AP-42 Section 12.2
Reference 4
Report Sect. 4
Reference 113
No process data

PARTICULATE EMISSION MEASUREMENT ON #2 COKE OVEN BATTERY AT UNITED STATES STEEL CORPORATION FAIRFIELD, ALABAMA

Prepared for
United States Steel Corporation
Fairfield, Alabama

Prepared by
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807 South McDonough Street
Montgomery, Alabama 36104

March 1979

Project No. MG63304.90

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CHAPTER 1
INTRODUCTION

The purpose of this study was to measure the concentration of particulate matter in the exhaust gases from the underfiring stack serving the #2 coke oven battery at US Steel in Fairfield, Alabama. The underfiring stack receives the combustion products of the by-product gas which is burned to supply heat for the coking process.

Since the purpose of this test was to determine whether this source is in compliance with regulatory standards, the US Environmental Protection Agency (EPA), the Alabama Air Pollution Control Commission (AAPCC), and the Jefferson County Health Department were contacted prior to the test. Representatives of these agencies were present during the test series and monitored process operation and testing procedures. Gary Euler and Jim Long of US Steel's Fairfield Engineering Department coordinated the sampling with process operation. Bill Morgan and Rex Stephens of CH2M HILL conducted the tests.

CHAPTER 2
SUMMARY OF RESULTS

Table 2-1 is a summary of the various parameters measured during the three particulate runs conducted on the underfiring stack serving the #2 coke oven battery at US Steel. As shown in this table, the average grain loading measured during these tests was .0324 gr/sdcf.

Table 2-1
Summary of Test Results - US Steel Underfire Stack (#2 Coke Battery)

Parameter	Run 1	Run 2	Run 3	Average
Date of Test	3/6/79	3/7/79	3/7/79	
Sampling Period (Time of Day)	0955-1307	0916-1215	1418-1713	
Stack Gas Temperature (°F)	431	432	431	431
Moisture Content (% Vol)	12.74	12.94	12.58	12.75
Stack Gas Velocity (fps)	10.89	9.57	10.16	10.21
Gas Volumetric Flow Rate (SDCFH)[a]	6,219,783	5,424,774	5,789,522	5,811,360
Particulate Emissions (Grains/SDCF)	0.0334	0.0302	0.0335	0.0324
Particulate Emissions (lbs/hour)	29.89	23.41	27.76	27.02
Percent of Isokinetic Sampling	106.2	107.0	106.6	106.6

a Dry basis, standard conditions of 70°F and 29.92" Hg

CHAPTER 3
DESCRIPTION OF INSTALLATION

The coke oven facility of US Steel Corporation in Fairfield, Alabama, generates coke for use in blast furnaces. Coke is produced by the distillation of a mixture of two or more low, medium, and high volatile coals in a chemical retort or oven. The coal mixture is charged through holes in the top of the oven. The lids are then sealed with a wet clay mixture. Heat for the coking operation is supplied by a flue system located between the ovens. The regenerators serve as pre-heaters for the combustion air that enters the flues. Distilled volatiles are withdrawn to a duct system to be stripped of by-product chemicals. These gases are fed through scrubbers to remove such chemicals as ammonia, naphthalene, and light and heavy oil. The hot combustion gases after heating the regenerators are discharged through the underfiring stack. Typically, 18 hours are required to produce blast furnace coke. Coking time is determined by the coal mixture, moisture control, rate of underfiring, and desired properties of the coke. The oven doors are removed after the desired coking time is achieved. The hot coke is then pushed into a rail car and quenched with water.

Coke battery #2 discharges its combustion gases to the under-firing stack that was tested during this sampling program. There are 57 ovens in the #2 battery. Each oven has a capacity of 3.3 tons of coal. Figure 1 is a schematic of the coke oven operation. US Steel collected the required process data during the test periods and supplied that data to regulatory agency representatives.

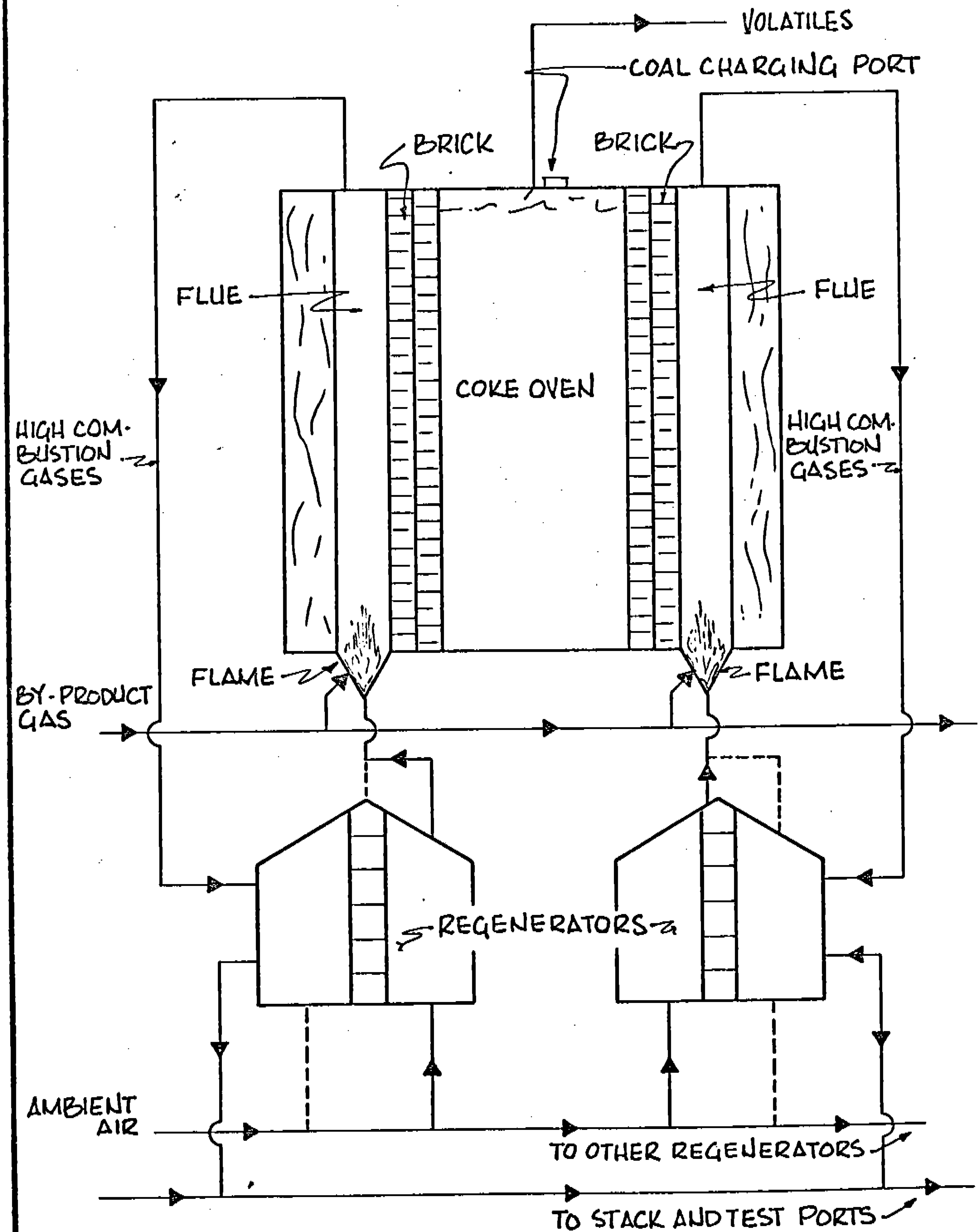


Figure 3-1
PROCESS FLOW DIAGRAM

CH2M HILL

CHAPTER 4
SAMPLING AND ANALYTICAL PROCEDURES

Sampling Location and Procedures

An EPA sampling train as described in the Air Pollution Control Office publication, APTD-0581, was used for collecting the particulate samples. Figure 4-1 shows a schematic of this sampling equipment. There were no modifications to this basic configuration for the test covered by this report.

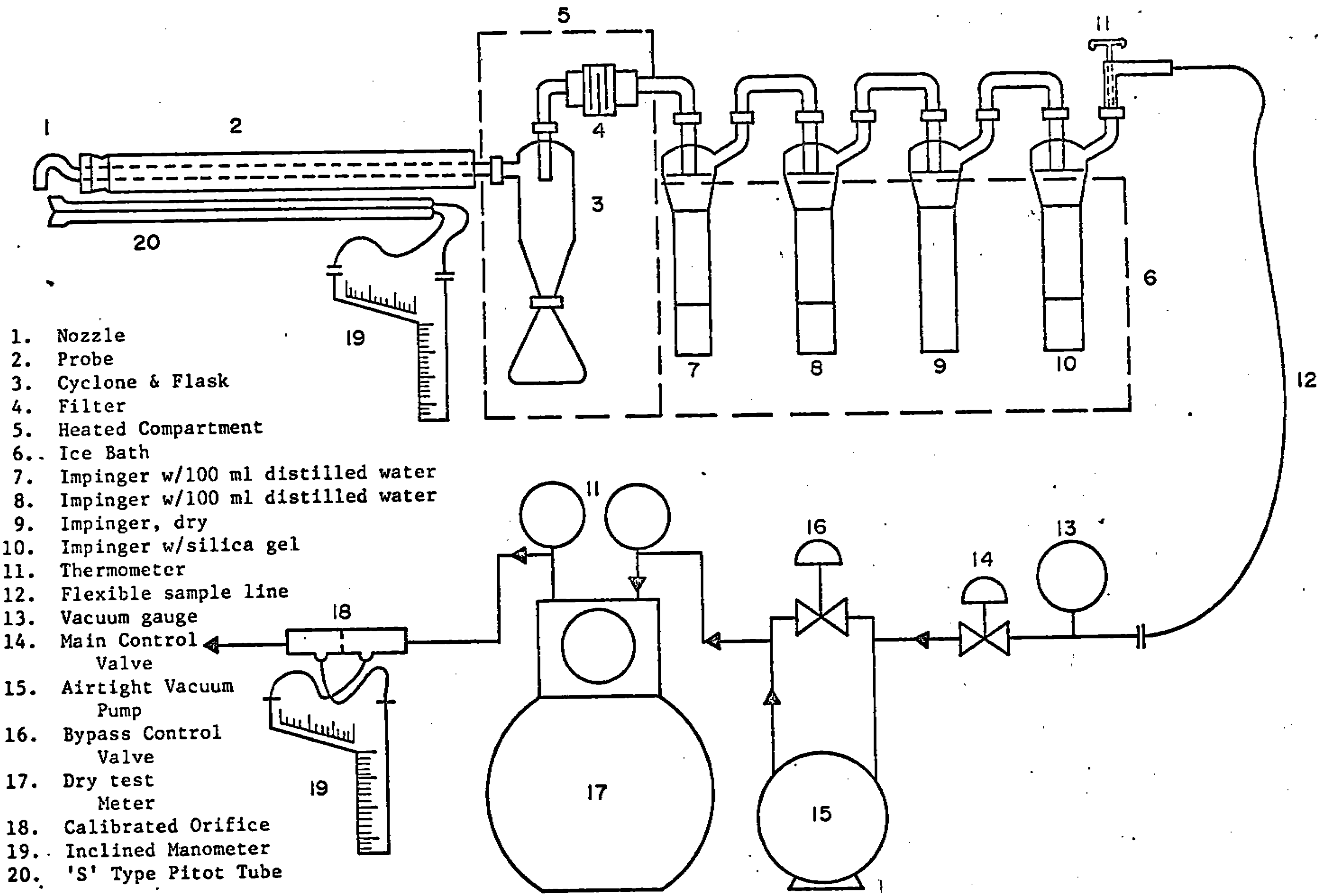
Layout of the sampling ports in relation to flow disturbances for the stack is shown by Figure 4-2. Based on the stack diameter and the upstream and downstream distances of the sampling ports from the closest flow disturbances, the required number of sampling points according to Figure 1-1 and Method 1 of the August 18, 1977, Federal Register, Volume 42, was determined to be 44. Sampling was conducted through four ports at these 44 points for three minutes per point. Table 4-1 shows the dimensions from the stack wall to each sampling point as directed by the previously mentioned Federal Register.

Prior to the start of the first particulate sampling run, stack temperature was measured and a velocity traverse was made in the stack. Moisture was estimated based on previous sampling data. Using the above data, the nomograph was set up to utilize an appropriate size nozzle. Settings for the nomograph and the exact nozzle diameter are shown on the field data sheets (Appendix).

The particulate sampling procedures followed were as outlined by Method 5 from the previously mentioned Federal Register. Sampling data for each run is a part of the Appendix. A test run was voided on the afternoon of the 6th when a leak was detected during the test period. Acceptable isokinetic sampling rates were achieved during all test runs as indicated by the data summary sheet of Chapter 2. Calculations for the isokinetic rates are also a part of the Appendix.

