Submitted: 4-28-93
Test No.: 4
Date of Analysis: 4-30-93

Source: No. 4 Pelletizer
Test Site: Stack
Date of Test: 4-28-93
No. of Runs Completed: 3
Technician: B. Dale

0
Test ____ Run 0
Field Blank
Log Number ____
Comments ____
Filter No. ____
Filter Type ____
Filter Tare Wt. ____ g
Filter+Sample Wt. ____ g
Sample Wt. ____ g

1
Test 4 Run 1
Log Number 8678-30
Comments ____
Filter No. 5102
Filter Type 4"GF
Filter Tare Wt. .8858 g
Filter+Sample Wt. .9060 g
Sample Wt. 0.0202 g

2
Test 4 Run 2
Log Number -34
Comments ____
Filter No. 5101
Filter Type 4"GF
Filter Tare Wt. .8761 g
Filter+Sample Wt. .8898 g
Sample Wt. 0.0137 g

3
Test 4 Run 3
Log Number -38
Comments ____
Filter No. 5123
Filter Type 4"GF
Filter Tare Wt. .8781 g
Filter+Sample Wt. .8907 g
Sample Wt. 0.0126 g

4
Test ____ Run ____
Log Number ____
Comments ____
Filter No. ____
Filter Type ____
Filter Tare Wt. ____ g
Filter+Sample Wt. ____ g
Sample Wt. ____ g

5
Test ____ Run ____
Log Number ____
Comments ____
Filter No. ____
Filter Type ____
Filter Tare Wt. ____ g
Filter+Sample Wt. ____ g
Sample Wt. ____ g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0202	0.0137	0.0126		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0301	0.0283	0.0172		

LSC-02PR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job: US Steel / Minntac
Team Leader: SLB
Date Submitted: 4-28-93
Test No.: 5
Date of Analysis: 5-6-93

Source: NO. 5 Pelletizer
Test Site: Stack
Date of Test: 4-28-93
No. of Runs Completed: 3
Technician: R. Quinn

0	Test ____ Run 0 Field Blank Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
1	Test 5 Run 1 Log Number 8678-43 Comments ____	Dish No. 21 Dish Tare Wt. 47.5276 g Dish+Sample Wt. 47.5299 g Sample Wt. 0.0023 g
2	Test 5 Run 2 Log Number -47 Comments ____	Dish No. 61A Dish Tare Wt. 51.4830 g Dish+Sample Wt. 51.4860 g Sample Wt. 0.0030 g
3	Test 5 Run 3 Log Number -51 Comments ____	Dish No. 98 Dish Tare Wt. 47.2149 g Dish+Sample Wt. 47.2169 g Sample Wt. 0.0020 g
4	Test ____ Run ____ Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
5	Test ____ Run ____ Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g

Blank Solvent Wt. 0.0004g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0019	0.0026 D-6	0.0016		

LSC-03.GR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job: US Steel Minntac
Team Leader: SLB
Date Submitted: 4-28-93
Test No.: 5
Date of Analysis: 4-30-93
Transport Leakage [X] None [ ] _____ ml

Source: No. 5 Pelletizer
Test Site: Stack
Date of Test: 4-28-93
No. of Runs Completed: 3
Technician: B. Lee
Solvent: Acetone

0
Test _____ Run 0
Field Blank
Log Number _____
Vol. of Solvent _____ ml
*Solvent Residue 2.0 ug/ml
Dish No. _____
Dish Tare Wt. _____ g
Dish+Sample Wt. _____ g
Sample Wt. _____ g

1
Test 5 Run 1
Vol. of Solvent 180 ml
Log Number 8678-41
Comments _____
Dish No. 17
Dish Tare Wt. 48.3906 g
Dish+Sample Wt. 48.3961 g
Sample Wt. 0.0055 g

2
Test 5 Run 2
Vol. of Solvent 150 ml
Log Number -45
Comments _____
Dish No. 27
Dish Tare Wt. 52.4480 g
Dish+Sample Wt. 52.4569 g
Sample Wt. 0.0089 g

3
Test 5 Run 3
Vol. of Solvent 120 ml
Log Number -49
Comments _____
Dish No. 37
Dish Tare Wt. 49.4981 g
Dish+Sample Wt. 49.5071 g
Sample Wt. 0.0090 g

4
Test _____ Run _____
Vol. of Solvent _____ ml
Log Number _____
Comments _____
Dish No. _____
Dish Tare Wt. _____ g
Dish+Sample Wt. _____ g
Sample Wt. _____ g

5
Test _____ Run _____
Vol. of Solvent _____ ml
Log Number _____
Comments _____
Dish No. _____
Dish Tare Wt. _____ g
Dish+Sample Wt. _____ g
Sample Wt. _____ g

*Solvent Residue ___ ug/ml = [(Sample Wt. _____ g)(10^6)]/Vol. of Sol. _____ ml
EPA-M5 Acetone Residue Blank Spec. < 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0051	0.0086 D-7	0.0086		

LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job U.S. Steel / Minntac
Team Leader SLB
Date Submitted 4-28-93
Test No. 5
Date of Analysis 4-30-93

Source No. 5 Pelletizer
Test Site Stack
Date of Test 4-28-93
No. of Runs Completed 3
Technician B. Drake

0 Test ____ Run 0
Field Blank
Log Number ____
Comments ____
Filter No. ____
Filter Type ____
Filter Tare Wt. ____ g
Filter+Sample Wt. ____ g
Sample Wt. ____ g

1 Test 5 Run 1
Log Number 8678-42
Comments ____
Filter No. 5119
Filter Type 4" GF
Filter Tare Wt. .8778 g
Filter+Sample Wt. .8916 g
Sample Wt. 0.0138 g

2 Test 5 Run 2
Log Number -46
Comments ____
Filter No. 5120
Filter Type 4" GF
Filter Tare Wt. .8854 g
Filter+Sample Wt. .8952 g
Sample Wt. 0.0098 g

3 Test 5 Run 3
Log Number -50
Comments ____
Filter No. 5121
Filter Type 4" GF
Filter Tare Wt. .8825 g
Filter+Sample Wt. .8965 g
Sample Wt. 0.0140 g

4 Test ____ Run ____
Log Number ____
Comments ____
Filter No. ____
Filter Type ____
Filter Tare Wt. ____ g
Filter+Sample Wt. ____ g
Sample Wt. ____ g

5 Test ____ Run ____
Log Number ____
Comments ____
Filter No. ____
Filter Type ____
Filter Tare Wt. ____ g
Filter+Sample Wt. ____ g
Sample Wt. ____ g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0138	0.0098	0.0140		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0208	0.0210	0.0242		

LSC-02PR

Interpoll Laboratories
(612) 786-6020

Chain of Custody
Sample Deposition Sheet

Job: US Steel/MINNTAC
Team Leader: SLS
Date Submitted: 4-29-93
Test No.: 5

Source: No. 5 Pelletizer
Test Site: STACK
Date of Test: 4-28-93
No. of Runs Completed: 3

No. of Samples	Type of Sample	Analysis Required	Comments
3	Probe Wash: ☒ Acetone ☐ D.I. Water	☒ As per EPA M-5 ☐ Other _____	
3	Filter: ☒ 4" G.F. ☐ S.S. Thimble ☐ 2.5" G.F. ☐ 47 mm G.F.	☒ As per EPA M-5 ☐ As per EPA M-17 ☐ Other _____	
3	Impinger Catch: ☒ D.I. Water ☐ 3% H_2O_2 ☐ 4M5 Hg Only ☐ 4M5 Metals ☐ 1.0 N NaOH ☐ Other _____	☒ MN Protocol ☐ WI Protocol ☐ EPA M-6 or 8 ☐ Acid Gases ☐ Formaldehyde ☐ Metals ☐ Other _____	
3	Integrated Gas sample	☐ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	
	Oxides of Nitrogen (NO_x)	☐ As per EPA M-7A ☐ Other _____	Date _____ Time (HRS) _____
	☐ Fuel Sample ☐ Aggregate	☐ Attached fuel Form #S-0163RRR	
	Particle Size	☐ X-Ray Sedigraph ☐ Bahco Method ☐ Other _____	
	Audit Samples ☐ Sulfur Dioxide ☐ Oxides of Nit. ☐ Other _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Source Information

1) Type of Source: ☐ Boiler ☐ Asphalt Plant ☐ Incinerator ☐ Dryer ☒ Other Pelletizer
2) Fuel: ☐ Coal ☐ Wood ☒ Gas ☐ Oil ☐ RDF ☐ Other _____
3) Is sample combustible? ☒ No ☐ Yes
4) Does sample need special handling? ☒ No ☐ Yes If yes, explain _____

REQUIRED DATA
for
PROCESS EMISSIONS

Company Name US Steel Group

C. Equipment & Operating Data

1. Process Equipment No./Ident. Source No 8.22

2. Process Equipment Description Agglomerator Line 5
Waste Gas Stack

3. Process equipment operating under normal operating conditions?

No ____. Yes ✓. Process rate during the test 475 LTPH.
(raw materials or finished product)

D. Instrument Data on Process Equipment

1. Include copy of production records or instrumentation which indicates rate of production or operation of the equipment, i.e. units per hour, lbs. per hour, pressure, air flow, etc.

E. Air Pollution Control Equipment Multi-throat Scrubber

1. Type/model of control equipment Air Tech MTS 600K.

2. Air pressure drop across the control equipment 6" W.G.

3. Air flow through the control equipment 580,000 ACFM.

4. Was the control equipment operating normally? Yes.

5. Data of last major maintenance/cleaning of control equipment ____
Feb '93 Clean-Out.

F. Plant Manager's Certification

I certify that the information submitted herein is accurate and correct and that no information requested was withheld from the Division Manager.

By M Brannagh, Position Mgr-Tech Serv.

lmb1770

REQUIRED DATA
for
PROCESS EMISSIONS

Company Name *US Steel Group*

C. Equipment & Operating Data

1. Process Equipment No./Ident. *Source No. 8.21* .
2. Process Equipment Description *Agglomerator Line 4 Waste Gas Stack* .
3. Process equipment operating under normal operating conditions?

   No ______. Yes *✓*. Process rate during the test *498 LTPH*.
   (raw materials or finished product)

D. Instrument Data on Process Equipment

1. Include copy of production records or instrumentation which indicates rate of production or operation of the equipment, i.e. units per hour, lbs. per hour, pressure, air flow, etc.

E. Air Pollution Control Equipment

1. Type/model of control equipment *Multi-Throat Scrubber Air Tech MTS 600K* .
2. Air pressure drop across the control equipment *6" W.G.* .
3. Air flow through the control equipment *600,000 ACFM* .
4. Was the control equipment operating normally? *Yes* .
5. Data of last major maintenance/cleaning of control equipment ______ *Jan '93 Clean-out* .

F. Plant Manager's Certification

I certify that the information submitted herein is accurate and correct and that no information requested was withheld from the Division Manager.

By *[signature]*, Position *Mngr-Tech Serv.*

1mb1770

				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-40.1	1741.2

TURBINE 5411.7 30.5 98.7

T PULSE 5471.0

USS MINNTAC GAS CONSUMPTION 20-APR-1993 15:04:46.23

	HOUR	24 HOUR
MAIN TURBINES	633.9	2069.2

FUEL CONSUMPTION HOUR 20-APR-1993 15:31:51.42

	GAS SMCF	GAS TEMP	GAS PRESS	GAS MBTU/T	COAL TONS	COAL MBTU/T	OIL GALLONS	OIL MBTU/T	WOOD TONS	WOOD MBTU/T	TOTAL MBTU/T	PHB GAS SMCF
LINE 3	150.4	45.0	19.8	674.0	0.0	0.0	0.0	0.0	0.0	0.0	674.0	32.8
LINE 4	88.9	70.9	0.0	-8121.0	0.0	0.0	-22797.4	-8120.0	0.0	0.0	-8120.0	88.9
LINE 5	117.8	47.2	21.1	1158.1	0.0	0.0	0.0	0.0	7.8	920.7	1030.5	4.0
LINE 6	0.0	67.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LINE 7	239.9	46.5	18.4	607.8	0.0	0.0	0.0	0.0	0.0	0.0	607.8	76.4
UTIL	0.0	70.6	13.0									
CTAILS	0.0											
TOTAL	596.9			842.5	0.0	0.0	-22797.4	-8120.0	7.8	920.7	-2023.7	202.2

TURBINE 573.6 35.5 99.4

T PULSE 593.0

USS MINNTAC GAS CONSUMPTION 20-APR-1993 16:04:46.29

	HOUR	24 HOUR
MAIN TURBINES	559.1	2640.6

FUEL CONSUMPTION HOUR 20-APR-1993 16:31:45.64

	GAS SMCF	GAS TEMP	GAS PRESS	GAS MBTU/T	COAL TONS	COAL MBTU/T	OIL GALLONS	OIL MBTU/T	WOOD TONS	WOOD MBTU/T	TOTAL MBTU/T	PHB GAS SMCF
LINE 3	157.2	45.8	19.7	710.0	0.0	0.0	0.0	0.0	0.0	0.0	710.0	33.6
LINE 4	101.2	0.0	0.0	-8056.3	0.0	0.0	-22989.0	-8058.0	0.0	0.0	-8058.0	101.2
LINE 5	144.8	50.8	21.0	817.5	0.0	0.0	0.0	0.0	7.8	713.2	769.1	53.7
LINE 6	0.0	68.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LINE 7	243.8	47.4	18.4	617.8	0.0	0.0	0.0	0.0	0.0	0.0	617.8	76.0
UTIL	0.0	69.2	13.0									
CTAILS	0.0											
TOTAL	647.0			828.8	0.0	0.0	-22989.0	-8058.0	7.8	713.2	-1833.2	264.5

TURBINE 600.7 35.7 99.2

T PULSE 610.0

USS MINNTAC GAS CONSUMPTION 20-APR-1993 17:04:46.34

HOUR 24 HOUR

17:30

LINE 4	99.6	0.0	0.0	-8047.9	0.0	0.0	-22989.0	-8074.3	0.0	0.0	-8075.1	99.6
LINE 5	149.0	49.8	21.1	811.8	0.0	0.0	0.0	0.0	7.8	676.6	748.6	62.9
LINE 6	0.0	68.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LINE 7	241.0	48.4	18.4	610.3	0.0	0.0	0.0	0.0	0.0	0.0	610.3	76.6
UTIL	0.0	68.7	13.0									
CTAILS	0.0											
TOTAL	642.9			816.5	0.0	0.0	-22989.0	-8074.3	7.8	676.6	-1817.2	272.5
TURBINE	600.0	34.3	99.5									
T PULSE	606.0											

USS MINNTAC GAS CONSUMPTION 28-APR-1993 18:04:46.17

	HOUR	24 HOUR
MAIN TURBINES	598.6	3857.8

FUEL CONSUMPTION HOUR 28-APR-1993 (18:31):51.27

	GAS MSCF	GAS TEMP	GAS PRESS	GAS MBTU/T	COAL TONS	COAL MBTU/T	OIL GALLONS	OIL MBTU/T	WOOD TONS	WOOD MBTU/T	TOTAL MBTU/T	PHB GAS MSCF
LINE 3	156.7	46.5	19.7	707.1	0.0	0.0	0.0	0.0	0.0	0.0	707.1	33.6
LINE 4	104.0	0.0	0.0	-8023.8	0.0	0.0	-22989.0	-8037.4	0.0	0.0	-8037.8	104.0
LINE 5	177.8	50.1	21.0	684.2	0.0	0.0	0.0	0.0	5.4	658.0	676.2	79.8
LINE 6	0.0	68.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LINE 7	245.8	48.1	18.3	622.6	0.0	0.0	0.0	0.0	0.0	0.0	622.6	76.3
UTIL	0.0	68.0	13.0									
CTAILS	0.0											
TOTAL	684.3			792.6	0.0	0.0	-22989.0	-8037.4	5.4	658.0	-1770.9	293.7
TURBINE	630.3	32.5	99.3									
T PULSE	637.0											

USS MINNTAC GAS CONSUMPTION 28-APR-1993 19:04:46.55

	HOUR	24 HOUR
MAIN TURBINES	668.0	4534.6

FUEL CONSUMPTION HOUR 28-APR-1993 (19:31):42.09

	GAS MSCF	GAS TEMP	GAS PRESS	GAS MBTU/T	COAL TONS	COAL MBTU/T	OIL GALLONS	OIL MBTU/T	WOOD TONS	WOOD MBTU/T	TOTAL MBTU/T	PHB GAS MSCF
LINE 3	164.6	45.3	19.7	755.0	0.0	0.0	0.0	0.0	0.0	0.0	755.0	33.7
LINE 4	133.1	34.3	23.1	1470.0	0.0	0.0	-16859.6	-8074.7	0.0	0.0	-5804.7	98.1
LINE 5	228.9	44.9	21.0	616.1	0.0	0.0	0.0	0.0	0.0	0.0	616.1	74.8
LINE 6	0.0	68.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LINE 7	249.3	47.9	18.3	630.5	0.0	0.0	0.0	0.0	0.0	0.0	630.5	76.3
UTIL	0.0	67.3	13.0									
CTAILS	0.0											
TOTAL	775.9			721.4	0.0	0.0	-16859.6	-8074.7	0.0	0.0	-1147.7	282.9

Test #'s 4 & 5

STAGE NUMBER: [illegible]
DATE: 04/28/[illegible]

04/28/[illegible] — STATUS OVERVIEW [illegible] — 13:1[illegible]:30

BALL MILLS		
030-1	95	0.4
-2	104	-.0
-3	109	-1
-4	98	77
-5	102	0.3
TOTAL	509	77
BENT	16.1	0.0
FLX RATIO	.082	
CALCIUM	3.65	
[illegible]		
BED D	5.2	4.5
SPEED	224	-10
AMPS	46	0.1
[illegible]		
BED D	3.5	4.1
SPEED	86	-1
AMPS	13	.0

TEMPS		
KEXIT	2084	1668
SAIR	1929	750
WB-1A	960	292
WB-1B	964	292
RECUP	1196	283
DDII	1055	354
DDI	606	246
B.Z.	2383	2496
1Aout	616	111
1Bout	587	192
WGin	104	65
ClrST	889	116
RecST	2125	206
PRE H	5015	-563
OUTSIDE		60.3

DAMPER POS		
W.G.	101	4.2
1A	57	-.4
1B	45	0.2
3A	96	8.4
3B	74	11
ClrST	-5	106
Rec1A	-0	-1
Rec1B	-1	-1
259-	71	82
ST-UP	1	100
BI-1A	1	76
BI-1B	1	85
BP-1A	-4	83
BP-1B	-5	13
STACK CAP POS	0	55

PRESSURES		
KHOOD	-.10	-.07
DDIfr	1.6	-0.2
DDIwb	-11	-0.6
DDIIF	-1.1	-0.0
PREfr	-.03	-.10
PREwb	-1.3	0.0
CLR-1	11.1	0.7
CLR-2	5.9	0.1
REC S	-1.2	-0.1
[illegible]		
WG	3.3	1.1
1A	1.1	0.1
1B	1.9	1.1
[illegible]		
IN1 T	229	208
IN2 T	265	194
OUT T	106	63.3
DiF P	10.5	0.0