Analytical Procedures

Particulate sample recovery procedures were as outlined in Method 5 of the Federal Register. Acetone was used to wash down all parts of the sampling train prior to the glass fiber filter. A probe brush was utilized to ensure that the probe was properly cleansed following each run, and the nozzle was removed at the conclusion of each run and cleaned with a nozzle brush. Laboratory data for all runs are a part of the Appendix. Using the field data taken during each sample run, along with corresponding laboratory data, calculations were made to determine various exhaust gas parameters and particulate emissions. A summary of these is found in Chapter 2, Table 2-1. Calculation sheets on



1. Nozzle
2. Probe
3. Cyclone & Flask
4. Filter
5. Heated Compartment
6. Ice Bath
7. Impinger w/100 ml distilled water
8. Impinger w/100 ml distilled water
9. Impinger, dry
10. Impinger w/silica gel
11. Thermometer
12. Flexible sample line
13. Vacuum gauge
14. Main Control Valve
15. Airtight Vacuum Pump
16. Bypass Control Valve
17. Dry test Meter
18. Calibrated Orifice
19. Inclined Manometer
20. 'S' Type Pitot Tube

FIGURE 4-1. PARTICULATE SAMPLING TRAIN

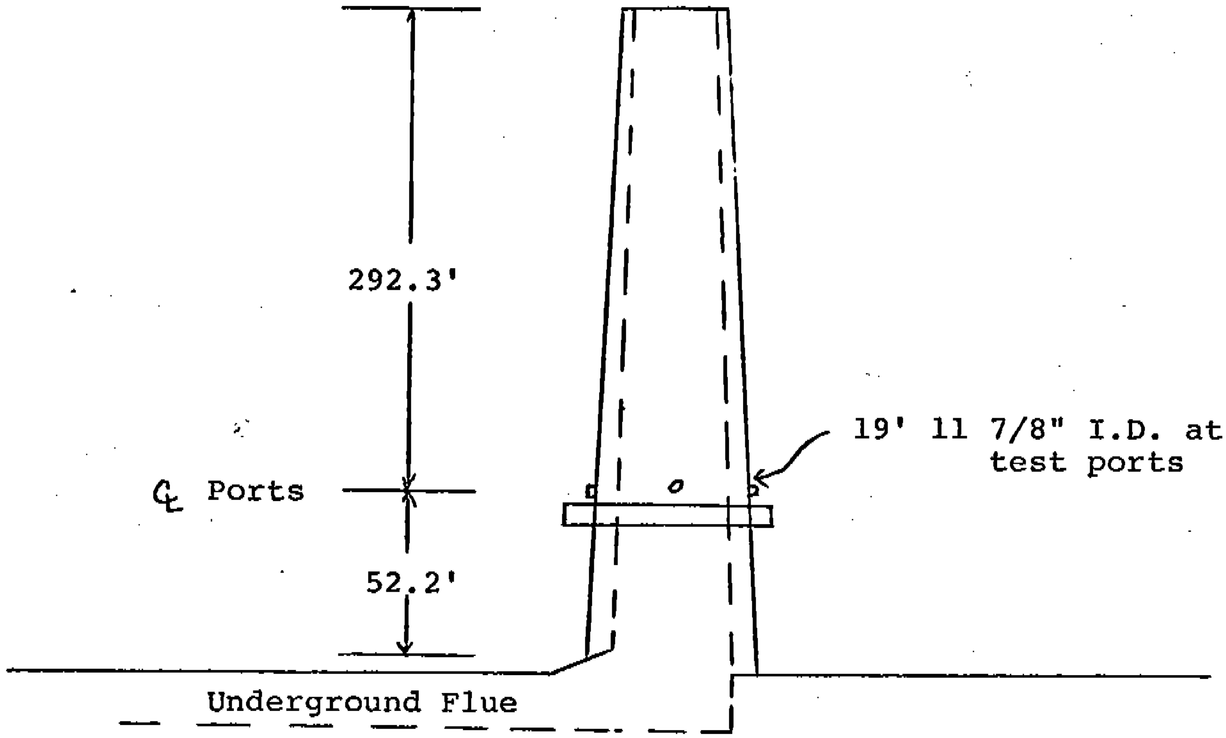


Figure 4-2
Location of Sampling Ports

Table 4-1
Location of Sampling Points

Point	% of Stack I.D.	x	Stack I.D. (Inches)	=	Distance to Sampling Point (Inches)
1	1.1		239.88		2.64
2	3.5		239.88		8.40
3	6.0		239.88		14.39
4	8.7		239.88		20.87
5	11.6		239.88		27.83
6	14.6		239.88		35.02
7	18.0		239.88		43.18
8	21.8		239.88		52.29
9	26.2		239.88		62.85
10	31.5		239.88		75.56
11	39.3		239.88		94.27
12	60.7		239.88		145.61
13	68.5		239.88		164.32
14	73.8		239.88		177.03
15	78.2		239.88		187.59
16	82.0		239.88		196.70
17	85.4		239.88		204.86
18	88.4		239.88		212.05
19	91.3		239.88		219.01
20	94.0		239.88		225.49
21	96.5		239.88		231.48
22	98.9		239.88		237.24

each run are also a part of the Appendix. Fyrite readings taken during the study for calculating gas densities are shown on the field data sheets. Parameters used for all calculations are listed on each calculation sheet and are a part of the Appendix also.

APPENDIX A

LAB DATA

CH2M HILL

MONTGOMERY OFFICE
807 SOUTH McDONOUGH STREET
MONTGOMERY, ALABAMA 36104
TELEPHONE 205/834-2870

Client U.S. STEEL
Date 3/8 Weighings By B. MORGAN
Sampling Location UNDERFIRE #2 BATTERY
Remarks:

LABORATORY DATA

PARTICULATE SOURCE	RUN # 1 Final Wt (g)	RUN # 1 Initial Wt (g)	RUN # 1 Diff. (g)	RUN # 2 Final Wt (g)	RUN # 2 Initial Wt (g)	RUN # 2 Diff. (g)	RUN # 3 Final Wt (g)	RUN # 3 Initial Wt (g)	RUN # 3 Diff. (g)	BLANKS Final Wt (g)	BLANKS Initial Wt (g)	BLANKS Diff. (g)
PROBE & CYCLONE WASH	155.9736 g 350 ml	#45 155.9109	.0627	159.4743 g 290 ml	F4 159.4491	.0252	153.2797 g 350 ml	153.2522	.0275	155.4829 g 153.2741 200 ml	#4 155.4816 F5 153.9732	.0013 .0009
FILTER	.5003	#133 .4249	.0754	.5326	#260 .4479	.0847	.5556	#118 .4533	.1023			.0022 400ml
IMPINGERS ACETONE WASH												
IMPINGERS H_2O												
	Gross Weight		.1381	Gross Weight		.1099	Gross Weight		.1298	Total Blank Wt.		.0006/100
	Less Blank Wt.		-.0021	Less Blank Wt.		-.0017	Less Blank Wt.		-.0021			
	Net Weight		.1360	Net Weight		.1082	Net Weight		.1277			

NOTE: The weight of the probe and cyclone wash blank for each sample is in direct proportion to the weight of the actual blank based on volume.

SILICA GEL	Final Wt (g)	Initial Wt (g)	Diff. (g)	Final Wt (g)	Initial Wt (g)	Diff. (g)	Final Wt (g)	Initial Wt (g)	Diff. (g)	Final Wt (g)	Initial Wt (g)	Diff. (g)

APPENDIX B

FIELD DATA AND CALCULATIONS

CH2M HILL
MONTGOMERY OFFICE
807 SOUTH McDONOUGH STREET
MONTGOMERY, ALABAMA 36104
205/834-2870

PLANT U.S. Steel / Fairfield, Ala.
DATE March 6, 1979 RUN NUMBER #1
TIME START 9:55 TIME END 1:07
MATERIAL PROCESSING RATE
SAMPLING LOCATION
WEATHER Cool / Sunny
AMBIENT TEMP. °F STACK PRESS. -1.6 " H_2O "Hg
BAROMETRIC PRESS. 29.15 "Hg WET BULB °F
DRY BULB °F MOISTURE %
DEW POINT °F

TEST CONDUCTED BY: Stephens / Morgan

NOZZLE DIA. .500 in.
PITOT CORR. FACTOR .84 (By Design)
ORIFICE CORR. FACTOR 1.90
FILTER NUMBER
SILICA GEL NUMBER

READING	GAS METER	IMPINGER COND.
FINAL	88.079	378
INITIAL	22.456	200
NET	65.623	78

ORSAT READING
% CO_2 5.0
% O_2 11.5
% CO
% N_2

REMARKS: T_m = 75, % H_2O = 12, C = .94, T_s = 400, ΔP = .5

SKETCH:
Nozzle - Pretest .501, .500, .500, .500

Silica Gel Wt: 15.0
*Note: Post leak checks from filter only / Pre-checks showed probe leak free

FINAL LEAK CHECK
SAMPLE TRAIN AT 5 in.Hg
FINAL
INITIAL
LEAK .005 /min.
PITOT CHECKED on 10" Manometer prior to test
IMPACT at in.
STATIC at in.

STACK INFORMATION
DIA. 239.88 in.
AREA 314.16 ft^2
DISTANCE FROM DISTURBANCE: DOWNSTREAM 52.2 ft. UPSTREAM 292.3 ft.

PORT # / POINT #	DISTANCE FROM PORT (in.)	TIME	GAS METER VOLUME (ft^3)	STACK VELOCITY HEAD-Δp (in. H_2O)	$\sqrt{\Delta p}$	ORIFICE VELOCITY HEAD-Δp (in. H_2O)	GAS METER TEMP. T_m (°F) INLET	GAS METER TEMP. T_m (°F) OUTLET	STACK TEMP.-T_s (°F)	IMPINGER TEMP. (°F)	BOX TEMP. (°F)	VACUUM (in. Hg)
1		:55	~~—~~	.040	0.200	1.38	5	6	445	40	240	2.5
2		9:58	24.5	.040	0.200	1.28	5	8	443	40	250	2.5
3		10:01	26.5	.022	.148	.86	6	0	418	40	245	2.3
4		10:04	27.9	.023	.152	.87	6	2	421	50	250	2.5
5		:07	29.3	.014	.118	.51	6	4	419	50	240	2.0
6		:10	30.4	.015	.122	.54	6	6	419	50	250	2.1
7		:13	31.7	.018	.134	.67	6	8	418	60	250	2.1
8		:16	32.0	.019	.138	.68	7	0	410	60	240	2.3
9		:19	33.3	.022	.148	.86	7	1	412	65	250	2.5
10		:22	34.7	.035	.187	1.24	7	4	429	65	250	2.3

? /6/7? Sheet #? of Test #1

PORT # / POINT #	DISTANCE FROM PORT (in.)	TIME	GAS METER VOLUME (ft^3)	STACK VELOCITY HEAD- p (in. H_2O)	$\sqrt{\Delta p}$	ORIFICE VELOCITY HEAD- H (in. H_2O)	GAS METER TEMP. T_m (°F)		STACK TEMP.-T_s (°F)	IMPINGER TEMP. (°F)	BOX TEMP. (°F)	VACUUM (in. Hg)
							INLET	OUTLET				
11		:25	36.6	.010	0.100	.35	7	6	431	65	250	1.7
1		10:42	37.3	.023	.152	~~[illegible]~~ .87	7	8	426	45	240	2.3
2		:45	39.2	.014	.118	.52	7	9	436	50	240	1.9
3		:48	40.7	.018	.134	.67	7	9	437	50	250	2.1
4		:51	42.1	.018	.134	.67	8	0	438	55	250	2.1
5		:54	43.5	.014	.119	.51	8	1	440	55	245	1.7
6		:57	45.2	.014	.119	.51	8	2	442	55	250	1.7
7		11:00	46.4	.011	0.105	.39	8	3	450	60	250	1.3
8		:03	47.6	.019	.138	.68	8	4	456	63	240	2.1
9		:06	48.9	.015	.122	.54	8	6	459	65	245	1.9
10		:09	50.2	.013	.114	.46	8	7	462	65	250	1.7
11		:12	51.4	.010	0.100	.35	8	7	463	65	250	1.0
1		11:40	52.5	.025	.158	.91	7	6	415	40	240	2.3
2		:43	54.1	.025	.158	.91	7	4	427	45	240	2.3
3		:46	55.7	.020	.141	.72	7	4	430	50	245	2.1
4		~~:49~~	57.1	.022	.148	.86	7	4	439	50	245	2.2
5	:57	~~:52~~	58.5	.025	.158	.91	7	5	439	50	245	2.3
6	12:00	~~:55~~	60.1	.020	.141	.72	7	5	419	55	250	2.1
7	12:03	~~:58~~	61.5	.020	.141	.72	7	6	419	60	250	2.1

-/16/19

HE #2, 0" TEST #1

PORT # / POINT #	DISTANCE FROM PORT (in.)	TIME	GAS METER VOLUME (ft^3)	STACK VELOCITY HEAD- p (in. H_2O)	$\sqrt{\Delta p}$	ORIFICE VELOCITY HEAD- H (in. H_2O)	GAS METER TEMP. T_m (°F) INLET	GAS METER TEMP. T_m (°F) OUTLET	STACK TEMP.-T_s (°F)	IMPINGER TEMP. (°F)	BOX TEMP. (°F)	VACUUM (in. Hg)
8		:04	62.9	.020	.141	.72	7	7	419	65	260	2.1
9		:07	64.8	.020	.141	.72	7	9	427	65	260	2.1
10		:10	66.2	.032	.179	1.18	8	0	426	65	260	2.7
11		:13	67.9	.027	.164	.96	8	1	438	65	260	2.4
1		12:34	69.8	.024	.155	.88	8	1	435	50	240	2.4
2		:37	71.4	.020	.141	.72	8	1	437	55	245	2.1
3		:40	72.8	.023	.152	.83	8	1	415	50	250	2.3
4		:43	74.3	.028	.167	1.02	8	2	413	50	250	2.5
5		:46	75.9	.025	.158	.90	8	4	413	55	250	2.3
6		:49	78.1	.020	.141	.72	8	4	422	60	255	2.1
7		:52	79.5	.025	.158	.90	8	5	417	60	255	2.3
8		:55	81.1	.023	.152	.83	8	7	427	55	260	2.3
9		:58	83.2	.032	.179	1.18	8	7	413	50	260	2.7
10		1:01	84.9	.032	.179	1.18	8	7	434	50	260	2.7
11		1:04	86.8	.015	.122	.54	8	7	435	50	260	1.9
					6.254	34.54						
			[illegible]	AVG	.145	.785	7	7	434			

CH2M HILL

MONTGOMERY OFFICE

807 SOUTH McDONOUGH STREET
MONTGOMERY, ALABAMA 36104
205/834-2870

Plant U.S. STEEL

Date 3/6 Run # 1

Sampling Location UNDERFIRE STACK BATTERY #2

Sampling Data

T_s = 891 °R; T_m = 537 °R

C_p = 0.84 ; $(\sqrt{\Delta p})_{avg}$ = .145

P_s = 29.11 in.Hg; M_s = 27.97 #/#-mole

A_s = 314.16 sq.ft.; V_m = 65.623 cu.ft.