FUEL CONS		
MBTU	---	+++
MCF/H	63	223
VALVE	0.0	47
PRESS	32	21
TEMP	55	41
BURNP	1.8	9.6
WOOD%	0.0	61
PHB %	48	0
MAIN GAS:		
MSCFH		673
TEMP		31.7
PRESS		98.0
[illegible]		
203-1	43	61
-2	57	62
-3	48	50
-4	50	49
SCRB PH		9.8

030-1	103	0.9
-2	106	0.0
-3	95	-1
-4	97	77
-5	95	0.4
TOTAL	493	77
BENT	17.7	0.0
FLX RATIO		0.090
CALCIUM		3.57
BED D	5.6	4.5
SPEED	243	-10
AMPS	44	0.1
BED D	3.1	5.0
SPEED	72	-1
AMPS	13	-.1

KEXIT	2067	1506
SAIR	1919	692
WB-1A	952	263
WB-1B	958	271
RECUP	1163	253
DDII	1031	327
DDI	614	229
B.Z.	2294	2353
1Aout	621	107
1Bout	587	177
WGin	104	57
ClrST	816	112
RecST	2125	181
PRE H	5015	-563
OUTSIDE		61.2

W.G.	101	4.2
1A	56	-.4
1B	36	0.2
3A	98	8.4
3B	74	11
ClrST	-5	104
Rec1A	-0	-1
Rec1B	-1	-1
259-	71	82
ST-UP	1	100
BI-1A	2	76
BI-1B	1	85
BP-1A	-4	84
BP-1B	-5	-.1
STACK CAP POS		
	0	55

KHOOD	-.10	-.06
DDIfr	1.6	-0.2
DDIwb	-10	-0.6
DDIlf	-1.2	-0.0
PREfr	-.04	-.09
PREwb	-1.2	0.0
CLR-1	11.9	0.8
CLR-2	5.7	0.1
REC-S	-1.2	-0.1
WG	3.1	1.3
1A	1.0	0.1
1B	1.8	1.1
IN1 T	235	195
IN2 T	272	184
OUT T	106	61.4

MBTU	---	+++
MCF/H	64	210
VALVE	0.0	43
PRESS	32	21
TEMP	73	43
BURNP	2.8	7.2
WOOD%	0.0	61
PHB %	48	0
MAIN GAS:		
MSCFH		653
TEMP		32.6
PRESS		98.9
203-1	43	60
-2	57	60
-3	48	50
-4	50	49

04/20/93 14:25:39

030-1	97	69
-2	105	68
-3	104	72
-4	99	0.9
-5	93	0.3
TOTAL	497	211
BENT	16.9	30.6
FLX RATIO	.088	
CALCIUM	3.49	
BED D	5.2	4.0
SPEED	234	57
AMPS	45	46
BED D	3.5	2.9
SPEED	86	77
AMPS	16	15

KEXIT	2067	1588
SAIR	1909	777
WB-1A	962	369
WB-1B	960	315
RECUP	1177	233
DDII	1040	281
DDI	610	231
B.Z.	2373	2378
1Aout	623	252
1Bout	582	221
WGin	105	69
ClrST	845	107
RecST	2125	167
PRE H	5016	-563
OUTSIDE		60.1

W.G.	101	23
1A	63	17
1B	41	16
3A	102	2.8
3B	74	40
ClrST	-5	105
Rec1A	-0	-1
Rec1B	-1	-1
259-	71	82
ST-UP	1	100
BI-1A	1	0
BI-1B	1	1
BP-1A	-4	84
BP-1B	-5	-.1
STACK CAP POS		
	-0	-1

KHOOD	-.12	-.03
DDIfr	1.7	-0.1
DDIwb	-11	-5.6
DDIIf	-1.2	-0.1
PREfr	-.03	-.08
PREwb	-1.3	-3.3
CLR-1	11.9	1.9
CLR-2	5.4	0.1
REC-S	-1.2	-0.1
WG	3.5	1.3
1A	1.0	1.6
1B	1.9	1.8
IN1 T	230	185
IN2 T	265	175
OUT T	106	73.4
Dif P	10.5	4.3

MBTU	---	908
MCF/H	66	188
VALVE	0.1	38
PRESS	32	21
TEMP	79	44
BURNP	3.6	5.5
WOOD%	0.0	61
PHB %	48	0
MAIN GAS:		
MSCFH		630
TEMP		32.8
PRESS		98.1
203-1	43	60
-2	57	61
-3	48	50
-4	50	49
SCRB PH		9.8

030-1	94	70
-2	93	71
-3	100	78
-4	94	65
-5	100	0.3
TOTAL	498	280
BENT	17.1	22.4
FLX RATIO		0.081
CALCIUM		3.38
BED D	5.5	4.5
SPEED	230	93
AMPS	44	44
BED D	3.6	2.5
SPEED	90	37
AMPS	16	15

KEXIT	2060	1847
SAIR	1922	1115
WB-1A	972	935
WB-1B	965	911
RECUP	1189	647
DDII	1051	567
DDI	616	455
B.Z.	2407	2386
1Rout	628	461
1Bout	589	487
WGin	105	88
ClrST	870	287
RecST	2125	640
PRE H	5015	-563
OUTSIDE		60.3

W.G.	101	40
1A	60	27
1B	42	33
3A	102	18
3B	74	58
ClrST	-5	105
Rec1A	-0	-1
Rec1B	-1	-1
259-	71	82
ST-UP	1	100
BI-1A	2	0
BI-1B	1	1
BP-1A	-4	85
BP-1B	-5	-.1
STACK CAP		POS
	-0	-1

KHOOD	-.11	-.02
DDIfr	1.8	0.0
DDIwb	-11	-9.0
DDIIf	-1.2	-0.0
PREfr	-.03	0.22
PREwb	-1.5	-8.1
CLR-1	12.2	9.7
CLR-2	5.9	0.1
REC-S	-1.2	-0.1
WG	3.1	2.0
1A	0.9	2.7
1B	1.9	1.7
IN1 T	232	227
IN2 T	268	219
OUT T	106	93.4

MBTU	---	835
MCF/H	63	70
VALVE	0.1	21
PRESS	32	21
TEMP	79	47
BURNP	3.3	-.7
WOOD%	0.0	61
PHB %	48	0
MAIN GAS:		
MSCFH		528
TEMP		36.7
PRESS		99.0
203-1	43	59
-2	57	61
-3	48	50
-4	50	49

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030-1	100	73
-2	116	63
-3	104	71
-4	94	72
-5	104	73
TOTAL	516	351
BENT	12.4	15.9
FLX RATIO		0.080
CALCIUM		3.59
BED D	5.7	4.3
SPEED	230	125
AMPS	44	49
BED D	3.4	3.0
SPEED	83	61
AMPS	14	15

KEXIT	2083	1749
SAIR	1926	1390
WB-1A	957	947
WB-1B	953	888
RECUP	1190	445
DDII	1058	452
DDI	615	489
B.Z.	2428	2373
1Aout	625	489
1Bout	582	514
WGin	105	94
ClrST	896	113
RecST	2125	230
PRE H	5015	-563
OUTSIDE		62.9

W.G.	101	96
1A	59	32
1B	35	66
3A	101	43
3B	74	58
ClrST	-5	103
Rec1A	-0	-1
Rec1B	-1	-1
259-	71	82
ST-UP	1	101
BI-1A	2	0
BI-1B	1	1
BP-1A	-4	87
BP-1B	-5	-.1
STACK CAP POS		
	0	-1

KHOOD	-.06	-.02
DDIfr	1.8	-0.2
DDIwb	-11	-16
DDIlf	-1.2	-0.1
PREfr	-.02	0.07
PREwb	-1.1	-13
CLR-1	12.4	19.7
CLR-2	5.8	0.1
REC-S	-1.1	-0.1
WG	3.2	1.7
1A	0.8	3.0
1B	1.9	2.4
IN1 T	233	229
IN2 T	268	228
OUT T	106	95.2
Dif P	10.5	10.5

MBTU	---	862
MCF/H	63	90
VALVE	0.2	16
PRESS	32	22
TEMP	79	51
BURNP	3.2	-.7
WOOD%	0.0	61
PHB %	48	0
MAIN GAS:		
MSCFH		569
TEMP		37.0
PRESS		99.5
203-1	43	60
-2	58	60
-3	48	50
-4	50	49
SCRB PH		9.6

DIAGRAM NUMBER: [illegible]
DATE: [illegible]

[illegible] STATUS OVERVIEW [illegible]

[illegible]		
030-1	104	88
-2	102	90
-3	100	106
-4	93	88
-5	102	109
TOTAL	498	477
BENT	16.7	16.9
FLX RATIO		.080
CALCIUM		3.51
[illegible]		
BED D	5.4	4.6
SPEED	241	185
AMPS	47	51
[illegible]		
BED D	3.3	2.6
SPEED	81	52
AMPS	13	14

TEMPS		
KEXIT	2041	1876
SAIR	1906	1500
WB-1A	983	872
WB-1B	979	825
RECUP	1255	546
DDII	1098	498
DDI	618	491
B.Z.	2141	2364
1Aout	630	471
1Bout	603	518
WGin	104	97
ClrST	909	114
RecST	2125	364
PRE H	5015	-563
OUTSIDE		62.0

DAMPER POS		
W.G.	101	101
1A	57	59
1B	45	66
3A	95	37
3B	74	58
ClrST	-5	105
Rec1A	-0	-1
Rec1B	-1	-1
259-	71	82
ST-UP	1	101
BI-1A	1	0
BI-1B	1	1
BP-1A	-4	87
BP-1B	-5	-.1
STACK CAP POS		
	0	-1