H_2O (condensate) = 178 mls

H_2O (silica gel) = 15.8 gms

ΔH_{avg} = .785 in H_2O; P_b = 29.23 in Hg

Total particulate = .1360 grams

1. Calculate Stack gas velocity--

$$V_s = 85.48\ C_p\ (\sqrt{\Delta p})avg \sqrt{\frac{T_s}{P_s M_s}}$$

$$V_s = 85.48\ (.84)\ (.145) \sqrt{\frac{891}{(29.11)(27.97)}}$$

V_s = 10.89 fps

2. Calculate volume of water vapor in gas sample--

$$V_{wstd} = (0.0474) \left(\begin{matrix}\text{mls } H_2O \\ \text{condensate}\end{matrix} + \begin{matrix}\text{grams } H_2O \\ \text{silica gel}\end{matrix}\right)$$

V_{wstd} = (0.0474)(178 + 15.8) = (0.0474) (193.8) = 9.186 cu.ft.

3. Calculate gas sample volume at standard conditions--

$$V_{mstd} = (17.71)(V_m) \left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m}\right)$$

MCF = .993
V_m = 65.164

V_{mstd} = (17.71)(65.164) $\left(\frac{29.23 + \frac{.785}{13.6}}{537}\right)$ = (1154.054)(.0545) = 62.896 cu.ft.

4. Calculate percent moisture in gas stream--

$$B_{wo} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}} = \frac{9.186}{62.896 + 9.186} = .1274 = 12.74\ \%$$

5. Calculate stack gas volumetric flow rate, dry basis, std. conditions--

$$Q_{stpd} = 3600(1-B_{wo})V_s A_s \frac{530}{T_s} \frac{P_s}{29.92}$$

Q_{stpd} = 3600 (1-.1274) (10.89) (314.16) (530/891) (29.11 /29.92) = 6,219,783 cu.ft./hr

6. Calculate grain loading--

grains/sdcf = (15.43)(grams)/V_{mstd} = (15.43)(.1360)/(62.896) = .0334

7. Calculate mass emission rate--

lbs/hr = (grains/stdcf)(Q_{stpd})(1.43 x 10^{-4})

lbs/hr = (.0334)(6,219,783)(1.43 x 10^{-4}) = 29.71

CH2M HILL

MONTGOMERY OFFICE

807 SOUTH McDONOUGH STREET
MONTGOMERY, ALABAMA 36104
205/834-2870

Client U.S. STEEL

Date 3/6 Run # 1

Sampling Location UNDERFIRE STACK BATTERY #2

CALCULATION OF STACK GAS MOLECULAR WEIGHT (M_s)

Average Orsat Analysis (dry)

Moisture Content = 12.74 %

$\%CO_2$ = 5.0

$\% O_2$ = 11.5

$\%CO$ = —

$\% N_2$ = 83.5

Component	% Vol/100	X	Moisture Correction	X	Molecular Weight	=	Wt./Mole (wet base)
H_2O	0.1274	x	1.0	x	18.0	=	2.29
CO_2	0.05	x	.8726	x	44.0	=	1.92
O_2	0.115	x	↓	x	32.0	=	3.21
CO	—	x	↓	x	28.0	=	—
N_2	0.835	x	↓	x	28.2	=	20.55

Average Molecular Wt., wet basis (M_s) = 27.97 lb/lb-mole

Density of gas referred to air = $\frac{27.97}{28.95}$ = .9661

Gas density correction factor = $\sqrt{\frac{1.00}{.9661}}$ = $\sqrt{1.0351}$ = 1.0174

CH2M HILL

MONTGOMERY OFFICE

807 SOUTH McDONOUGH STREET
MONTGOMERY, ALABAMA 36104
205/834-2870

Client U.S. STEEL

Date 3/6/79 Run# 1

Sampling Location UNDERFIRE stack BATTERY # 2

CALCULATION OF ISOKINETIC RATE

$$I = \frac{T_s \left(1.667\ \frac{min}{sec}\right) \left[\left(0.00267\ \frac{in.\ Hg-cu.ft.}{ml - °R}\right) V_1 + \frac{V_m}{T_m}\left(P_{bar} + \frac{\Delta H}{13.6}\right)\right]}{\Theta V_s P_s A_n}$$

Where I = % of isokinetic sampling T_s = Avg. stack temperature = 891 °R

V_1 = Total volume of liquid collected in impingers & silica gel = 193.8 ml

V_{m_1} = Gas sample thru dry gas meter @ meter conditions = 65.164 cu.ft.

T_m = Average dry gas meter temperature = 537 °R

P_{bar} = Barometric pressure @ sampling site = 29.23 in.Hg

ΔH = Average pressure drop across orifice = 0.785 in.H_2O

Θ = Total sampling time = 132 min.

V_s = Stack gas velocity = 10.89 fps

P_s = Stack gas pressure = 29.11 in.Hg

A_n = Cross-sectional area of nozzle = .00136 sq.ft.

$$I = \frac{(891)(1.667)\left[(0.00267)(193.8) + \frac{65.164}{537}\left(29.23 + \frac{.785}{13.6}\right)\right]}{(132)(10.89)(29.11)(.00136)}$$

$$I = \frac{(1485.30)\left[(.5174) + (.1213)(29.29)\right]}{(56.909)}$$

$$I = \frac{(1485.30)[.5174 + 3.5529]}{(56.909)} = \frac{(1485.30)[4.0703]}{(56.909)} = \frac{6045.58}{56.909}$$

I = 106.23 = 106.2 % of isokinetic sampling

CH2M HILL

MONTGOMERY OFFICE
807 SOUTH McDONOUGH STREET
MONTGOMERY, ALABAMA 36104
205/834-2870

PLANT U.S. STEEL / F 2E1 - 2 A
DATE March 7 1979 RUN NUMBER #2
TIME START 9:16 TIME END 12:15
MATERIAL PROCESSING RATE
SAMPLING LOCATION
WEATHER Overcast / Cool
AMBIENT TEMP. °F STACK PRESS. 28.99 "Hg
BAROMETRIC PRESS. 29.10 "Hg WET BULB °F
DRY BULB °F MOISTURE %
DEW POINT °F

TEST CONDUCTED BY: Morgan / Stephens

NOZZLE DIA. .500 in.
PITOT CORR. FACTOR .84 (By Design)
ORIFICE CORR. FACTOR 1.90
FILTER NUMBER
SILICA GEL NUMBER

READING	GAS METER	IMPINGER COND.
FINAL	175.082	358
INITIAL	117.141	200
NET	57.941	158

ORSAT READING

- % CO_2 5
- % O_2 11.5
- % CO
- % N_2

REMARKS: See Run #1

SKETCH:

Silica gel wt. gain. 15.5g

DIA. 239.88 in.
AREA 314.16 ft^2

FINAL LEAK CHECK
SAMPLE TRAIN AT 3 in.Hg
FINAL
INITIAL
LEAK .011 /min.
PITOT
IMPACT at in.
STATIC at in.

STACK INFORMATION
DISTANCE FROM DISTURBANCE: DOWNSTREAM 52.2 ft. UPSTREAM 292.3 ft.

PORT # / POINT #	DISTANCE FROM PORT (in.)	TIME	GAS METER VOLUME (ft^3)	STACK VELOCITY HEAD-Δp (in. H_2O)	$\sqrt{\Delta p}$	ORIFICE VELOCITY HEAD-Δp (in. H_2O)	GAS METER TEMP. T_m (°F) INLET	OUTLET	STACK TEMP.-T_s (°F)	IMPINGER TEMP. (°F)	BOX TEMP. (°F)	VACUUM (in. Hg)
1	9:16	~~[illegible]~~	X	.015	.122 ~~.387~~	.54	60	60	414	40	250	0
2		9:19	119.5	.013	.114 ~~.361~~	.47	61	61	419	45	250	0
3		:22	119.6	.020	.141	.72	62	62	421	45	250	1.0
4		:25	121.0	.023	.152	.84	63	63	423	45	250	1.0
5		:28	123.0	.020	.141	.72	65	65	395	50	250	1.0
6		:31	124.5	.023	.152	.84	67	67	435	55	250	1.5
7		:34	126.0	.020	.141	.72	70	70	450	55	250	1.0
8		:37	127.4	.017	.130	.61	71	71	440	55	250	1.0
9		:40	128.8	.013	.114	.47	73	73	452	55	260	1.0
10		:43	129.9	.015	.122	.54	74	74	450	60	260	1.0

2/7/79 Sheet #2 of Test 2

POINT # / POINT #	DISTANCE FROM PORT (in.)	TIME	GAS METER VOLUME (ft^3)	STACK VELOCITY HEAD- p (in. H_2O)	$\sqrt{\Delta_p}$	ORIFICE VELOCITY HEAD- H (in. H_2O)	GAS METER TEMP. T_m (°F) INLET	OUTLET	STACK TEMP.-T_s (°F)	IMPINGER TEMP. (°F)	BOX TEMP. (°F)	VACUUM (in. Hg)
11		:46	131.2	.005	.071	.17	7	5	455	60	260	0
1		10:00	132.1	.023	.152	.84	7	7	431	40	240	1.5
2		:03	133.5	.020	.141	.72	7	8	429	45	250	1.0
3		:06	134.9	.015	.122	.54	7	8	427	55	250	1.0
4		:09	136.7	.017	.130	.61	8	0	427	55	250	1.0
5		:12	138.0	.020	.141	.72	8	1	436	45	250	1.0
6		:15	139.4	.023	.152	.84	8	2	442	50	250	1.5
7		:18	140.9	.017	.130	.61	8	2	446	50	250	1.0
8		:21	142.3	.020	.141	.72	8	3	449	55	260	1.0
9		:24	143.7	.019	.138	.69	8	4	452	60	260	1.0
10		:27	145.1	.015	.122	.54	8	4	454	65	260	0
11		:30	146.0	.005	.071	.17	8	5	449	60	255	0
1		10:58	147.0	.013	.114	.47	7	9	434	40	240	0
2		11:01	148.2	.015	.122	.54	7	9	439	45	240	1.0
3		:04	149.5	.023	.152	.84	7	9	440	50	250	1.0
4		:07	150.9	.015	.122	.54	7	9	442	50	250	1.0
5		:10	152.2	.013	.114	.47	7	9	444	55	250	1.0
6		:13	153.4	.013	.114	.47	7	9	415	55	250	1.0
7		:16	154.5	.013	.114	.47	7	9	415	60	260	1.0

?/4/?? Sheet ? 3 of ? Test #2

PORT # / POINT #	DISTANCE FROM PORT (in.)	TIME	GAS METER VOLUME (ft^3)	STACK VELOCITY HEAD- p (in. H_2O)	$\sqrt{\Delta_p}$	ORIFICE VELOCITY HEAD- H (in. H_2O)	GAS METER TEMP. T_m (°F) INLET	OUTLET	STACK TEMP.-T_s (°F)	IMPINGER TEMP. (°F)	BOX TEMP. (°F)	VACUUM (in. Hg)
8		:19	155.7	.007	.084	.25	[illegible]	0	415	60	260	0
9		:22	156.6	.010	.100	.36	8	0	416	55	260	0
10		:25	157.6	.010	.100	.36	8	0	417	55	260	0
11		:28	158.6	.003	.055	.11	8	0	419	60	260	0
1		11.42	159.1	.017	.130	.61	7	9	437	45	240	1.0
2		:45	160.5	[illegible]	.141	.72	7	9	395	45	245	1.0
3		:48	161.9	.023	.152	.84	7	9	410	45	250	1.5
4		:51	[illegible]	.035	.187	1.20	7	9	415	45	260	[illegible]
5		:54	[illegible]	[illegible]	.187	1.20	7	9	[illegible]	[illegible]	[illegible]	[illegible]
6		[illegible]	[illegible]	.025	.158	.83	7	9	435	60	260	2.0
7		[illegible]	[illegible]	.030	.173	1.10	7	9	442	60	260	2.5
8		[illegible]	170.4	.017	.130	.61	7	9	440	60	260	1.0
9		[illegible]	171.7	.017	.130	.61	7	9	438	60	260	1.0
10		[illegible]	173.0	[illegible]	.130	[illegible]	7	9	447	60	260	1.0
11		[illegible]	174.	[illegible]	.055	.11	7	9	445	60	260	0
					5.604	27.180	77		432.			
				AVG.	.127	.618						

CH2M HILL
MONTGOMERY OFFICE
807 SOUTH McDONOUGH STREET
MONTGOMERY, ALABAMA 36104
205/834-2870

Plant U.S. STEEL
Date 3/7 Run # 2
Sampling Location UNDERFIRE STACK #2 BATTERY

Sampling Data
T_s = 892 °R; T_m = 537 °R
C_p = .84 ; $(\sqrt{\Delta p})_{avg}$ = .127
P_s = 28.99 in.Hg; M_s = 27.95 #/#-mole
A_s = 314.16 sq.ft.; V_m = 57.941 cu.ft.
H_2O (condensate) = 158 mls
H_2O (silica gel) = 15.5 gms
ΔH_{avg} = .62 in H_2O; P_b = 29.10 in Hg
Total particulate = 0.1082 grams

1. Calculate Stack gas velocity--

$V_s = 85.48\ C_p\ (\sqrt{\Delta p})avg\sqrt{\frac{T_s}{P_sM_s}}$

$V_s = 85.48\ (.84)(.127)\sqrt{\frac{892}{(27.95)(28.99)}}$

V_s = 9.57 fps

2. Calculate volume of water vapor in gas sample--

$V_{wstd} = (0.0474)\left(\begin{matrix}\text{mls } H_2O \\ \text{condensate}\end{matrix} + \begin{matrix}\text{grams } H_2O \\ \text{silica gel}\end{matrix}\right)$

$V_{wstd} = (0.0474)(158 + 15.5) = (0.0474)(173.5) =$ 8.224 cu.ft.