PRESSURES		
KHOOD	-.11	-.01
DDIfr	1.8	0.3
DDIwb	-7.9	-17
DDIIF	-1.2	-0.1
PREfr	-.02	0.10
PREwb	-1.4	-17
CLR-1	11.5	17.7
CLR-2	6.1	0.1
REC-S	-1.2	0.9
[illegible]		
WG	3.0	1.6
1A	0.8	2.9
1B	1.9	2.8
[illegible]		
IN1 T	235	205
IN2 T	273	212
OUT T	106	98.5

FUEL CONS		
MBTU	---	+++
MCF/H	64	41
VALVE	0.1	14
PRESS	32	21
TEMP	79	50
BURNP	4.7	-.7
WOOD%	0.0	61
PHB %	48	0
MAIN GAS:		
MSCFH		574
TEMP		33.4
PRESS		100
[illegible]		
203-1	43	60
-2	59	60
-3	48	50
-4	50	49

030-1	97	100
-2	103	91
-3	100	101
-4	93	96
-5	100	99
TOTAL	492	483
BENT	16.9	15.8
FLX RATIO		0.078
CALCIUM		3.59

BED D	5.0	4.5
SPEED	234	193
AMPS	44	48

BED D	3.5	1.9
SPEED	86	45
AMPS	13	13

KEXIT	2086	1902
SAIR	1927	1410
WB-1A	966	942
WB-1B	969	881
RECUP	1208	712
DDII	1078	610
DDI	619	512
B.Z.	2454	2361
1Aout	625	511
1Bout	594	528
WGin	105	98
ClrST	870	114
RecST	2125	685
PRE H	5015	-563
OUTSIDE		61.5

W.G.	101	101
1A	44	51
1B	31	66
3A	101	56
3B	74	58
ClrST	-5	105
Rec1A	0	-1
Rec1B	-1	-1
259-	71	82
ST-UP	1	101
BI-1A	1	1
BI-1B	1	1
BP-1A	-4	89
BP-1B	-5	-.1

STACK CAP POS	
	-0 -1

HOOD	-.06	0.00
DDIfr	1.0	0.2
DDIwb	-8.8	-16
DDIIf	-1.2	-0.1
PREfr	-.01	0.03
PREwb	-1.2	-14
CLR-1	11.8	23.8
CLR-2	5.9	0.1
REC S	-1.1	-0.1

WG	3.8	1.4
1A	0.8	3.1
1B	1.8	2.8

IN1 T	238	215
IN2 T	275	220
OUT T	106	99.9
Dif P	10.5	10.4

MBTU	---	843
MCF/H	49	251
VALVE	0.0	81
PRESS	32	21
TEMP	79	47
BURNP	4.4	14
HOOD%	0.0	61
PHB %	48	0
MAIN GAS:		
MSCFH		768
TEMP		31.6
PRESS		98.6

203-1	43	60
-2	58	60
-3	48	50
-4	50	49
SCRB PH		9.6

DIAGRAM NUMBER: 2020 [illegible]
DATE: [illegible]

04/28/93 [illegible] 12:04:51

[illegible]		
030-1	95	93
-2	103	90
-3	107	97
-4	92	100
-5	102	99
TOTAL	501	479
BENT	16.3	16.2
FLX RATIO		.078
CALCIUM		3.65
[illegible]		
BED D	4.8	4.5
SPEED	225	190
AMPS	42	47
[illegible]		
BED D	3.5	2.8
SPEED	86	100
AMPS	13	14

[illegible]		
KEXIT	2069	1954
SAIR	1932	1694
WB-1A	968	969
WB-1B	972	958
RECUP	1214	1265
DDII	1085	984
DDI	619	546
B.Z.	2397	2378
1Aout	625	517
1Bout	598	586
WGin	105	99
ClrST	892	696
RecST	2125	1315
PRE H	5015	-563
OUTSIDE		63.7

DAMPER POS		
W.G.	101	60
1A	42	19
1B	35	56
3A	99	30
3B	74	58
ClrST	-5	105
Rec1A	0	-1
Rec1B	-1	-1
259-	71	82
ST-UP	1	101
BI-1A	2	0
BI-1B	1	1
BP-1A	-4	90
BP-1B	-5	-.1
STACK CAP POS		
	0	-1

PRESSURES		
KHOOD	-.07	-.01
DDIfr	0.9	-0.3
DDIwb	-11	-13
DDIIF	-1.3	-0.1
PREfr	-.03	0.04
PREwb	-1.3	-12
CLR-1	11.8	17.3
CLR-2	5.8	0.1
REC-S	-1.2	-0.2
[illegible]		
WG	4.0	1.3
1A	0.7	3.0
1B	1.9	2.6
[illegible]		
IN1 T	239	263
IN2 T	278	261
OUT T	107	101
[illegible]		

FUEL CONS		
MBTU	---	641
MCF/H	46	49
VALVE	0.1	15
PRESS	32	21
TEMP	79	51
BURNP	4.6	-.7
WOOD%	0.0	61
PHB %	48	0
MAIN GAS:		
MSCFH		571
TEMP		35.7
PRESS		99.9
DENSITIES		
203-1	43	60
-2	58	60
-3	48	50
-4	50	49
[illegible]		

DIAGRAM NUMBER: [illegible]
DATE: 01/20/93

030-1	88	105
-2	101	92
-3	105	105
-4	92	93
-5	98	98
TOTAL	490	487
BENT	17.1	16.1
FLX RATIO	.078	
CALCIUM	3.48	
BED D	4.9	4.5
SPEED	229	197
AMPS	44	50
BED D	3.3	2.6
SPEED	86	93
AMPS	15	13

KEXIT	2060	1922
SAIR	1932	1774
WB-1A	969	953
WB-1B	972	924
RECUP	1197	1194
DDII	1067	912
DDI	615	546
B.Z.	2442	2393
1Aout	629	524
1Bout	593	582
WGin	105	100
ClrST	865	249
RecST	2125	1160
PRE H	5015	-563
OUTSIDE		62.7

W.G.	101	69
1A	54	22
1B	36	66
3A	96	40
3B	74	58
ClrST	-5	105
Rec1A	0	-1
Rec1B	-1	-1
259-	71	82
ST-UP	1	101
BI-1A	1	0
BI-1B	1	1
BP-1A	-4	88
BP-1B	-5	-.1
STACK CAP		POS
	0	-1

KHOOD	.00	0.00
DDIfr	1.4	-0.1
DDIwb	-9.1	-14
DDIIF	-1.2	-0.1
PREfr	-.03	-.01
PREwb	-1.4	-11
CLR-1	12.2	20.4
CLR-2	6.0	0.1
REC-S	-1.2	0.2
WG	4.1	1.2
1A	0.8	3.0
1B	1.8	2.5
IN1 T	236	247
IN2 T	275	247
OUT T	107	102
D.C P	10.5	9.1

MBTU	---	719
MCF/H	78	66
VALVE	0.1	18
PRESS	32	21
TEMP	79	51
BURNP	4.0	-.7
WOOD%	0.0	61
PHB %	48	0
MAIN GAS:		
MSCFH		592
TEMP		33.8
PRESS		99.6
203-1	43	60
-2	58	61
-3	48	50
-4	50	49
SCRB PH		9.5

[illegible] NUMBER: [illegible]
DATE: [illegible]

[illegible] **[illegible] STATUS OVERVIEW [illegible]** [illegible]

BALLING

030-1	104	97
-2	111	99
-3	99	93
-4	94	94
-5	100	98
TOTAL	506	483
BENT	16.7	16.1
FLX RATIO		.077
CALCIUM		3.56
[illegible]		
BED D	4.9	4.5
SPEED	231	191
AMPS	45	50
[illegible]		
BED D	3.6	2.6
SPEED	88	93
AMPS	15	14

TEMPS

KEXIT	2066	1903
SAIR	1932	1807
WB-1A	947	946
WB-1B	952	932
RECUP	1214	1276
DDII	1077	968
DDI	613	546
B.Z.	2394	2376
1Aout	617	521
1Bout	586	583
WGin	105	99
ClrST	848	313
RecST	2125	1251
PRE H	5015	-563
OUTSIDE		62.3

DAMPER POS

W.G.	101	69
1A	52	28
1B	36	66
3A	100	43
3B	74	58
ClrST	-5	105
Rec1A	0	-1
Rec1B	-1	-1
259-	71	82
ST-UP	1	101
BI-1A	1	0
BI-1B	1	1
BP-1A	-4	88
BP-1B	-5	-.1
STACK CAP POS	0	-1

PRESSURES

KHOOD	-.10	-.01
DDIfr	0.9	-0.2
DDIwb	-5.5	-14
DDIIf	-1.4	-0.2
PREfr	-.02	0.00
PREwb	-1.2	-12
CLR-1	12.6	21.3
CLR-2	5.6	0.1
REC-S	-1.3	-0.2
[illegible]		
WG	4.1	1.1
1A	0.8	3.1
1B	1.9	2.7
[illegible]		
IN1 T	238	245
IN2 T	275	245
OUT T	107	101
[illegible] P [illegible] 5 [illegible] 5		

FUEL CONS

MBTU	---	600
MCF/H	85	151
VALVE	0.0	30
PRESS	32	21
TEMP	79	48
BURNP	2.9	1.9
WOOD%	0.0	61
PHB %	48	0
MAIN GAS:		
MSCFH		678
TEMP		30.3
PRESS		99.0
[illegible]		
203-1	43	61
-2	59	60
-3	48	50
-4	50	49
SCRB [illegible]		5

DIAGRAM NUMBER: 2626 VERSION: 0
DATE: 04/28/93 TIME: 18:31:31

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030-1	96	106
-2	104	93
-3	98	108
-4	105	109
-5	96	103
TOTAL	501	518
BENT	16.4	16.2
FLX RATIO		0.077
CALCIUM		3.56
BED D	4.9	5.0
SPEED	245	205
AMPS	44	52
BED D	3.3	2.4
SPEED	87	93
AMPS	13	13

KEXIT	2089	1900
SAIR	1940	1810
WB-1A	937	959
WB-1B	937	923
RECUP	1190	1285
DDII	1067	966
DDI	609	547
B.Z.	2376	2368
1Aout	609	528
1Bout	583	581
WGin	105	101
ClrST	844	310
RecST	2125	1255
PRE H	5015	-563
OUTSIDE		60.7

W.G.	101	72
1A	53	22
1B	35	66
3A	100	40
3B	74	58
ClrST	-5	105
Rec1A	0	-1
Rec1B	-1	-1
259-	71	82
ST-UP	0	101
BI-1A	1	0
BI-1B	1	1
BP-1A	-4	88
BP-1B	-5	-.1
STACK CAP POS		
	0	-1

KHOOD	-.05	0.00
DDIfr	1.0	-0.2
DDIwb	-4.0	-15
DDIIf	-1.2	-0.2
PREfr	-.03	-.02
PREwb	-1.2	-12
CLR-1	12.1	20.8
CLR-2	5.2	0.1
REC-S	-1.2	-0.2
WG	3.9	1.1
1A	1.0	3.0
1B	1.8	2.3
IN1 T	235	250
IN2 T	269	251
OUT T	107	103
Dif P	10.5	9.4

MBTU	---	589
MCF/H	85	159
VALVE	0.2	31
PRESS	32	21
TEMP	79	45
BURNP	3.8	2.4
WOOD%	0.0	61
PHB %	48	0
MAIN GAS:		
MSCFH		680
TEMP		28.5
PRESS		99.5
203-1	43	60
-2	59	59
-3	48	50
-4	50	49
SCRB PH		9.5

DIAGRAM NUMBER: 252[illegible] VE[illegible]
DATE: 04/26/9[illegible] TIME: [illegible]

04/26/9[illegible]

030-1	92	98
-2	98	88
-3	95	95
-4	95	91
-5	99	92
TOTAL	481	462
BENT	17.2	16.6
FLX RATIO	.072	
CALCIUM	3.62	
BED D	5.3	4.5
SPEED	232	195
AMPS	43	51
BED D	3.6	2.7
SPEED	88	97
AMPS	14	13

KEXIT	2138	1916
SAIR	1945	1823
WB-1A	953	958
WB-1B	958	916
RECUP	1215	1306
DDII	1074	993
DDI	611	544
B.Z.	2387	2374
1Aout	617	526
1Bout	588	575
WGin	106	101
ClrST	840	233
RecST	2125	1260
PRE H	5015	-563
OUTSIDE		56.3

W.G.	101	76
1A	57	22
1B	40	66
3A	102	38
3B	74	58
ClrST	-5	105
Rec1A	0	-1
Rec1B	-1	-1
259-	71	82
ST-UP	1	101
BI-1A	1	0
BI-1B	1	1
BP-1A	-4	88
BP-1B	-5	-.1
STACK CAP POS		
	0	-1

KHOOD	-.05	-.01
DDIfr	1.7	0.3
DDIwb	-4.3	-16
DDIIF	-1.3	-0.2
PREfr	-.04	-.04
PREwb	-1.3	-12
CLR-1	12.2	19.8
CLR-2	4.9	0.1
REC-S	-1.2	-0.2
WG	3.9	1.1
1A	0.9	3.0
1B	1.8	2.1
IN1 T	234	246
IN2 T	268	248
OUT T	108	103
[illegible] P	[illegible]	[illegible]

MBTU	464	622
MCF/H	109	163
VALVE	27	32
PRESS	24	21
TEMP	50	43
BURNP	7.2	2.7
WOOD%	0.0	61
PHB %	48	0
MAIN GAS:		
MSCFH		810
TEMP		23.3
PRESS		98.5
203-1	43	61
-2	58	61
-3	48	50
-4	50	49
[illegible]		[illegible]

DIAGRAM NUMBER: 2626 VERSION: 0
DATE: 04/28/93 TIME: 21:14:25

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030-1	97	103
-2	98	89
-3	99	92
-4	97	105
-5	99	100
TOTAL	486	484
BEMT	18.4	18.1
FLX RATIO	0.875	
CALCIUM	3.53	

BED D	5.2	4.6
SPEED	237	195
AMPS	47	45

BED D	3.6	2.8
SPEED	87	109
AMPS	16	14

KEXIT	2126	1916
SAIR	1913	1848
WB-1A	963	947
WB-1B	956	906
RECUP	1182	1323
DDII	1048	1030
DDI	611	539
B.Z.	2396	2375
1Aout	617	522
1Bout	587	567
WGin	106	100
ClrST	873	250
RecST	2125	1281
PRE H	5015	-563
OUTSIDE		47.3

W.G.	101	82
1A	55	30
1B	43	66
3A	89	40
3B	74	58
ClrST	-5	105
Rec1A	-0	-1
Rec1B	-1	-1
259-	71	82
ST-UP	1	101
BI-1A	1	0
BI-1B	1	1
BP-1A	-4	84
BP-1B	-5	-.1

STACK CAP POS	
-0	-1

KHOOD	-.07	-.01
DDIfr	2.0	-0.3
DDIwb	-4.6	-16
DDIlf	-1.2	-0.1
PREfr	-.05	-.13
PREwb	-1.6	-13
CLR-1	11.9	22.0
CLR-2	5.7	0.1
REC-S	-1.1	-0.2

WG	3.9	1.0
1A	1.1	2.9
1B	1.9	2.7

IN1 T	231	240
IN2 T	265	243
OUT T	108	102
Dif P	10.5	9.4

MBTU	606	625
MCF/H	217	151
VALVE	47	29
PRESS	24	21
TEMP	39	41
BURNP	18	1.8
WOOD%	0.0	61
PHB %	48	0

MAIN GAS:

MSCFH	870
TEMP	21.8
PRESS	97.9

203-1	43	60
-2	59	59
-3	48	50
-4	50	49
SCRB PH		9.5

030-1	95	100
-2	99	94
-3	103	94
-4	90	92
-5	96	95
TOTAL	480	471
BENT	18.1	17.9
FLX RATIO		.075
CALCIUM		3.59

BED D	5.3	4.3
SPEED	237	197
AMPS	46	48

BED D	3.5	2.7
SPEED	87	99
AMPS	12	13

KEXIT	2086	1936
SAIR	1897	1870
WB-1A	969	962
WB-1B	966	930
RECUP	1164	1353
DDII	1036	1013
DDI	606	547
B.Z.	2360	2386
1Aout	618	625
1Bout	584	579
WGin	106	101
ClrST	883	196
RecST	2125	1315
PRE H	5015	-563
OUTSIDE		45.9

W.G.	101	75
1A	60	22
1B	44	66
3A	96	40
3B	74	58
ClrST	-5	104
Rec1A	-0	-1
Rec1B	-1	-1
259-	71	82
ST-UP	1	101
BI-1A	1	0
BI-1B	1	1
BP-1A	-4	82
BP-1B	-5	-.1

STACK CAP	POS
-0	-1

KHOOD	-.10	-.01
DDIfr	1.9	-0.2
DDIwb	-7.6	-15
DDIIf	-1.2	-0.0
PREfr	-.03	-.09
PREwb	-1.5	-12
CLR-1	11.8	22.8
CLR-2	6.3	0.1
REC-S	-1.1	-0.2

WG	4.2	1.1
1A	1.2	3.0
1B	1.9	2.7

IN1 T	231	243
IN2 T	267	245
OUT T	108	103

MBTU	555	643
MCF/H	140	160
VALVE	33	30
PRESS	24	21
TEMP	39	40
BURNP	11	2.0
WOOD%	0.0	61
PHB %	48	0

MAIN GAS:

MSCFH	871
TEMP	21.4
PRESS	97.8

203-1	43	60
-2	57	60
-3	48	50
-4	50	49

TURBINE 5411.7 30.5 98.7

T PULSE 5471.0

USS MINNTAC GAS CONSUMPTION 28-APR-1993 15:04:46.23

TEST #5

	HOUR	24 HOUR
MAIN TURBINES	633.9	2069.2

FUEL CONSUMPTION HOUR 28-APR-1993 15:30:51.42

	GAS MMCF	GAS TEMP	GAS PRESS	GAS MBTU/T	COAL TONS	COAL MBTU/T	OIL GALLONS	OIL MBTU/T	WOOD TONS	WOOD MBTU/T	TOTAL MBTU/T	PHB GAS MMCF
LINE 3	150.4	45.0	19.8	674.0	0.0	0.0	0.0	0.0	0.0	0.0	674.0	32.8
LINE 4	88.9	78.9	0.0	-8121.0	0.0	0.0	-22797.4	-8120.0	0.0	0.0	-8120.0	88.9
LINE 5	117.8	47.2	21.1	1158.1	0.0	0.0	0.0	0.0	7.8	920.7	1030.5	4.0
LINE 6	0.0	67.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LINE 7	239.9	46.5	18.4	607.8	0.0	0.0	0.0	0.0	0.0	0.0	607.8	76.4
UTIL	0.0	70.6	13.0									
CTAILS	0.0											
TOTAL	596.9			842.5	0.0	0.0	-22797.4	-8120.0	7.8	920.7	-2023.7	202.2
TURBINE	573.6	35.3	99.4									
T PULSE	593.0											