3. Calculate gas sample volume at standard conditions--

$V_{mstd} = (17.71)(V_m)\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m}\right)$ MCF = .993 V_m, = 57.535

$V_{mstd} = (17.71)(57.535)\left(\frac{29.10 + \frac{.62}{13.6}}{537}\right) = (1018.945)(.0543) =$ 55.329 cu.ft.

4. Calculate percent moisture in gas stream--

$B_{wo} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}} = \frac{8.224}{55.329 + 8.224} =$ .1294 = 12.94 %

5. Calculate stack gas volumetric flow rate, dry basis, std. conditions--

$Q_{stpd} = 3600(1-B_{wo})V_sA_s\ \frac{530}{T_s}\ \frac{P_s}{29.92}$

$Q_{stpd} = 3600\ (1-.1294)(9.57)(314.16)(530/892)(28.99/29.92) =$ 5,424,774 cu.ft./hr

6. Calculate grain loading--

grains/sdcf = (15.43)(grams)/V_{mstd} = (15.43)(.1082)/(55.329) = .0302

7. Calculate mass emission rate--

lbs/hr = (grains/stdcf)(Q_{stpd})(1.43 x 10^{-4})

lbs/hr = (.0302)(5,424,774)(1.43 x 10^{-4}) = 23.41

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205/834-2870

Client U.S. STEEL

Date 3/7 Run # 2

Sampling Location UNDERFIRE STACK #2 BATTERY

CALCULATION OF STACK GAS MOLECULAR WEIGHT (M_s)

Average Orsat Analysis (dry) — Moisture Content = 12.94 %

$\%CO_2$ = 5.0

$\% O_2$ = 11.5

%CO = —

$\% N_2$ = 83.5

Component	% Vol/100	X	Moisture Correction	X	Molecular Weight	=	Wt./Mole (wet base)
H_2O	.1294	x	1.0	x	18.0	=	2.33
CO_2	.050	x	.8706	x	44.0	=	1.92
O_2	.115	x	↓	x	32.0	=	3.20
CO	—	x	↓	x	28.0	=	—
N_2	.835	x	↓	x	28.2	=	20.50

Average Molecular Wt., wet basis (M_s) = 27.95 lb/lb-mole

Density of gas referred to air = $\frac{27.95}{28.95}$ = .9655

Gas density correction factor = $\sqrt{\frac{1.00}{.9655}} = \sqrt{1.0358}$ = 1.0177

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205/834-2870

Client U.S. STEEL

Date 3/7 Run# 2

Sampling Location UNDERFIRE STACK #2 BATTERY

CALCULATION OF ISOKINETIC RATE

$$I = \frac{T_s \left(1.667 \frac{min}{sec}\right) \left[\left(0.00267 \frac{in.\ Hg\text{-}cu.ft.}{ml - {}^\circ R}\right) V_1 + \frac{V_m}{T_m}\left(P_{bar} + \frac{\Delta H}{13.6}\right)\right]}{\theta V_s P_s A_n}$$

Where I = % of isokinetic sampling; T_s = Avg. stack temperature = 892 °R

V_1 = Total volume of liquid collected in impingers & silica gel = 173.5 ml

V_m = Gas sample thru dry gas meter @ meter conditions = 57.535 cu.ft.

T_m = Average dry gas meter temperature = 537 °R

P_{bar} = Barometric pressure @ sampling site = 29.10 in.Hg

ΔH = Average pressure drop across orifice = .62 in.H_2O

θ = Total sampling time = 132 min.

V_s = Stack gas velocity = 9.57 fps

P_s = Stack gas pressure = 28.99 in.Hg

A_n = Cross-sectional area of nozzle = .00136 sq.ft.

$$I = \frac{(892)(1.667)\left[(0.00267)(173.5) + \frac{57.535}{537}\left(29.10 + \frac{.62}{13.6}\right)\right]}{(132)(9.57)(28.99)(.00136)}$$

$$I = \frac{(1486.96)\left[(.4632) + (.1071)(29.15)\right]}{(49.805)}$$

$$I = \frac{(1486.96)[.4632 + 3.1220]}{(49.805)} = \frac{(1486.96)[3.5852]}{(49.805)} = \frac{5331.00}{49.805}$$

I = 107.03 = 107.0 % of isokinetic sampling

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205/834-2870

PLANT [illegible] RUN NUMBER #3
DATE March 7, 1979
TIME START 2:10 TIME END
MATERIAL PROCESSING RATE
SAMPLING LOCATION
WEATHER Sunny, Windy & Cool
AMBIENT TEMP. °F STACK PRESS. "Hg
BAROMETRIC PRESS. 29.10 "Hg WET BULB °F
DRY BULB °F MOISTURE %
DEW POINT °F

TEST CONDUCTED BY: Morgan/Stephens

NOZZLE DIA. .500 in.
PITOT CORR. FACTOR .84 (By design)
ORIFICE CORR. FACTOR 1.89
FILTER NUMBER
SILICA GEL NUMBER

READING	GAS METER	IMPINGER COND.
FINAL	237.962	362
INITIAL	175.378	200
NET	62.584	162

ORSAT READING

% CO_2	6.0		
% O_2	11.5		
% CO			
% N_2	83.5		

REMARKS: SEE RUN #2

SKETCH:
NOZZLE POST-TEST .501
.503
.499
.501

SILICA GEL wt. gain = 16.4g

DIA. 239.88 in.
AREA 314.16 ft^2

FINAL LEAK CHECK
SAMPLE TRAIN AT 5 in.Hg
FINAL
INITIAL
LEAK .008 /min.
PITOT
10" manometer IMPACT ✓ at 3 in.
STATIC ✓ at 3 in.

STACK INFORMATION
DISTANCE FROM DISTURBANCE: DOWNSTREAM 52.2 ft. UPSTREAM 242.3 ft.

PORT # / POINT #	DISTANCE FROM PORT (in.)	TIME	GAS METER VOLUME (ft^3)	STACK VELOCITY HEAD-Δp (in. H_2O)	$\sqrt{\Delta p}$	ORIFICE VELOCITY HEAD-Δp (in. H_2O)	GAS METER TEMP. T_m (°F) INLET	GAS METER TEMP. T_m (°F) OUTLET	STACK TEMP.-T_s (°F)	IMPINGER TEMP. (°F)	BOX TEMP. (°F)	VACUUM (in. Hg)
1	2:18	[illegible]		.020	.141	.72	7	2	414	40	240	1.0
2	:21	[illegible]	176.8	.020	.141	.72	7	3	419	60	250	1.0
3	:24	[illegible]	178.3	.023	.152	.84	7	3	432	60	250	1.0
4	:27	[illegible]	179.7	.025	.158	.90	7	4	426	60	250	1.5
5	:30	[illegible]	181.3	.025	.158	.90	7	6	420	60	250	1.5
6	:33	[illegible]	182.9	.023	.152	.84	7	7	417	65	250	1.0
7	:3[illegible]		184.4	.027	.164	.97	7	9	416	60	250	1.5
8	:3[illegible]		186.1	.023	.158	.84	8	0	416	55	250	1.0
9	:41		187.6	.025	.158	.90	8	2	412	50	250	1.5
10	:44		189.2	.025	.158	.90	8	3	409	50	250	1.5

3/7/79 SHEET #7 TEST #2

PORT # / POINT #	DISTANCE FROM PORT (in.)	TIME	GAS METER VOLUME (ft^3)	STACK VELOCITY HEAD- p (in. H_2O)	$\sqrt{\Delta p}$	ORIFICE VELOCITY HEAD- H (in. H_2O)	GAS METER TEMP. T_m (°F) INLET	OUTLET	STACK TEMP.-T_s (°F)	IMPINGER TEMP. (°F)	BOX TEMP. (°F)	VACUUM (in. Hg)
11		:41	190.8	.020	.141	.72	8	5	406	60	250	1.0
1		3:04	192.4	.023	.152	.84	8	5	431	55	250	1.8
2		3:07	193.9	.020	.141	.72	8	5	445	60	250	1.0
3		:10	195.4	.015	.122	.54	8	5	440	60	250	0
4		:13	196.7	.013	.114	.47	8	5	421	60	250	0
5		:16	197.9	.010	.100	.36	8	5	421	55	250	0
6		:19	199.0	.015	.122	.54	8	6	421	60	250	0
7		:22	200.2	.010	.100	.36	8	6	422	65	250	0
8		:25	201.6	.023	.152	.84	8	8	421	60	250	1.5
9		:28	203.1	.010	.100	.36	8	9	421	55	250	0
10		:31	204.2	.010	.100	.36	9	0	424	50	250	0
11		:34	205.1	.005	.071	.17	9	0	424	50	250	0
1		3:54	206.0	.015	.122	.54	8	9	424	50	250	1.0
2		3:57	207.3	.017	.130	.61	8	9	422	55	250	1.0
3		4:00	208.6	.017	.130	.61	8	7	426	60	250	1.0
4		:03	209.9	.020	.141	.72	8	9	423	60	250	1.8
5		:06	211.3	.025	.158	.90	8	9	424	65	250	2.0
6		:09	212.9	.020	.141	.72	8	9	427	65	260	2.0
7		:12	214.3	.013	.114	.41	8	9	434	60	250	1.1

3/7/79

Sheet # 2 of Test # [illegible]

PORT # / POINT #	DISTANCE FROM PORT (in.)	TIME	GAS METER VOLUME (ft^3)	STACK VELOCITY HEAD- P (in. H_2O)	$\sqrt{\Delta p}$	ORIFICE VELOCITY HEAD- H (in. H_2O)	GAS METER TEMP. T_m (°F) INLET	GAS METER TEMP. T_m (°F) OUTLET	STACK TEMP.-T_s (°F)	IMPINGER TEMP. (°F)	BOX TEMP. (°F)	VACUUM (in. Hg)
8		:15	215.5	.013	.114	.47	8	9	449	60	250	1.0
9		:19	217.0	.013	.114	.47	8	9	455	60	250	1.0
10		:21	218.6	.010	.100	.36	8	9	460	60	250	1.0
11		:24	220.0	.007	.084	.25	8	9	464	65	260	0
1		4:40	220.8	.025	.158	.92	8	9	450	60	260	2.0
2		:43	222.4	.020	.141	.72	8	9	422	60	250	1.0
3		:46	223.8	.015	.122	.55	8	8	429	60	250	1.0
4		:49	225.2	.023	.152	.84	8	9	430	60	250	2.0
5		:52	226.6	.030	.173	1.10	8	8	437	60	260	2.5
6		:55	228.3	.025	.158	.92	8	9	441	65	260	2.0
7		:58	229.9	.025	.158	.92	8	9	443	65	260	2.0
8		5:01	231.6	.025	.158	.92	9	0	445	65	260	2.0
9		:04	233.2	.027	.164	1.00	9	0	446	60	260	2.0
10		:07	234.8	.023	.152	.84	9	1	448	60	260	2.0
11		:10	236.4	.013	.114	.47	9	1	449	65	260	1.5
					.135	.685	86		431			

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MONTGOMERY OFFICE

807 SOUTH McDONOUGH STREET
MONTGOMERY, ALABAMA 36104
205/834-2870

Plant U.S. STEEL

Date 3/7/79 Run # 3

Sampling Location UNDERFIRE STACK BATTERY #2

Sampling Data

$\bar{T}_s$ = 891 °R; $\bar{T}_m$ = 546 °R

C_p = .84 , $(\sqrt{\Delta p})_{avg}$ = .135

P_s = 28.99 in.Hg; M_s = 27.98 #/#-mole

A_s = 314.16 sq.ft.; V_m = 62.584 cu.ft.

H_2O (condensate) = 162 mls

H_2O (silica gel) = 16.4 gms

ΔH_{avg} = .685 in H_2O; P_b = 29.10 in Hg

Total particulate = .1277 grams

1. Calculate Stack gas velocity--

$$V_s = 85.48\ C_p\ (\sqrt{\Delta p})avg \sqrt{\frac{T_s}{P_s M_s}}$$

$$V_s = 85.48\ (.84)(.135)\sqrt{\frac{891}{(28.99)(27.98)}}$$

V_s = 10.16 fps

2. Calculate volume of water vapor in gas sample--

$$V_{wstd} = (0.0474)\left(\begin{matrix}\text{mls } H_2O \\ \text{condensate}\end{matrix} + \begin{matrix}\text{grams } H_2O \\ \text{silica gel}\end{matrix}\right)$$

$$V_{wstd} = (0.0474)(162 + 16.4) = (0.0474)\ (178.4) = 8.456 \text{ cu.ft.}$$

3. Calculate gas sample volume at standard conditions--

MCF = .993
V_m = 62.146

$$V_{mstd} = (17.71)(V_m)\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m}\right)$$

$$V_{mstd} = (17.71)(62.146)\left(\frac{29.10 + \frac{.685}{13.6}}{546}\right) = (1100.605)(.0534) = 58.772 \text{ cu.ft.}$$

4. Calculate percent moisture in gas stream--

$$B_{wo} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}} = \frac{8.456}{58.772 + 8.456} = .1258 = 12.58\ \%$$

5. Calculate stack gas volumetric flow rate, dry basis, std. conditions--

$$Q_{stpd} = 3600(1-B_{wo})V_s A_s \frac{530}{T_s}\ \frac{P_s}{29.92}$$

$$Q_{stpd} = 3600\ (1-.1258)(10.16)(314.16)(530/891)(28.99/29.92) = 5,789,522 \text{ cu.ft./hr}$$

6. Calculate grain loading--

grains/sdcf = (15.43)(grams)/V_{mstd} = (15.43)(.1277)/(58.772) = .0335

7. Calculate mass emission rate--

lbs/hr = (grains/stdcf)(Q_{stpd})(1.43 x 10^{-4})

lbs/hr = (.0335)(5,789.5)(1.43 x 10^{-4}) = 27.76

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807 SOUTH McDONOUGH STREET
MONTGOMERY, ALABAMA 36104
205/834-2870

Client U.S. STEEL

Date 3/7 Run # 3

Sampling Location UNDERFIRE STACK #2 BATTERY

CALCULATION OF STACK GAS MOLECULAR WEIGHT (M_s)

Moisture Content = 12.58 %

Average Orsat Analysis (dry)

%CO_2 = 5.0

% O_2 = 11.5

%CO = —

% N_2 = 83.5

Component	% Vol/100	X	Moisture Correction	X	Molecular Weight	=	Wt./Mole (wet base)
H_2O	.1258	x	1.0	x	18.0	=	2.26
CO_2	.050	x	.8742	x	44.0	=	1.92
O_2	.115	x	↓	x	32.0	=	3.22
CO	—	x	↓	x	28.0	=	—
N_2	.835	x	↓	x	28.2	=	20.58

Average Molecular Wt., wet basis (M_s) = 27.98 lb/lb-mole

Density of gas referred to air = $\frac{27.98}{28.95}$ = .9665

Gas density correction factor = $\sqrt{\frac{1.00}{.9665}}$ = $\sqrt{1.0347}$ = 1.0172

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Client U.S. STEEL

Date 3/7 Run# 3

Sampling Location UNDERFIRE STACK #2 BATTERY

CALCULATION OF ISOKINETIC RATE

$$I = \frac{T_s \left(1.667 \frac{min}{sec}\right) \left[\left(0.00267 \frac{in.\ Hg-cu.ft.}{ml - °R}\right) V_1 + \frac{V_m}{T_m}\left(P_{bar} + \frac{\Delta H}{13.6}\right)\right]}{\theta V_s P_s A_n}$$

Where I = % of isokinetic sampling

T_s = Avg. stack temperature = 891 °R

V_1 = Total volume of liquid collected in impingers & silica gel = 178.4 ml

V_m = Gas sample thru dry gas meter @ meter conditions = 62.146 cu.ft.