USS MINNTAC GAS CONSUMPTION 28-APR-1993 16:04:46.29

	HOUR	24 HOUR
MAIN TURBINES	559.1	2640.6

FUEL CONSUMPTION HOUR 28-APR-1993 16:30:45.64

	GAS MMCF	GAS TEMP	GAS PRESS	GAS MBTU/T	COAL TONS	COAL MBTU/T	OIL GALLONS	OIL MBTU/T	WOOD TONS	WOOD MBTU/T	TOTAL MBTU/T	PHB GAS MMCF
LINE 3	157.2	45.8	19.7	710.0	0.0	0.0	0.0	0.0	0.0	0.0	710.0	33.6
LINE 4	101.2	0.0	0.0	-8056.8	0.0	0.0	-22989.0	-8058.0	0.0	0.0	-8058.0	101.2
LINE 5	144.8	50.8	21.0	917.5	0.0	0.0	0.0	0.0	7.8	713.2	769.1	53.7
LINE 6	0.0	68.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LINE 7	243.8	47.4	18.4	617.8	0.0	0.0	0.0	0.0	0.0	0.0	617.8	76.0
UTIL	0.0	69.2	13.0									
CTAILS	0.0											
TOTAL	647.0			829.8	0.0	0.0	-22989.0	-8058.0	7.8	713.2	-1833.2	264.5
TURBINE	600.7	35.7	99.2									
T PULSE	610.0											

USS MINNTAC GAS CONSUMPTION 28-APR-1993 17:04:46.34

	HOUR	24 HOUR

17:30

LINE 4	99.6	0.0	0.0	-8047.9	0.0	0.0	-22989.0	-8074.3	0.0	0.0	-8075.1	99.6
LINE 5	149.0	49.8	21.1	811.8	0.0	0.0	0.0	0.0	7.8	676.6	748.6	62.9
LINE 6	0.0	68.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LINE 7	241.0	48.4	18.4	610.3	0.0	0.0	0.0	0.0	0.0	0.0	610.3	76.6
UTIL	0.0	68.7	13.0									
CTAILS	0.0											
TOTAL	642.9			816.5	0.0	0.0	-22989.0	-8074.3	7.8	676.6	-1817.2	272.5
TURBINE	600.0	34.3	99.5									
T PULSE	606.0											

USS MINNTAC GAS CONSUMPTION 28-APR-1993 18:04:46.17

	HOUR	24 HOUR
MAIN TURBINES	398.6	3857.8

FUEL CONSUMPTION HOUR 28-APR-1993 18:30:51.27

	GAS MMCF	GAS TEMP	GAS PRESS	GAS MBTU/T	COAL TONS	COAL MBTU/T	OIL GALLONS	OIL MBTU/T	WOOD TONS	WOOD MBTU/T	TOTAL MBTU/T	PHB GAS MMCF
LINE 3	156.7	46.5	19.7	707.1	0.0	0.0	0.0	0.0	0.0	0.0	707.1	33.6
LINE 4	104.0	0.0	0.0	-8023.8	0.0	0.0	-22989.0	-8037.4	0.0	0.0	-8037.8	104.0
LINE 5	177.8	50.1	21.0	684.2	0.0	0.0	0.0	0.0	5.4	658.0	676.2	79.8
LINE 6	0.0	68.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LINE 7	245.8	48.1	18.3	622.6	0.0	0.0	0.0	0.0	0.0	0.0	622.6	76.3
UTIL	0.0	68.0	13.0									
CTAILS	0.0											
TOTAL	684.3			792.6	0.0	0.0	-22989.0	-8037.4	5.4	658.0	-1770.9	293.7
TURBINE	630.3	32.3	99.3									
T PULSE	637.0											

USS MINNTAC GAS CONSUMPTION 28-APR-1993 19:04:46.35

	HOUR	24 HOUR
MAIN TURBINES	668.0	4534.6

FUEL CONSUMPTION HOUR 28-APR-1993 19:31:43.09

	GAS MMCF	GAS TEMP	GAS PRESS	GAS MBTU/T	COAL TONS	COAL MBTU/T	OIL GALLONS	OIL MBTU/T	WOOD TONS	WOOD MBTU/T	TOTAL MBTU/T	PHB GAS MMCF
LINE 3	164.6	45.3	19.7	755.0	0.0	0.0	0.0	0.0	0.0	0.0	755.0	33.7
LINE 4	133.1	54.3	23.1	1470.0	0.0	0.0	-16038.6	-8074.7	0.0	0.0	-5804.7	98.1
LINE 5	228.9	44.9	21.0	616.1	0.0	0.0	0.0	0.0	0.0	0.0	616.1	74.8
LINE 6	0.0	68.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LINE 7	249.3	47.9	18.3	630.5	0.0	0.0	0.0	0.0	0.0	0.0	630.5	76.3
UTIL	0.0	67.3	13.0									
CTAILS	0.0											
TOTAL	775.9			721.4	0.0	0.0	-16038.6	-8074.7	0.0	0.0	-1147.7	282.9

	HOUR	24 HOUR
MAIN TURBINES	789.7	5333.5

FUEL CONSUMPTION HOUR 28-APR-1993 20:31:42.72

	GAS SMCF	GAS TEMP	GAS PRESS	GAS MBTU/T	COAL TONS	COAL MBTU/T	OIL GALLONS	OIL MBTU/T	WOOD TONS	WOOD MBTU/T	TOTAL MBTU/T	PHB GAS SMCF
LINE 3	167.8	43.3	19.7	756.8	0.0	0.0	0.0	0.0	0.0	0.0	756.8	33.6
LINE 4	232.7	42.5	24.0	611.5	0.0	0.0	0.0	0.0	0.0	0.0	605.8	105.8
LINE 5	251.4	41.7	21.0	671.2	0.0	0.0	0.0	0.0	0.0	0.0	671.2	92.8
LINE 6	0.0	60.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LINE 7	249.2	47.8	18.3	631.4	0.0	0.0	0.0	0.0	0.0	0.0	631.4	76.5
UTIL	0.0	65.9	13.0									
CTAILS	0.0											
TOTAL	901.1			657.0	0.0	0.0	0.0	0.0	0.0	0.0	655.3	308.7
TURBINE	822.5	22.1	98.1									
T PULSE	832.0											

USS MINNTAC GAS CONSUMPTION 28-APR-1993 21:04:46.08

	HOUR	24 HOUR
MAIN TURBINES	813.9	6141.8

FUEL CONSUMPTION HOUR 28-APR-1993 21:31:53.50

	GAS SMCF	GAS TEMP	GAS PRESS	GAS MBTU/T	COAL TONS	COAL MBTU/T	OIL GALLONS	OIL MBTU/T	WOOD TONS	WOOD MBTU/T	TOTAL MBTU/T	PHB GAS SMCF
LINE 3	132.6	43.6	19.7	2373.5	0.0	0.0	0.0	0.0	0.0	0.0	2373.5	7.4
LINE 4	222.8	39.1	23.7	584.8	0.0	0.0	0.0	0.0	0.0	0.0	579.6	90.4
LINE 5	234.3	40.3	21.0	624.0	0.0	0.0	0.0	0.0	0.0	0.0	624.0	79.0
LINE 6	0.0	67.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LINE 7	247.6	47.3	18.3	628.5	0.0	0.0	0.0	0.0	0.0	0.0	628.5	76.0
UTIL	0.0	64.9	12.9									
CTAILS	0.0											
TOTAL	837.3			694.1	0.0	0.0	0.0	0.0	0.0	0.0	692.1	252.8
TURBINE	790.2	22.4	98.5									
T PULSE	799.0											

USS MINNTAC GAS CONSUMPTION 28-APR-1993 22:04:46.17

	HOUR	24 HOUR
MAIN TURBINES	805.9	6955.0

	TOT PRD TONS	PRODUCT LTPH	GRN BALL TOT TONS	BALL DRM TOT TONS	BENT PER PRD TON1	BENT PER PRD TON2	BENT PER PRD TON3	BENT PER PRD TON4	BENT PER PRD TON5	BENT PER LBS/TON	BENTONIT TOT LBS
LINE 3	1557.70	195.26	2022.99	2110.91	18.02	14.54	11.35	12.43		53.65	28000.00
LINE 4	3060.98	383.82	3975.30	3964.20	14.67	12.40	15.07	12.79	12.19	15.91	53079.00
LINE 5	2765.07	346.46	3591.00	10564.40	15.39	10.74	1.39	7.92	16.47	16.23	48308.00
TOT/AVG	7383.76	330.03	9589.29	16639.51							129387.00

	GRATE OPR HRS	LN3--DRUM OPR HRS	LN4--DRUM OPR HRS	LN5--DRUM OPR HRS	FILT HRS 4-1TO4-5	FILT HRS 5-1TO5-5	FILT HRS 2-1TO2-5	FILT HRS 2-6TO2-7
UNIT 1		7.58	7.99	7.99	4.44	7.99	0.00	0.00
UNIT 2		7.58	7.99	7.99	0.00	0.00	0.00	0.00
UNIT 3	7.26	7.18	7.99	7.99	7.99	7.99	0.00	
UNIT 4	7.99	7.22	7.99	7.99	0.00	7.99	0.00	
UNIT 5	7.99		7.99	7.08	7.99	5.64	0.00	
TOT/AVG	23.24	29.56	39.94	39.83	20.42	29.61	0.00	0.00

	RECLAIM HRS	TON FROM RECLAIM	G.B. CON REJ TONS	UPR HRS ALL FILT	BALL MRH TOT HRS	FILT TPH ALL FILT	TON FILT ALL FILT	TON FROM CONC	TONS TO STK-PILE	OUTSIDE TEMP
UNIT 1		0.00	0.00		29.56	4147.76	33068.00	0.00	0.00	56.64
UNIT 2		0.00	0.00	50.02	79.77	0.00	0.00		0.00	
TOT/AVG		0.00	0.00			4147.76	33068.00		0.00	