T_m = Average dry gas meter temperature = 546 °R

P_{bar} = Barometric pressure @ sampling site = 29.10 in.Hg

ΔH = Average pressure drop across orifice = .685 in.H_2O

θ = Total sampling time = 132 min.

V_s = Stack gas velocity = 10.16 fps

P_s = Stack gas pressure = 28.99 in.Hg

A_n = Cross-sectional area of nozzle = .00136 sq.ft.

$$I = \frac{(891)(1.667)\left[(0.00267)(178.4) + \frac{62.146}{546}\left(29.10 + \frac{.685}{13.6}\right)\right]}{(132)(10.16)(28.99)(.00136)}$$

$$I = \frac{(1485.297)\left[(.4763) + (.1138)(29.15)\right]}{(52.876)}$$

$$I = \frac{(1485.297)[.4763 + 3.3173]}{(52.876)} = \frac{(1485.297)[3.7936]}{(52.876)} = \frac{5634.578}{52.876}$$

I = 106.56 = 106.6 % of isokinetic sampling

APPENDIX C

CALIBRATIONS

Nutech CORPORATION

(919) 682-0402

CALIBRATION SHEET

MODEL 201

SERIAL 81-16

CUSTOMER CH2M Hill

DATE 1-3-79

BAROMETRIC PRESSURE, P_B 30.01

RUN #	1	2	3	4	5	6	7
ORIFICE SETTING, ΔH	.5		1.5		2.5		5.0
FINAL READING (TEST)	53.235		50.432		58.422		67.758
INITIAL READING (TEST)	51.310		47.065		54.163		64.210
VOLUME, V_T	1.925		3.367		4.259		3.548
TEMP, T_T	72		73		72		70
FINAL READING (BOX)	145.160		142.313		150.434		159.938
INITIAL READING (BOX)	143.202		138.919		146.103		156.334
VOLUME, V_B	1.958		3.394		4.331		3.604
TEMP, T_B	77		77		78.5		82
ELAPSED TIME, θ	5		5		5		3
ΔH_a	1.87		1.849		1.90		1.95
γ	.991		.995		.99		.995

$$\Delta H_a = \frac{(0.0317)\Delta H}{P_B(T_B + 460)} \left[\frac{(T_T + 460)}{V_T}\theta\right]^2 \qquad \gamma = \frac{V_T\,(P_B)\,(T_B + 460)}{V_B\left(P_B + \frac{\Delta H}{13.6}\right)(T_T + 460)}$$

CALIBRATION PERFORMED BY S. Bramlay

2-76

2806 Check Road Durham, N.C. 27704 P.O. Box 12425 Research Triangle Park, N.C. 27709

EXAMPLE

POST METER CALIBRATION FORM – U.S. STEEL, #2 COKEOVEN UNDERFIRE STACK

Date 3/15/79 Box No. NUTECH

P_{bar} = 30.12 in. Hg Calibrated by A. TODD

Orifice Manometer Setting ΔH (in. H_2O)	Δ wtm (in. H_2O)	Gas Volume Wet Test Meter		Gas Volume Dry Gas Meter		Temperature Wet Test Meter		Avg. Temp. Dry Gas Meter	
		Initial	Final	Initial	Final	Initial	Final	~~Inlet~~ Initial	~~Outlet~~ Final
(.[illegible]6) 0.7	1.0	0	8	245.600	253.882	68	68	74	88
(.986) 0.7	1.0	0	8	253.882	262.336	68	68	88	97
(.[illegible]4) 0.7	1.0	0	8	262.336	270.941	68	68	97	105

Pump must be operated for at least 15 minutes at each ΔH setting (.5, 1, 1.5, 2 and 3)

T_{dgm} = average temperature of dry gas meter (inlet and outlet) + 460°F

T_{wtm} = average temperature of wet test meter + 460°F

$$P_{wtm} = P_{bar} - \frac{\Delta wtm}{13.6}$$

$$P_{dgm} = P_{bar} + \frac{\Delta H}{13.6}$$

MCF = .985

at Avg. ΔH of 0.7" & 2.7" Vacuum

Δwtm = pressure on wet test meter in inches of H_2O

Y = meter calibration factor

28.316 = conversion factor when using a wet test meter calibrated in liters

Calculations

$$Y = \frac{(\text{wet final} - \text{wet initial})(T_{dgm})(P_{wtm})}{(\text{dry final} - \text{dry initial})(28.316)(T_{wtm})(P_{dgm})}$$

or (1)

$$\overline{Y} = \frac{\Sigma Y}{5}$$

Meter Tolerance = 1.00 ± 0.01

If the meter calibration factor is not within the allowable tolerance, the calibration factory Y may be used to mathematically correct the gas meter dial readings to the proper values instead of physically adjusting the dry gas meter dials to correspond to the wet test meter readings.

CALIBRATION FORM A
(Must Be Included With Field Data Sheet)

Gauge	Average Test Condition Temperature	Gauge Reading	Reference Reading	Difference
Impinger (Pre)	65	70	71	1
Meter In (Pre) / Meter Out (Pre)	80	72	71	1
Filter Heated Area (Pre)	250	210	212	2
Stack (Post)	431	433	214 °C 417	16°

Post Test	Run 1	Run 2	Run 3
Train Leak Rate	.005	.011	.008

Pre Test (Answer Yes or No)

Pitot Leak Check (ok) CHECKED ON 10" GAUGE PRIOR TO TESTS (1/4" GAUGE USED FOR TEST

Orsat Leak Check Fyrite USED

Metering System Leak Check ✓

Barometer Calibrated ✓

Sample Bag Leak Check (if used) NA

Signature Bill Morgan Title Team Leader Date 3/12/79

*Note - 13' Pitot tube factor .84 By Design

Calibration data for dry gas meter, orifice, nozzle, pitot, and differential pressure gauge (if other than manometer) must be available for inspection at the time of the test and must be included in the stack test report.

JEFFERSON COUNTY DEPARTMENT OF HEALTH
BUREAU OF ENVIRONMENTAL HEALTH
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Name of Company: U.S. Steel

Address: Fairfield, Ala.

Location [1]: 0 9

Permit Number [3]:

Type of Source: underfiring stack #2

Type of Fuel: Coke Gas

Sky Condition: Clear

Observation Point: NE of Stack

Stack Height: 200

Distance from Stack: 700'

Wind Speed: 5 MPH

Wind Direction: Northerly

Color of Smoke: White

Observation Began: 13:03

Observation Ended: 14:03.

Violation Observed [13]: ☐ (if YES, X)

Notice Issued [14]: ☐ Number [15]:

Minutes Exceeding 20% Opacity [20]: 0 0

Minutes Exceeding 60% Opacity [22]: 0 0

Observer: [illegible] [24]: 2 3

Time Analysis (1/4 Hr. increments) [26]: 0 4

Date [28]: 1 3 0 6 7 9

Id [79]: V E

(Record all Remarks or Comments on back)

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

JEFFERSON COUNTY DEPARTMENT OF HEALTH
BUREAU OF ENVIRONMENTAL HEALTH
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Name of Company U. S. Steel

Address Fairfield, Ala.

Location (1) 09

Permit Number (3)

Type of Source Underfiring Stack #2

Type of Fuel Coke Gas

Sky Condition Clear

Observation Point NE of Stack

Stack Height 200

Distance from Stack 700'

Wind Speed 5MPH

Wind Direction Northerly

Color of Smoke White

Observation Began 12:03

Observation Ended 13:02.

Violation Observed (13) ☐ (if YES, X)

Notice Issued (14) ☐ Number (15)

Minutes Exceeding 20% Opacity (20) 00

Minutes Exceeding 60% Opacity (22) 00

Observer Keith Witherspoon (24) 72

Time Analysis (1/4 Hr. increments) (26) 04

Date (28) 032671 Id (79) VE

(Record all Remarks or Comments on back)

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

8/77

JEFFERSON COUNTY DEPARTMENT OF HEALTH
BUREAU OF ENVIRONMENTAL HEALTH
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Name of Company U.S. Steel

Address Fairfield, Ala.

Location [1] 0 9

Permit Number [3]

Type of Source Underfiring Stack #2

Type of Fuel Coke Gas

Sky Condition Clear

Observation Point N of stack

Stack Height 200'

Distance from Stack 700'

Wind Speed [illegible]

Wind Direction N[illegible]

Color of Smoke Wh[illegible]

Observation Began 9:59

Observation Ended 10:59

Violation Observed [13] (if YES, X)

Notice Issued [14] Number [15]

Minutes Exceeding 20% Opacity [20] 0 0

Minutes Exceeding 60% Opacity [22] 0 0

Observer Keith Witherspoon [24] 3 2

Time Analysis (1/4 Hr. increments) [26] 0 4

Date [28] 0 3 0 6 7 9   Id [79] V E

(Record all Remarks or Comments on back)

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

JEFFERSON COUNTY DEPARTMENT OF HEALTH
BUREAU OF ENVIRONMENTAL HEALT
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Name of Company U. S. Steel

Address Fairfield Ala

Location (1) 09

Permit Number (3)

Type of Source [illegible] #2

Type of Fuel C. F. Gas

Sky Condition Clear

Observation Point N of Stack

Stack Height 200'

Distance from Stack 500'

Wind Speed 5-10 MPH

Wind Direction Northerly

Color of Smoke White

Observation Began 15:09

Observation Ended 16:09

Violation Observed (13) ☐ (if YES, X)

Notice Issued (14) ☐ Number (15)

Minutes Exceeding 20% Opacity (20) 00

Minutes Exceeding 60% Opacity (22) 00

Observer [illegible] (24) [illegible]2

Time Analysis (1/4 Hr. increments) (26) 04

Date (28) 030679 Id (79) VE

(Record all Remarks or Comments on back)

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

JEFFERSON COUNTY DEPARTMENT OF HEALTH
BUREAU OF ENVIRONMENTAL HEALTH
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Name of Company U. S. Steel

Address Fairfield, Ala.

Location (1) 0 9

Permit Number (3)

Type of Source [illegible] stack #2

Type of Fuel [illegible]

Sky Condition Partly Sunny

Observation Point [illegible]

Stack Height 200'

Distance from Stack 500'

Wind Speed 5 MPH

Wind Direction Northwest

Color of Smoke Black

Observation Began 1500

Observation Ended 16:00.

Violation Observed (13) ☐ (if YES, X)

Notice Issued (14) ☐ Number (15)

Minutes Exceeding 20% Opacity (20) 0 0

Minutes Exceeding 60% Opacity (22) 0 0

Observer [illegible signature] (24) [illegible]

Time Analysis (1/4 Hr. increments) (26) 0 4

Date (28) 0 3 0 7 7 9 Id (79) V E

(Record all Remarks or Comments on back)

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

METHOD 5 SOURCE TEST FOR PARTICULATE

Todays Date MARCH 4, 1980

Company US STEEL Date of Test 10-10-79

Location FAIRFIELD, AL Run No. 2

Test Performed on (stack, boiler, etc.) #2 COKE UNDERFIRE STACK

ENTER		PRESS	ALTERNATE PRESS
.138	AVG $\sqrt{P}$ Calculator prints entry.	A	A
1.66	ΔH Calculator prints entry.	R/S	SBR 008
52.2	Tm-meter temperature °F Calculator prints entry and absolute temperature.	R/S	SBR 012
373	Ts-stack temperature °F Calculator prints entry and absolute temperature.	R/S	SBR 022
.84	Cp-pitot tube co-efficient Calculator prints entry.	R/S	SBR 032
132	θ minutes in run Calculator prints entry.	R/S	SBR 036
.625	DIAM NOZZLE IN INCHES Calculator prints entry and nozzle area.	R/S	SBR 040
	OR nozzle area in square feet Calculator prints entry.	SBR 052	SBR 052
29.5	Pbar-barometric pressure in inches in mercury Calculator prints entry.	R/S	SBR 056
	Ps-pressure of stack in inches of water. Calculator prints entry and absolute temperature.	R/S	SBR 060
29.30	OR absolute pressure of stack in inches of mercury Calculator prints entry.	SBR 070	SBR 070
239.88	DIAM STACK IN INCHES Calculator prints entry and area in square feet	R/S	SBR 074
	OR-area of stack in square feet Calculator prints entry.	SBR 086	SBR 086
1	MM BTU/HR(enter best estimates available or enter 1 and disregard calculated result.) Calculator prints entry.	R/S	SBR 090
9500	F. FACTOR DSCF/MM BTU (Federal Register 60.45, laboratory factor, or enter 9500 and disregard calculated results). Calculator prints entry.	R/S	SBR 094

ENTER		PRESS
261.4	Total milliliters of water (water plus silica gel) Calculator prints entry and volume of water vapor at standard conditions.	B
.1814	Total grams particulate collected (Subtract blank weight) Calculator prints out entry.	C
98.841	Total volume gas metered (less allowed leaks and gas lost at filter changes) Calculator prints entry.	D

ENTER		PRESS
5	% CO_2 Calculator prints entry.	E
11	% O_2 Calculator prints entry.	R/S
0	% CO Calculator prints entry.	R/S
84	% N_2 Calculator prints entry and molecular weight dry.	R/S

0.138
1.66
52.2
512.2
373.
833.
0.84
132.
0.625
.0021305289
29.5
29.3
239.88
313.8451846
1.
9500.