	GAS STD MCF	PH BURNR GAS SMCF	TURBINE GAS SMCF
LINE 3	1242.18	219.50	5546.39
LINE 4	1195.93	701.90	
LINE 5	1526.77	522.30	
TOT/AVG	3964.88	1523.70	5546.39

	TOT PRD TONS	PRODUCT LTPH	GRN BALL TOT TONS	BALL DRM TOT TONS	BENT PER PRD TON1	BENT PER PRD TON2	BENT PER PRD TON3	BENT PER PRD TON4	BENT PER PRD TON5	BENT PER LBS/TON	BENTONIT TOT LBS
LINE 3	5076.83	212.33	6593.20	6702.55	18.28	14.56	11.26	12.63		29.65	93089.00
LINE 4	9115.11	381.24	11837.81	11796.81	14.87	12.44	15.06	12.84	12.53	16.05	159418.00
LINE 5	7068.68	295.64	9180.10	25581.10	16.23	12.31	1.49	8.24	18.62	13.96	127698.00
TOT/AVG	21260.62	312.44	27611.19	44080.46							380205.00

	GRATE OPR HRS	LN3-DRUM OPR HRS	LN4-DRUM OPR HRS	LN5-DRUM OPR HRS	FILT HRS 4-1T04-5	FILT HRS 5-1T05-5	FILT HRS 2-1T02-5	FILT HRS 2-6T02-7
UNIT 1		23.55	23.96	18.75	16.89	23.90	0.00	0.00
UNIT 2		23.54	23.96	10.75	10.90	0.00	0.00	0.00
UNIT 3	23.23	23.15	23.96	18.74	14.23	23.96	0.00	
UNIT 4	23.96	23.19	23.96	18.36	0.00	23.96	0.00	
UNIT 5	18.39		23.96	18.26	22.45	21.61	0.00	
TOT/AVG	65.58	93.43	119.78	92.87	64.48	93.43	0.00	0.00

	RECLAIM HRS	TON FROM RECLAIM	G.B. CON REJ TONS	OPR HRS ALL FILT	BALL DRM TOT HRS	FILT TPH ALL FILT	TON FILT ALL FILT	TON FROM CONC	TONS TO STK-PILE	OUTSIDE TEMP
UNIT 1		0.00	0.00		93.43	4161.47	99502.00	0.00	0.00	50.34
UNIT 2		0.00	0.00	157.91	212.65	0.00	0.00		0.00	
TOT/AVG		0.00	0.00			4161.47	99502.00		0.00	

	GAS STD MCF	PH BURNR GAS SMCF	TURBINE GAS SMCF
LINE 3	3561.24	748.60	15875.82
LINE 4	3682.94	2124.20	
LINE 5	3641.50	1259.00	
TOT/AVG	10885.69	4131.80	15875.82

FUEL CONSUMPTION HOUR 28-APR-1993 22133:46.79

	GAS SMCF	GAS TEMP	GAS PRESS	GAS MBTU/T	COAL TONS	COAL MBTU/T	OIL GALLONS	OIL MBTU/T	WOOD TONS	WOOD MBTU/T	TOTAL MBTU/T	PHB GAS SMCF
LINE 3	159.5	40.8	19.7	913.7	0.0	0.0	0.0	0.0	0.0	0.0	913.7	11.4
LINE 4	213.6	38.4	23.9	560.9	0.0	0.0	0.0	0.0	0.0	0.0	560.9	93.9
LINE 5	222.7	39.6	21.1	599.6	0.0	0.0	0.0	0.0	0.0	0.0	599.6	75.3
LINE 6	0.0	64.9	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LINE 7	255.1	45.7	18.3	642.3	0.0	0.0	0.0	0.0	0.0	0.0	642.3	77.6
UTIL	0.0	63.2	12.9									
CTAILS	0.0											
TOTAL	850.9			642.7	0.0	0.0	0.0	0.0	0.0	0.0	642.7	258.3
TURBINE	800.2	21.5	98.6									
T PULSE	800.0											

FUEL CONSUMPTION SHIFT 28-APR-1993 22:33:46.79

	GAS SMCF	GAS TEMP	GAS PRESS	GAS MBTU/T	COAL TONS	COAL MBTU/T	OIL GALLONS	OIL MBTU/T	WOOD TONS	WOOD MBTU/T	TOTAL MBTU/T	PHB GAS SMCF
LINE 3	1242.2	44.6	19.7	797.4	0.0	0.0	0.0	0.0	0.0	0.0	797.4	219.5
LINE 4	1195.9	41.3	23.8	1010.0	0.0	0.0	-108623.0	-8042.8	0.0	0.0	-4541.3	781.9

Particulate Loadings and Emission Rates

The particulate emission rates were determined per EPA Methods 1-5, CFR title 40, Part 60, Appendix A (revised July 1, 1987). In this procedure, a preliminary velocity profile of the gases in the flue is obtained by means of a temperature and velocity traverse. On the basis of these values, sampling nozzles of appropriate diameter are selected to allow isokinetic sampling, a necessary prerequisite for obtaining a representative sample.

The sampling train consists of a heated glass-lined sampling probe equipped with a Type S pitot and a thermocouple. The probe is attached to a sampling module which houses the all-glass in line filter holder in a temperature controlled oven. In addition, the sampling module also houses the impinger case and a Drierite drying column. The sampling module is connected by means of an umbilical cord to the control module which houses the dry test gasmeter, the calibrated orifice, a leakless pump, two inclined manometers, and all controls required for operating the sampling train.

Particulate samples were collected as follows: The sample gas was drawn in through the sampling probe isokinetically and passed through a 4-inch diameter Gelman Type A/E glass fiber filter. The particulates were removed at this point and collected on the filter. The gases then passed through an ice-cooled impinger train and a desiccant-packed drying column which quantitatively absorb all moisture from the sample gas stream after which the sample gas passes through the pump and the dry test gasmeter which integrates the sample gas flow throughout the course of the test. A calibrated orifice attached to the outlet of the gasmeter provides instantaneous flow rate data.

A representative particulate sample was acquired by sampling for equal periods of time at the centroid of a number of equal area regions in the duct. The sampling rate is adjusted at each site such that an isokinetic sampling condition prevails. Nomographs are used to aid in the rapid determination of the sampling rate.

After sampling is complete, the filter is removed and placed in a clean container. The nozzle and inlet side of the filter holder are quantitatively washed with acetone and the washings are stored in a second container. A brush is often used in the cleaning step to help dislodge deposits. The samples are returned to the laboratory where they are logged in and analyzed. The volume of the acetone rinse ("probe wash") is noted and then the rinse is quantitatively transferred to a tared 120 cc porcelain evaporating dish and the acetone evaporated off at 97-105 °F. This temperature is used to prevent condensation of atmospheric moisture due to the cooling effect induced by the evaporation of acetone. The acetone-free sample is then transferred to an oven and dried at 105 °C for 30 minutes, cooled in a desiccator over Drierite, and then weighed to the nearest .01 mg. The filter sample is quantitatively transferred to a 6-inch watch glass and dried in an oven at 105 °C for two hours. The filter and watch glass are then cooled in a desiccator and the filter weighed to the nearest .01 mg. All weighings are performed in a balance room where the relative humidity is hydrostatted to less than 50% relative humidity. Microscopic examination of the samples is performed if any unusual characteristics are observed. The weight of the acetone rinse is corrected for the acetone blank. The Drierite column is weighed on-site and the water collected by Drierite is added to the condensate so that the total amount of absorbed water may be ascertained.

Integrated flue gas samples for Orsat analysis were collected simultaneously from the stack and from the breeching at the inlet to the wet scrubber. The samples were collected in 15-liter gas sampling bags at a constant flow rate throughout each particulate run. The bags were then returned to the laboratory and analyzed by Orsat analysis. Standard commercially prepared solutions were used in the Orsat analyzer (sat. KOH for carbon dioxide and reduced methylene blue for oxygen).

Interpoll Laboratories
(612)786-6020

Condensible Organic Compounds Analysis

(State of Minnesota - MPCA Exhibit C)

Method II-8672-MN

Equipment: Separatory funnel - 500 cc with Teflon stopcock

Powder funnel - 75 mm ID with a 17 mm stem

Evaporating dish(es) - 200 cc or 250 cc beaker

Reagents: Diethyl ether - reagent grade

Chloroform - reagent grade

Sodium sulfate - (ACS) granular anhydrous

Toluene - (if 3% hydrogen peroxide is used to collect the samples)

Glass wool (Pyrex microfiber)

PREPARATION

1. Place 1 kg of granular anhydrous sodium sulfate in a shallow tray and heat to 200 ^{o}C for at least four hours. Store in a tightly sealed glass container.

2. Place a plug of clean glass wool in the stem of the powder funnel. The plug must be of sufficient size so that it is held snuggly in place by its own pressure. Add a one-inch layer of dry sodium sulfate.

SAMPLING

An all-glass impinger assembly is used in the back half of the EPA Method 5 sampling train when an organic wet catch is to be collected. The impinger assembly consists of a modified impinger, a Greenburg Smith impinger followed by another modified impinger. The third impinger should have a temperature measuring device at the outlet upstream of a final impinger or desiccant column to monitor the temperature of the outlet gas stream. Prior to the start of the test, each of the first two impingers should be charged with 100 g of Class I water. The Method 5 train should be operated as provided for in EPA Method 5. Ice should be added to the impinger bath to keep the temperature of the gas at the outlet at or less than 68 ^{o}F. After the post test leak check, the impinger train is removed and impinger contents poured into a tared all-glass sample bottle and closed with a Teflon-lined cap. The sample bottle is then weighed and the total condensate calculated by subtraction of the bottle tare weight and the weight of initial water added to the impingers (200 g). A label is affixed and the sample is returned to the laboratory for analysis. The sample should be stored at 4 ^{o}C if the analysis is not conducted within 48 hours.