261.4
12.304098

0.1814

98.841

5.
11.
0.
84.
29.24

100.84 V/M DSCF
10.88 % WATER
28.02 M/S
9.98 V/S
11278845.99 ACFH
6237125.24 DSCFH
98.43 % EXCESS AIR

.0017989782 GM/CUFT
52.23 PPM
24.74 LB/HR
~~24.73644724 LB/MMBTU~~
~~0.037677013 LB/MMBTU(F FAC)~~

8904.875101 /
82.25753132 =
108.26 % ISOKINETIC

.0277582339 GR/SDCF

0.136
1.59
64.
524.
379.
839.
0.84
132.
0.625
.0021305289
29.5
29.4
239.88
313.8451846
1.
9500.

247.1
11.630997

0.1836

95.111

5.
11.
0.
84.
29.24

94.83 V/M DSCF
10.93 % WATER
28.01 M/S
9.86 V/S
11137475.70 ACFH
6132323.74 DSCFH
98.43 % EXCESS AIR

.0019361316 GM/CUFT
56.21 PPM
26.18 LB/HR
~~26.17501216 LB/MMBTU~~
~~.0485494925 LB/MMBTU(F-FAC)~~

8439.476801 /
81.50373004 =
103.55 % ISOKINETIC

.0298745092 GR/SDCF

METHOD 5 SOURCE TEST FOR PARTICULATE

Todays Date MARCH 4, 1980

Company US STEEL — Date of Test 10-10-79

Location FAIRFIELD, AL — Run No. 1

Test Performed on (stack, boiler, etc.) #2 COKE UNDERFIRE STACK

ENTER		PRESS	ALTERNATE PRESS
.136	AVG $\sqrt{P}$ Calculator prints entry.	A	A
1.59	ΔH Calculator prints entry.	R/S	SBR 008
64	Tm-meter temperature °F Calculator prints entry and absolute temperature.	R/S	SBR 012
379	Ts-stack temperature °F Calculator prints entry and absolute temperature.	R/S	SBR 022
.84	Cp-pitot tube co-efficient Calculator prints entry.	R/S	SBR 032
132	θ minutes in run Calculator prints entry.	R/S	SBR 036
.625	DIAM NOZZLE IN INCHES Calculator prints entry and nozzle area.	R/S	SBR 040
	OR nozzle area in square feet Calculator prints entry.	SBR 052	SBR 052
29.5	Pbar-barometric pressure in inches in mercury Calculator prints entry.	R/S	SBR 056
	Ps-pressure of stack in inches of water. Calculator prints entry and absolute temperature.	R/S	SBR 060
29.40	OR absolute pressure of stack in inches of mercury Calculator prints entry.	SBR 070	SBR 070
239.88	DIAM STACK IN INCHES Calculator prints entry and area in square feet	R/S	SBR 074
	OR-area of stack in square feet Calculator prints entry.	SBR 086	SBR 086
1	MM BTU/HR(enter best estimates available or enter 1 and disregard calculated result.) Calculator prints entry.	R/S	SBR 090
9500	F. FACTOR DSCF/MM BTU (Federal Register 60.45, laboratory factor, or enter 9500 and disregard calculated results). Calculator prints entry.	R/S	SBR 094

ENTER		PRESS
247.1	Total milliliters of water (water plus silica gel) Calculator prints entry and volume of water vapor at standard conditions.	B
.1836	Total grams particulate collected (Subtract blank weight) Calculator prints out entry.	C
95.111	Total volume gas metered (less allowed leaks and gas lost at filter changes) Calculator prints entry.	D

ENTER		PRESS
5	% CO_2 Calculator prints entry.	E
11	% O_2 Calculator prints entry.	R/S
—	% CO Calculator prints entry.	R/S
84	% N_2 Calculator prints entry and molecular weight dry.	R/S

JEFFERSON COUNTY DEPARTMENT OF HEALTH
BUREAU OF ENVIRONMENTAL HEALTH
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Name of Company: U. S. Steel

Address: Fairfield, Ala.

Location [1]: 0 9

Permit Number [3]:

Type of Source: Underfiring Stack #2

Type of Fuel: Coke Gas

Sky Condition: Partly Sunny

Observation Point: N. of Stack

Stack Height: 200'

Distance from Stack: 500'

Wind Speed: 3 MPH

Wind Direction: NW

Color of Smoke: White

Observation Began: 14:00

Observation Ended: 15:00

Violation Observed [13]: ☐ (if YES, X)

Notice Issued [14]: ☐ Number [15]:

Minutes Exceeding 20% Opacity [20]: 0 0

Minutes Exceeding 60% Opacity [22]: 0 0

Observer: [illegible] [24]: 3 2

Time Analysis (1/4 Hr. increments) [26]: 0 4

Date [28]: [illegible] Id [79]: V E

(Record all Remarks or Comments on back)

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

JEFFERSON COUNTY DEPARTMENT OF HEALTH
BUREAU OF ENVIRONMENTAL HEALTH
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Name of Company [illegible]

Address [illegible]

Location (1) 01

Permit Number (3)

Type of Source [illegible]

Type of Fuel [illegible]

Sky Condition [illegible]

Observation Point [illegible]

Stack Height 200'

Distance from Stack 700'

Wind Speed 4 MPH

Wind Direction N[illegible]

Color of Smoke Black

Observation Began 10:00

Observation Ended 11:00

Violation Observed (13) (if YES, X)

Notice Issued (14) Number (15)

Minutes Exceeding 20% Opacity (20) 00

Minutes Exceeding 60% Opacity (22) 00

Observer [illegible] (24) [illegible]

Time Analysis (1/4 Hr. increments) (26) 04

Date (28) [illegible] Id (79) VE

(Record all Remarks or Comments on back)

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

8/77

JEFFERSON COUNTY DEPARTMENT OF HEALTH
BUREAU OF ENVIRONMENTAL HEALTH
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Name of Company: U S Steel

Address: [illegible] Ala

Location (1): 0 9

Permit Number (3):

Type of Source: [illegible]

Type of Fuel: [illegible] Gas

Sky Condition: Partly Cloudy

Observation Point: NE of Stack

Stack Height: 200'

Distance from Stack: 700'

Wind Speed: 4 MPH

Wind Direction: Northerly

Color of Smoke: Blue Black

Observation Began: 9:00

Observation Ended: 10:00

Violation Observed (13): ☐ (if YES, X)

Notice Issued (14): ☐ Number (15):

Minutes Exceeding 20% Opacity (20): 0 0

Minutes Exceeding 60% Opacity (22): 0 0

Observer: Keith [illegible] (24): 3 2

Time Analysis (1/4 Hr. increments) (26): 0 4

Date (28): 0 3 0 7 7 9

Id (79): V E

(Record all Remarks or Comments on back)

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

SOTDAT/STEEL LIBRARY SYSTEM

Report Title: Particulate Emission measurement on #2 Coke Oven Battery at United States Steel Corporation, Fairfield, AL

Plant and Location: USSC, Fairfield, AL

SCC: 30300306

Testing Date(s): 3/6-7/79

By Whom: CH2M Hill

Stack Test Review Attached: Yes

Reviewed By: EPA

Problems Seen by Reviewer: No

Confidentiality Status: ~~Co~~ Clear

If status is confidential, list confidential pages or sections:

Source of Determination of the Confidentiality Status:
2/1/83 Memo from J. Baskerville to M. Siegler.

Report Encoded By:

Date Encoded:

Form Numbers:

Comments:

REPORT ID: —

PLANT: U.S. Steel Corp.

LOCATION: Fairfield, AL

PROCESS OPERATION: Coke oven underfiring

PROCESS DATA? N

OTHER TEST DATA: —

COMMENTS (CONTROL SYSTEM): —

DATA:	PM10	TP	NO_2	SO_2	CO	PB	VOC
IN		23		12			
OUT							

Summary

SOTDAT/STEEL LIBRARY SYSTEM

Report Title:

Plant and Location: USSC/Fairfield

SCC: 30300306

Testing Date(s): 2-3/80

By Whom: Co.

Stack Test Review Attached:

Reviewed By:

Problems Seen by Reviewer:

Confidentiality Status:

If status is confidential, list confidential pages or sections:

Source of Determination of the Confidentiality Status:

Report Encoded By:

Date Encoded:

Form Numbers:

Comments:

Summary
2-3/80
Comb. Stack

United States Steel Corporation

J. K. PETERSON
MANAGER
ENVIRONMENTAL CONTROL—SOUTH

FAIRFIELD WORKS
P. O. BOX 599
FAIRFIELD, ALABAMA 35064

No process data

July 31, 1981

Director, Enforcement Division
U. S. Environmental Protection Agency
345 Courtland Street, NE
Atlanta, Georgia 30308

Health Officer
Jefferson County Department of Health
P. O. Box 2646
Birmingham, Alabama 35202

Director
Alabama Air Pollution Control Commission
645 South McDonough Street
Montgomery, Alabama 36130

Gentlemen:

In response to questions raised by members of your respective agencies at a meeting in January 1981, we submit the attached information on the Coke Plant.

Sincerely,

Attachments

COKE PLANT

The following table summarizes the recent history of all active coke batteries:

Battery No.	Idle Hot	Returned to Service	Heating Ceased
2	July 12, 1980	July 27, 1980	
5	June 28, 1980		October 19, 1980
6	May 17, 1980		July 10, 1980
9	August 23, 1980		

No final decision on the future of Batteries Nos. 5 and 6 has yet been made.

A. Coke Battery No. 2

Before addressing each area specifically, the following operating history (since the July 1980 "idle hot" period) is offered:

July 28 - Sept. 20, 1980	Three-turn operation pushing at 67 ovens/day. During this period, ceramic welding was used to make oven repairs August 26 - September 17. Ovens for repair were left empty on nights, repaired on days and charged back on evenings.
Sept. 21 - Nov. 29, 1980	Operated two turns per day 11:00 a.m. - 7:00 p.m. and 11:00 p.m. - 7:00 a.m. pushing at 57 ovens per day.
Nov. 30 - Jan. 5, 1981	Attempting to increase pushing schedule. Hampered by severe equipment problems, causing long delays in pushing and charging.
Jan. 6 - Feb. 2, 1981	Repairing ovens using ceramic welding. Ovens left empty on nights, repaired on days and charged back on evenings.
Feb. 3 - March 23, 1981	Pushing at 96 ovens per day. Operation is consistent with few delays.
March 24 - May 2, 1981	Increased pushing schedule to 102 ovens per day.
May 3 - June 24, 1981	Reduced schedule to 75 ovens per day due to coal strike.
June 25 - July 15, 1981	Increasing schedule to 96 ovens per day.

1. Dry Coal Charging

From startup on dry coal operations, three problem areas were evident:

(1) Seal between loading bin and larry hopper.
(2) Top of larry hoppers.
(3) Drop sleeves.

Efforts to correct these problems have been continuing, viz:

Sept. 1979	Temporary hopper covers installed.
Sept. 1979	Engineering drawings released for permanent hopper covers (butterfly valve) and inflatable seals.
July 1980	Butterfly valves and inflatable seals installed on both larries.
Oct. 1980	Inflatable seals removed from larry tops and installed on premeter telescopes to prevent damage by heat.
Dec. 1980	New water seal drop sleeves received.
Feb.-Mar. 1981	After extensive modifications, new water seal drop sleeves installed on 2 and 3 boots on both larries for evaluation. During evaluation, several problems were evident with the new design. These problems consisted of (1) Dust packing in the water sealed section, (2) The water seal itself was not adequate, and (3) Adequate pressure could not be exerted on the drop sleeve to make it seal against the battery top.
Apr.-May. 1981	Attempted to correct these problems by (1) Insuring that operators clean water seals twice per shift, (2) Installing guides on water seal drop sleeves to insure adequate clearance is maintained between sleeve and housing. Also add two more inches to depth of water seal, thereby insuring effective seal, and (3) Installing springs on drop sleeves to exert adequate pressure against battery top.

The current status of these problem areas is as follows:

(1) An adequate seal can be maintained during loading with the present inflatable seal. Due to close clearance between hoppers and telescopes, however, they are easily damaged. New inflatable seals with a longer expansion stroke are being purchased so the telescopes can be made stationary to eliminate the clearance problem. Seals are due October 1981. After installation, the larry car evacuation system and scrubber can be tested.

(2) The larry hopper covers satisfactorily prevent the leakage of dust. Problems exist, however, with hopper stress caused by the present actuation system and a positive method of identification for the cover position prior to and after loading. The system is being redesigned with installation to be complete January 1982.

(3) Fairfield Engineering is currently designing a new drop sleeve due to the high maintenance of the current water sealed boot.

2. Battery Maintenance

An observation was made at the subject meeting that overall emissions from the battery had increased since the idle hot period, apparently due to maintenance practices. The following reports acknowledge that there were some problems, but that persistent maintenance and repair efforts plus more consistent operation had restored the battery to its previous condition, prior to cutting back operations during the coal strike. As noted, these efforts are continuing.

a. Oven Repair

Ceramic welding repair of oven walls was employed in August 1980, and January 1981. A total of 80 walls were repaired in 41 ovens. Battery maintenance reports for this period are attached (Attachment 1). Since February 3, 1981, a steady improvement in visible emissions has been seen which is verified by the transmissometer readings. This improvement was due to (1) The oven repair program undertaken in August 1980 and in January 1981, (2) Higher operating schedule which is more conducive to carbon formation, and (3) A more consistent operation which insures retention of carbon in the ovens.

b. Oven Doors

After the idle hot period in July 1980, it was found that oven door plug deterioration had occurred which not only affects door sealing but also pushing emissions. It was decided then to repair or replace the damaged door plugs along with our current seal repair program for broken knives. The original oven door seals failed at the weld, and of the 126 doors, 111 have been replaced to date. Resulting improvements are verified by recent Jefferson County Observation Reports:

Date	Doors Leaking
12-2-80	7%
1-19-81	6%
3-11-81	3%
6-17-81	3.5%

c. Offtakes

(1) Goosenecks - In August 1980, the decision was made to test a water seal on the gooseneck joints on No. 2 Battery. Through observations, it was determined that the test was successful and work began on fabricating 114 such seals. A completion date of November 1, 1981, has been set for installation of this system. To date, 90 have been installed. Following are the most recent Jefferson County Observation Reports:

Date	Leaks
12-2-80	1
1-19-81	0
3-11-81	0
6-17-81	3

(2) Bases - Many cracks have developed in standpipe bases since battery startup. A program was implemented in January 1981, to correct this situation by welding. So far, this program has been unsuccessful due to the recurrence of the cracks after welding. Other methods of repair are being investigated, such as banding or complete elimination of the bases. Until a successful alternative has been found, extra labor will be used to minimize the emissions from these points.

(3) Standpipe Lids - Lids require constant attention by the operators. Although leaks in this area are not large, they mainly consist of small leaks like cigarette smoke. This requires the larry operator to continuously recheck all lids and take corrective action when leaks are sighted. Insuring that this requirement is fulfilled by each larryman is the best assurance of prevention of these leaks. We believe that the most recent inspection reports show that this requiement is being fulfilled.

Date	Leaks
12-2-80	30
1-19-81	2
3-11-81	9
6-17-81	6

3. Standpipe Lids During Pushing

Following is an opinion from USS Research on the effects of the position of standpipe caps during pushing:

- "Coke batteries charged with preheated coal are subject to considerable carbon buildup in the oven-opening entrance to the standpipe. If not removed on an every-cycle basis, the buildup will eventually block the foul-gas flow from the oven into the collector main and cause serious charging emissions and create a potential fire hazard. Carbon buildup is particularly rapid on a preheated coal-charged battery because the coal is hot and very fine and fluid. Thus, the coal level in the oven is difficult to control, huge volumes of foul gas are generated during charging, and, subsequently, many coal fines are swept up into the ascension pipe. With the standpipe caps up and coke in the oven, some drafting occurs which tends to remove only the lightest, fluffiest carbon. During the push, decarburizing air, flowing from the top of the pusher ram, removes most of the remainder of the carbon buildup. If the caps were down, the drafting would be eliminated, the decarburizing air would be less effective, the rate of carbon buildup would be significantly increased, the charging emissions would tend to increase, and workers would be required to manually remove carbon more frequently from the standpipe. Another effect of leaving the standpipe caps down during the push is the flow of hot gases that normally exit through the standpipe cap opening would be forced out through the door opening, thereby overheating the jambs, packing, buckstays, collector main, and collector supports. The additional heat, gases, and flames would be extremely dangerous to the pusher operator; would hasten the damage to the steel structure that supports the battery; would open up cracks between end flue bricks and the jambs; and increase door, jamb, and combustion-stack emissions.

"In summary, by keeping the standpipe cap closed during pushing, it is probable that carbon buildup in the standpipes will increase; steel structural life will be shortened; charging, door, jamb, and stack emissions will increase; and worker safety will be lessened. Because of the aforementioned problems, the past coke-plant practice in both the United States and Canada included pushing with the standpipe caps up, and is believed to be the current practice."

4. Pushing Emissions Control System

An accurate log of downtime of the push control car has been kept since July 1980, when Permit No. 4-07-0375-1102 was received; the utilization factor of the car, by month, is indicated below:

Month	% Utilization
August 1980	4*
September	32
October	56
November	86
December	57
January 1981	65
February	45
March	19**
April	0
May	0
June	30

*Dangerous to use car due to track failure; being repaired.
**Utilization was 87% before breakdown of car.

Examination of earlier maintenance logs suggests that similar levels of utilization have been attained since the system was put into service. There appear to be four (4) reasons for outages:

a. Breakdown (and repair) of mechanical and electrical systems.

b. Routine maintenance.

c. Modifications and improvements.

d. Single spot box problems (distortion, excessive loss of coke, etc.)

The first two are controllable, in part, by the establishment of a regular preventive maintenance schedule for the system (see Attachment 2). The third item is, of course, controllable and predictable. Fabrication of a new single spot box, incorporating a number of improvements that should increase stability and reliability, is scheduled to be completed by May 1982. In the interim, structural repairs will be made as necessary to keep the existing box operable (it was a failure of the box that caused the most recent extended outage).

[redacted]

The status of the preheater stack has been discussed in a recent letter to all parties.

B. COKE BATTERY NO. 9 COMBUSTION STACK

A summary of all tests run on Coke Battery No. 9 combustion stack is attached (Attachment 3). With one obvious exception, all tests were well above the 0.015 gr/DSCF LAER standard, including the March 31, 1981, test, which was run while the battery was "idle hot." The latter test implies that wall leakage is not the most significant factor, but that combustion may be.

The one significantly lower value was obtained in the midst of precipitator studies (discussed below). USS Research, who was conducting that study, examined plant operating records for the period from February 21 to March 27, 1980 (covers the period of the precipitator tests) in an attempt to determine the cause(s) for low and high readings during that period. Factors examined included the following:

1. Gas pressure, coke side and pusher side
2. Stack draft, coke side and pusher side
3. Waste heat temperature, coke side and pusher side
4. Gas volume fired
5. Gas temperature
6. Gas supply pressure
7. Stack-gas opacity
8. Ovens pushed
9. Coking time
10. Flue temperature, coke side and pusher side
11. Delays
12. Coke temperature
13. Patching program
14. Coal charged
15. Coal analyses
16. Coke oven gas analyses

17. Coke analyses

18. Logbook of heater

19. Various discussions with plant personnel

No correlation between operating parameters and low or high emissions could be made.

In February and March 1980, pilot plant evaluations of both wet and dry precipitators were performed; the objectives and testing programs were forwarded to you by my letter of March 4, 1980 (Attachment 4). A tabulation of test results is attached (Attachment 5). The results show that the wet system could not achieve an outlet loading of 0.015 gr/SCFD (full train). They also suggest that such an outlet loading may be achievable with the dry system; however, any such conclusion must be qualified in light of the variability of the inlet loadings during these tests.

In light of these data and other considerations, we believe that the LAER standard (0.015 gr/SCFD), as well as the need for a control device, needs to be redefined. This subject will be treated more extensively in a separate letter.

BATTERY MAINTENANCE REPORT

BATTERY NO. 2 QUARTER ENDING Sept 30, 198[illegible]

GAS OFFTAKE PIPING

Hydraulic Main Expansion Joint	Tightened	0	Repacked	0
Hydraulic Main	Repaired	0		
Damper Shaft Packing Gland	Tightened	1 (2 ...)	Repacked	0
Standpipe-Elbow Seal	Taped	456	Repacked	
Standpipe Base	Resealed	114	Replaced	0
Block	Welded	0	Replaced	0

BATTERY TOP

Charging Hole Castings	Resealed	114	Reset	0
Charging Hole Lids	Replaced	0		

BATTERY DOORS

Leveler Door Frames	Replaced	0		
Leveler Door Shutters	Adjusted	0	Replaced	0
Doors Pusher Side				
Plugs	Replaced	10		
Sealing Rings	Adjusted	0	Straightened	0
	Replaced	10		
Latching Mechanism	Adjusted	0		
Jamb Castings	Resealed	171	Reset	0
	Replaced	0	Welded	0
Buckstays	Replaced	0	Straightened	0
	Resealed	0		
Doors Coke Side				
Plugs	Replaced	12		
Sealing Rings	Adjusted	8	Straightened	0
	Replaced	8		
Latching Mechanism	Adjusted	0		
Jamb Castings	Resealed	342	Reset	0
	Replaced	0	Welded	0
Buckstays	Replaced	0	Straightened	0
	Resealed	0		

OVEN BRICKWORK

Oven Walls (Cracks & Spalls)	Resealed	41	Replaced	0
Gunbrick	Resealed	0	Replaced	0

LARRY DELAYS (30 Minutes or More) ____

STANDPIPES BLOCKED WITH COAL 2

OVEN STICKERS 0

BATTERY MAINTENANCE REPORT

BATTERY NO. 2 2 QUARTER ENDING Dec. 31 - 198

GAS OFFTAKE PIPING

Hydraulic Main Expansion Joint	Tightened	0	Repacked	0
Hydraulic Main	Repaired	0		
Damper Shaft Packing Gland	Tightened	0	Repacked	0
Standpipe-Elbow Seal	Tamped	560	Repacked	12
Standpipe Base	Resealed	114	Replaced	0
Elbow	Welded	0	Replaced	0

BATTERY TOP

Charging Hole Castings	Resealed	0	Reset	0
Charging Hole Lids	Replaced	0		

BATTERY DOORS

Leveler Door Frames	Replaced	0		
Leveler Door Shutters	Adjusted	0	Replaced	0
Doors Pusher Side				
Plugs	Replaced	0		
Sealing Rings	Adjusted	9	Straightened	0
	Replaced	9		
Latching Mechanism	Adjusted	0		
Jamb Castings	Resealed	218	Reset	0
	Replaced	0	Welded	0
Buckstays	Replaced	0	Straightened	0
	Resealed	31		
Doors Coke Side				
Plugs	Replaced	0		
Sealing Rings	Adjusted	7	Straightened	0
	Replaced	8		
Latching Mechanism	Adjusted	0		
Jamb Castings	Resealed	320	Reset	0
	Replaced	0	Welded	0
Buckstays	Replaced	0	Straightened	0
	Resealed	57		

OVEN BRICKWORK

Oven Walls (Cracks & Spalls)	Resealed	5	Replaced	0
Gunbrick	Resealed	0	Replaced	0

LARRY DELAYS (30 Minutes or More) ______

STANDPIPES BLOCKED WITH COAL 4

OVEN STICKERS 1

BATTERY MAINTENANCE REPORT

BATTERY NO. 2 QUARTER ENDING March 31

GAS OFFTAKE PIPING				
Hydraulic Main Expansion Joint	Tightened	1	Repacked	0
Hydraulic Main	Repaired	0		
Damper Shaft Packing Gland	Tightened	0	Repacked	0
Standpipe-Elbow Seal	Tamped	870	Repacked	67
Standpipe Base	Resealed	228	Replaced	0
Elbow	Welded	0	Replaced	0
BATTERY TOP				
Charging Hole Castings	Resealed	228	Reset	0
Charging Hole Lids	Replaced	0		
BATTERY DOORS				
Leveler Door Frames	Replaced	0		
Leveler Door Shutters	Adjusted	0	Replaced	0
Doors Pusher Side				
Plugs	Replaced	11		
Sealing Rings	Adjusted	21	Straightened	0
	Replaced	11		
Latching Mechanism	Adjusted	0		
Jamb Castings	Resealed	420	Reset	0
	Replaced	0	Welded	0
Buckstays	Replaced	0	Straightened	0
	Resealed	28		
Doors Coke Side				
Plugs	Replaced	13		
Sealing Rings	Adjusted	3[illegible]	Straightened	0
	Replaced	13		
Latching Mechanism	Adjusted	0		
Jamb Castings	Resealed	550	Reset	0
	Replaced	0	Welded	0
Buckstays	Replaced	0	Straightened	0
	Resealed	37		
OVEN BRICKWORK				
Oven Walls (Cracks & Spalls)	Resealed	39	Replaced	0
Gunbrick	Resealed	0	Replaced	0
LARRY DELAYS (30 Minutes or More)				
STANDPIPES BLOCKED WITH COAL		4		
OVEN STICKERS		17		

1 SPOT SCRUBBER CAR, & QUENCHER CAR

PREVENTIVE MAINTENANCE WORK ORDER

OUT OUT OUT

ITEM	PROPERTY NO.	DATE ISSUED
PREVENTATIVE MAINTENANCE		

SERIAL NO.	DEPARTMENT	LOCATION		DATE COMPLETED

NOTE: DO ENCIRCLED OPERATION NUMBERS ONLY

OPER. NO.	FREQ CODE	PREVENTIVE MAINTENANCE OPERATION	✓ - OK X - SEE NOTE	STANDARD
M	2	Scrubber - SECTION 1		
m1		Pumps- check out while in operation		
a		Pump packing .		
b		Pump pressure.		
m2	2	Scrubber fan - check out while in operation.		
a		Vibratian		
b		Bearings		
c		Check all seals.		
d		Check damber actuators for operation.		
e		Check dump valves for operation.		
		Note any items that need attention to be repaired		
		when set out,		
		SECTION 2		
m3		Check all flange bolts.		
a		Check spray nozzles, for plugging or wear.		
b		Inspect silicone carbide bricks, for wear & chipping		
c		Check pump inlet valves for operation.		
d		Make all repairs as noted in Section 1		
m4		AIR COMPRESSOR		
a		Clean filters.		
b		Check oil & coolant, add as needed.		
c		Check compressor & motor base.		
d		Set pressure @ 125 PSI.		
e		Check V-belts, adjust tension as needed.		
m5	2	Hydraulics		
a	2	Check fluid level, add as needed.		
b	2	Check unloading valve function, set @ 1800 PSI.		
c	4	Change filters.		
m5		BRAKES		
a	2	Replace any shoe worn past half its original thickness.		
b		Adjust shoes to 1/4 " of wheels.		
c		Inspect cylinders, and hoses- Replace if any sign		
		of wear or leaks.		
d		Check operation		
e		Inspect linkages & tie rods, for wear or bends.		