I. Organics

Caution! Work in vented hood!!!

A. Organic Blank Determination

1. Pour 125 mL of ethyl ether and 125 mL of chloroform into a tared beaker.
2. Evaporate solvent in hood at 70 ^{o}F or less until no solvent remains.
3. Desiccate the sample in dish for two hours.
4. Weigh the sample to nearest 0.1 mg, record and report on Form LSC-036.

B. Organic Sample Determination

1. Test for peroxide in sample ether using KI strips. (If KI strip shows positive, contact your supervisor before proceeding.)
2. Transfer the sample solution quantitatively to a 500 mL separatory funnel. Use the first of three 25 mL chloroform aliquots to rinse the sample container.
3. Extract with three 25 mL portions of chloroform. (Shake and vent to release pressure about 4 to 5 times each.) Allow the phases to separate. (Bottom layer is chloroform.) Draw off the bottom layer, transferring the solvent with a funnel containing a plug of sodium sulfate into a tared beaker. (Do not draw off any of the aqueous layer.)

4. After the three chloroform extractions, use two 25 mL portions of chloroform to rinse the sodium sulfate, collecting the rinses in the same tared beaker as the extracts.

5. Next extract the sample three times with 25 mL aliquots of ethyl ether. (Shake and vent to release pressure about 4 to 5 times each.) Allow the phases to separate. (Top layer is ethyl ether.) Draw off the bottom layer (aqueous) into another separatory funnel taking less than 1 mL of the ethyl ether layer with. Decant the ethyl ether, passing it through sodium sulfate and collecting the ethyl ether in the same tared dish as the chloroform.

6. After the three ethyl ether extractions, take two 25 mL portions of ethyl ether and rinse the sodium sulfate collecting the rinses in the same tared beaker as the extracts.

7. Evaporate the solvents (chloroform and ethyl ether) in the tared beaker in the hood at 70 ^{o}F or less until no solvent remains. (Use no heat and have no sources of ignition in the hood when doing this procedure.) Do not evaporate so quickly as to allow evaporative cooling to lower the temperature of the container below the dew point of water, otherwise, water will be condensed out in the container.

8. Desiccate to constant weight (two hours). Record and report the final weight to the nearest 0.1 mg on Form LSC-036.

II. Inorganics

If inorganic residue information is required, the following procedure should be conducted:

A. Inorganic Blank Determination

1. Vent the remaining aqueous phase from the organic extraction in the hood to remove residual organic solvents (usually overnight).
2. Decant the impinger catch into a tared evaporating dish.
3. Evaporate all of the water in the sample in an oven at 100 ^{o}C. Take care not to boil to prevent bumping and loss of sample.
4. Cool the dried sample in the desiccator and desiccate until a constant weight is obtained.
5. Report the results to the nearest 0.1 mg on Form LSC-036.

B. Inorganic Sample Determination

Follow steps 1-5 in Section A above.

NOTES

1. For the organics determination, in the rare event that the impinger catch resulted from a Modified Method 6 determination (SO_2), whereby the solution contains dilute hydrogen peroxide ($\geq$ 3%), do <u>not</u> use ether as an extraction solvent. <u>Substitute toluene</u> for ethyl ether in Section I. (Ether in the presence of peroxide forms explosive hydroperoxide.)

2. In the organics determination, more than three extractions may be required to extract all of the organics. Additional extractions should be performed if the aqueous phase is still cloudy.

3. Special state requirements:

   <u>Michigan</u> - Total sample evaporated in tared evaporating dish on steam bath.

   <u>Iowa</u> - Organics and inorganics separately, as required.

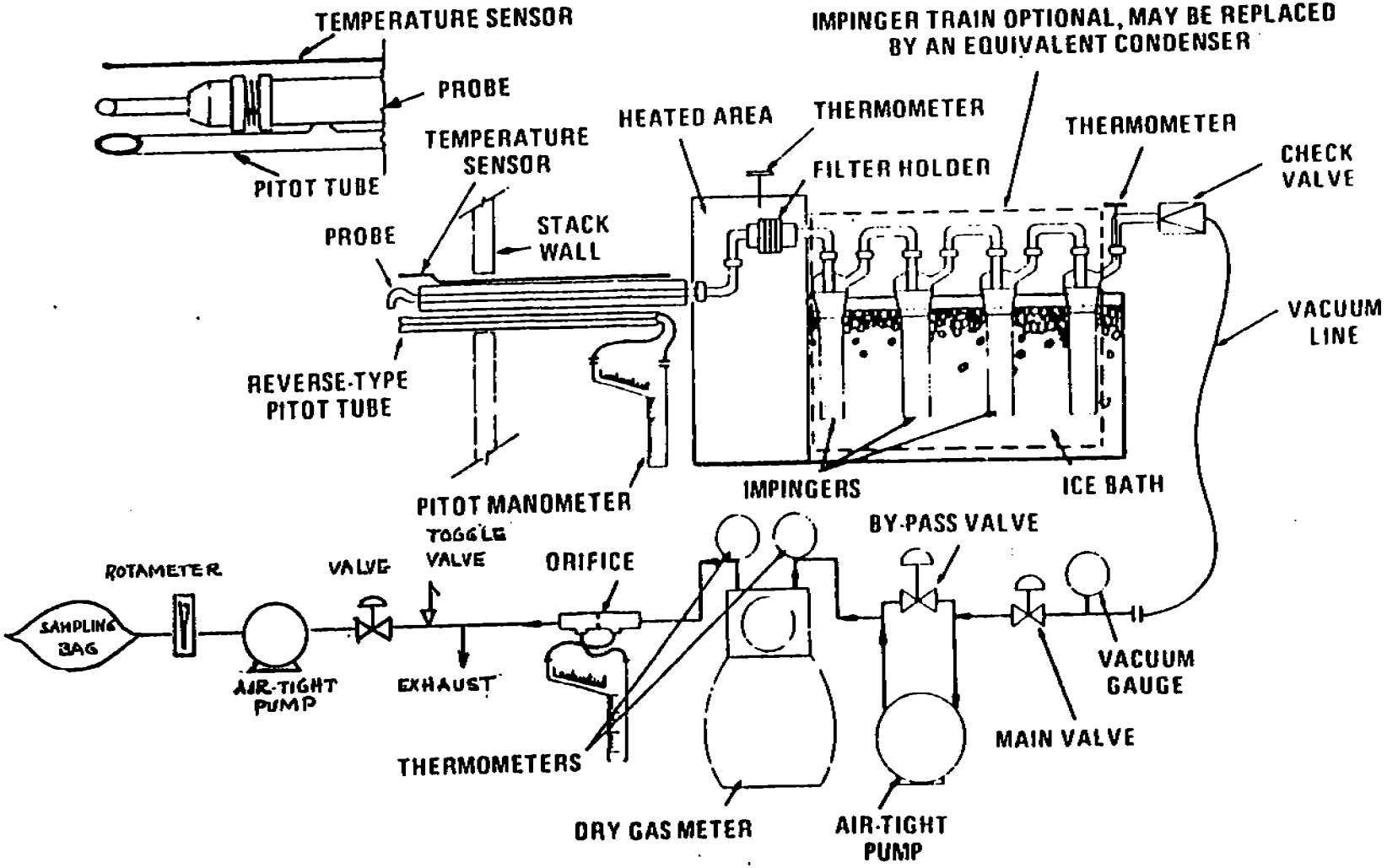
   <u>Wisconsin</u> - Use Method II-8672-WI.

   <u>Rest of states</u> - Organics only.

REFERENCES

Proposed Standards of Performance for New Stationary Sources, Federal Register <u>36</u>(159) Part II, August 1, 1979.

Minnesota Pollution Control Agency, Exhibit C.



Particulate-sampling train.

CALCULATION EQUATIONS

METHOD 2

$$\bar{V}_s = 85.48\ C_p\ (\sqrt{\Delta p})_{avg}\ \sqrt{\frac{T_{s(avg)}}{P_s\ M_s}}$$

$$Q_{s,d} = 60(1 - B_{ws})\ \bar{V}_s\ A\ \left(\frac{528}{T_{s(avg)}}\right)\ \left(\frac{P_s}{29.92}\right)$$

$$Q_a = 60\ \bar{V}_s\ A$$

$$\dot{m}_g = \frac{4.995\ Q_{s,d}\ G_d}{1 - B_{ws}}$$

$$RH^* = 100\ (vp_{twb}\ 0.0003641\ P_s\ (T_{db} - T_{wb}))/vp_{tdb}$$

$$B^*_{ws} = RH(vp_{tdb})/P_s$$

$$= \frac{4.585 \times 10^{-2}\ P_s M_s}{T_{s\ (avg)}}$$

*Alternate equations for calculating moisture content from wet bulb and dry buld data.

SYMBOLS

A = Cross sectional area of stack, SQ. FT.

A_n = Cross sectional area of nozzle, SQ. FT.

B_{ws} = Water vapor in gas stream, proportion by volume

C_p = Pitot tube coefficient, dimensionless

C_a = Concentration of particulate matter in stack gas, wet basis, GR/ACF

C_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, GR/DSCF

EA = Excess air, percent by volume

γ = Dry test meter correction factor, dimensionless

G_d = Specific gravity (relative to air), dimensionless

I = Isokinetic variation, percent by volume

M_d = Molecular weight of stack gas, dry basis, g/g - mole.

$\dot{m}_g$ = Mass flow of wet flue gas, LB/HR

$\dot{m}_p$ = Particulate mass flow, LB/HR

M_s = Molecular weight of stack gas, wet basis, g/g, mole.

M_p = Total amount of particulate matter collected, g

P_{bar} = Atmospheric pressure, IN. HG. (uncompensated)

P_g = Stack static gas pressure, IN. WC.