FREQ. CODE	
1	ANNUAL
2	SEMI-ANNUAL
4	QUARTERLY
6	BI-MONTHLY
12	MONTHLY
26	SEMI-MONTHLY

PREV. MAIN. SCHEDULE

MISC.	LUB.	ELEC.	MECH.	WEEK
				2
				4
				6
				8
				10
				12
				14
				16
				18
				20
				22
				24
				26

COMPLETED BY:
BADGE ____________

DATE ____________

PREVENTIVE MAINTENANCE W K ORDER

ITEM	PROPERTY NO.	DATE ISSUED
1- SPOT SCRUBBER CAR & QUENCHER CAR.		

SERIAL NO.	DEPARTMENT	LOCATION		DATE COMPLETED

NOTE: DO ENCIRCLED OPERATION NUMBERS ONLY

OPER. NO.	FREQ. CODE	PREVENTIVE MAINTENANCE OPERATION	V - OK X - SEE NOTE	STANDA
Mc 6	2	Quencher car.		
a		BOX- Check for buckled, bent, warped plates, cylinder mounts, bearings and bushings.		
b		Truck wheels and bearings.		
c		Flexable duct.		
d		Check couplings and safety chains.		
e		Check truck springs..		
m-7	2	Scrubber car drive		
a		Check drive trucks, wheels and bearings.		
b		Drive couplings, and brakes.		
c		Check motor & reducer base bolts.		
e		Check drive unit springs, adjust as needed.		
L- 1	2	LUBRICATION		
a		Grease fan bearings		
c		Grease all other points.		
L-2	4	LUBE.		
a		Grease truck wheel bearings.		
b		Grease all couplings.		

FORM 5-101

SUMMARY OF NO. 9 BATTERY STACK TESTS

Date & Run Number		Temp. °F	H_2O %	Flow Rate DSCFM	Loading Gr/SCFD Front	Back	Total	Loading Lb/Hr
4-24-79	1	509	13.5	54,226	.106	-	-	
	2	506	15.5	49,341	.251	-	-	
	3	516	14.5	55,290	.093	-	-	
	Average	510	14.5	52,953	.150	-	-	68.1
6-7-79	1	518	16.4	39,689	.055	.022	.076	
	2	474	14.3	44,418	.052	.023	.075	
	3	555	15.7	38,249	.062	.018	.080	
	Average	516	15.5	40,785	.056	.021	.077	19.6
6-18-79	1	527	15.6	38,025	.065	.018	.083	
	2	460	11.4	40,751	.051	.019	.069	
	3	510	16.2	38,909	.055	.013	.068	
	4	513	15.1	36,002	.068	.040	.108	
	Average	503	14.6	38,422	.060	.023	.082	19.8
8-8-79	1	493	15.7	35,456	.071	.046	.117	
	2	488	16.1	35,742	.067	.053	.120	
	3	512	15.8	30,000	.069	.096	.165	
	Average	498	15.9	33,733	.069	.065	.134	18.5
3-4-80	1	521	15.4	72,900	.0122	-	-	
	2	522	15.1	70,900	.0084	-	-	
	Average	522	15.3	71,900	.0103	-	-	6.4
4-28-80	1	497	16.3	31,987	.088	.016	.105	
	2	493	16.3	37,651	.059	.013	.072	
	3	502	16.5	36,788	.066	.017	.083	
	Average	497	16.4	35,475	.071	.016	.086	21.6
3-31-81	1	302	5.3	45,001	.0303	-	-	
(Idle Hot)	2	301	4.1	47,709	.0516	-	-	
	Average	302	4.7	46,355	.0410	-	-	16.4

ATTACHMENT 4

United States Steel Corporation

J. K. PETERSON
MANAGER
ENVIRONMENTAL CONTROL—SOUTH

FAIRFIELD WORKS
P. O. BOX 599
FAIRFIELD, ALABAMA 3506-

March 4, 1980

Mrs. V. M. Hampton
Air Pollution Control Engineer
Jefferson County Department of Health
P. O. Box 2646
Birmingham, Alabama 35202

Dear Mrs. Hampton:

Responsive to your letter of February 21, 1980, I have already furnished you with three copies each of permit applications for the pilot wet and dry electrostatic precipitators (ESP), plus one set of prints for this installation (additional copies can be furnished if required) on Coke Battery No. 9.

The Settlement Agreement of March 31, 1978, required USSC to conduct a pilot study of a wet ESP and, subsequently, to install a control device on the combustion stack of Coke Battery No. 9, if compliance with the emission standard (0.015 gr/SCFD, front half) could not be demonstrated within nineteen months of completion of the battery rebuild. While that nineteen-month period has not yet expired, and while USSC has petitioned Jefferson County, the State of Alabama and EPA to modify these provisions into accordance with the Mon Valley Consent Decree provisions (which would remove the requirement for a wet ESP pilot study), USSC nevertheless finds it expedient at this time to conduct side-by-side evaluations of wet and dry ESP.

The evaluations are to be performed by USSC Research; the objectives and testing programs are attached for your review. We will be happy to share the final results of both evaluations with you.

Please advise me if there are any questions or if additional information is required.

Sincerely,

Attachment

cc: Mr Sanford W. Harvey, Jr.
Mr. James W. Cooper

PROGRAM FOR PILOT-PLANT EVALUATIONS OF WET AND DRY ELECTROSTATIC PRECIPITATORS FOR COKE-OVEN-BATTERY STACK-GAS-PARTICULATE CONTROL

Wet Electrostatic Precipitator

Object

1. To install and evaluate a wet electrostatic precipitator (ESP) to determine its ability to reduce coke-oven-battery stack-gas-particulate concentration to no greater than 0.015 grain per standard cubic foot, dry (gr/scf (dry)) as measured by the EPA full train.

2. To determine the corrosive and scaling tendencies of the recycled and blowdown water.

3. To determine the content of controlled water pollutants in blowdown water and the amount of blowdown water.

4. To establish any operating or maintenance problems associated with the use of wet ESP's or with the particular brand of ESP used in the study.

Testing Program

Phase I Operate the pilot wet ESP at a recommended liquid-to-gas (l/g) ratio and at three different levels of gas space velocity. Perform inlet and outlet tests for particulate matter (3 runs) at each level. These data will permit determination of optimum space velocity to achieve a desired particulate concentration.

Phase II Operate the pilot plant for approximately two weeks at conditions established in Phase I. Perform inlet and outlet tests at least twice during this period. This period will indicate the ability of the ESP to sustain required efficiency and will indicate operating and maintenance problems associated with the type of unit and particular unit tested.

Additional Information

1. During the above operating phases, obtain grab samples for analytical determination of pH and oil and grease content. Obtain composite samples for determination of suspended solids, dissolved solids, ammonia, total cyanide, amenable cyanide, phenol, SO_4, Ca, Mg, fluorides, and on at least one sample, determine all priority pollutants.

2. Expose corrosion cupons to the gas-conditioning and precipitator-water recycle systems to determine the most economical materials from which to construct the water-handling systems if a commercial system is installed.

3. Determine the rate of buildup of scale-forming ions to predict the recycle ratio at which scale may be expected to form. Examine the pilot equipment for scale buildup before and after use.

4. Determine the effectiveness of removal of sulfates from front- and back-catch particulates by analyzing inlet- and outlet-stack particulates for sulfate content.

5. Determine the composition, physical nature, and leachability of sludges decanted from the recycled-water systems. Analyze the leachate for As, Ba, Cd, Cr, Pb, Hg, Se, Ag, F, CN, NH_4, phenol, and any organic priority pollutants found in the water recycle system in significant amounts.

Dry Electrostatic Precipitator

Object

1. To install and evaluate a dry ESP to determine its ability to reduce coke-oven-battery stack-gas particulate concentration to a value no greater than 0.02 gr/scf (dry), as measured by the EPA train front half. This evaluation must be made on flue gas from a coke battery using undesulfurized coke-oven-gas fuel.

2. Determine the corrosive effect of the flue gas on various candidate materials of construction.

3. Determine the chemical composition, physical properties, and leachability of the dry dust collected by the dry ESP.

4. Obtain data to assist in the sizing of a commercial dry ESP.

5. Determine the effect of operating time on precipitator-collection efficiency of dry ESP's in general, and on the particular brand tested.

Testing Program

Phase I — Operate the dry ESP pilot-plant unit at three levels of space velocity. Perform inlet and outlet tests for particulate matter (3 runs) at each level. These data will establish whether the dry ESP can attain the 0.02 gr/scf (dry) desired loading and the relationship between space velocity and outlet loading. The dry ESP should be operated for at least three 24-hour days, prior to initial testing, to establish equilibrium dust accumulation on ionizing wires and collection plates.

Phase II — Operate the pilot plant for approximately two weeks at conditions established as optimum in Phase I. Perform inlet and outlet-stack tests at least twice during this period. This will indicate the ability of the dry ESP to sustain the desired particulate-removal efficiency

Additional Information

1. Install corrosion specimens in the dry ESP ductwork to establish the corrosion rate of various alloys to permit selection of the most economical material of construction for a commercial dry ESP.

2. Obtain samples of dry dust and analyze for ash, loss on ignition, particle size, and total noncarbonate carbon. Also, determine water extractable SO_4, NH_4, and acidity as H_2SO_4. Perform a leachate test on a sample of ESP dust and analyze leachate for As, Ba, Cd, Cr, Pb, Hg, Se, Ag, F, CN, NH_4, phenol and any organic priority pollutants found in the water from the wet ESP tests in significant amounts.

3. Submit a sample of dry ESP dust for determination of electrical resistivity at conditions of temperature and humidity found in the coke-battery stack.

Time Schedule

It is anticipated that the field testing and evaluation program will require four to six weeks for both precipitators after completion of installation.

Installation

It is suggested that the two pilot units be connected to obtain hot flue gas from a single flue outlet. This must be split and dampers provided so that either or both units can be operated. Provisions must be made to measure the flow and perform isokinetic sampling at the common pilot-plant inlet. Efficient insulation (at least 3 inches) should be applied to all ductwork leading to the dry ESP and to the gas contact parts of the dry ESP. The wet ESP, ductwork to the wet ESP only, and ductwork from both ESP's need not be insulated.

SUMMARY OF ELECTROSTATIC PRECIPITATOR TEST
NO. 9 COKE BATTERY STACK

	Date 1980	Run Number	Space Velocity	Grain Loading Gr/DSCF Inlet Front	Outlet Total	Outlet Front
Dry	2-21	1	2.9	.0076	.0107	(.0106)
	2-21	2	2.6	.0163	-	.0062
	2-22	3	3.4	.0102	-	.0052
		Average	3.0	.0114	.0107	.0073
Dry	2-26	4	6.0	.0109	.0141	.0064
	2-27	5	6.4	.0207	.0116	.0073
	2-27	6	6.0	.0141	.0103	.0087
		Average	6.1	.0152	.0120	.0075
Dry	2-28	7	4.2	.0427	.0146	.0135
	2-28	8	4.7	.0383	.0169	.0140
	2-29	9	5.1	.0414	.0230	.0221
		Average	4.7	.0408	.0182	.0165
Dry	3-14	1	6.5	.0486	-	.0046
	3-14	2	6.4	.0604	-	.0333
	3-16	3	6.5	.0558	-	.0056
		Average	6.5	.0549	-	.0145
Dry	3-16	4	4.3	.0763	-	.0115
	3-16	5	4.6	.0703	-	.0046
	3-18	6	4.5	.0641	-	.0046
		Average	4.5	.0702	-	.0069
Dry	3-19	7	3.1	.0141	-	.0069
	3-19	8	3.1	.0136	-	.0052
	3-20	9	2.9	.0118	-	(.0176)
		Average	3.1	.0132	-	.0099
Wet	3-14	1	17.4	.0506	.0600	.0450
	3-14	2	16.8	.0424	(.0928)	(.0756)
	3-15	3	13.1	.0557	.0488	.0334
		Average	15.8	.0496	.0544	.0392
Wet	3-16	4	9.0	.0724	.0270	.0120
	3-16	5	9.0	.0847	.0279	.0121
	3-18	6	9.0	.0869	.0245	.0118
		Average	9.0	.0813	.0265	.0120
Wet	3-18	7	10.5	.0752	.0290	.0196
	3-19	8	11.0	.0734	.0218	.0124
	3-19	9	11.0	.0773	.0286	.0164
		Average	10.8	.0753	.0265	.0161

SOTDAT/STEEL LIBRARY SYSTEM Summary

Report Title:

Plant and Location: USSC/Fairfield

SCC: 30300306

Testing Date(s): 7/79 - 3/81

By Whom: Co.

Stack Test Review Attached:

Reviewed By:

Problems Seen by Reviewer:

Confidentiality Status:

If status is confidential, list confidential pages or sections:

Source of Determination of the Confidentiality Status:

Report Encoded By:

Date Encoded:

Form Numbers:

Comments:

Sulfate Content of Coke Oven Gas

Battery	Test Date	Run No	Front Half Loading GR/SCFD	% Sulfate	SO4 GR/SCFD	
No. 9-FF	4/24/79	1	.106	42	.045	FLOW HIGH DURING THIS TE
		2	.251	12	.030	
		3	.093	37	.034	
			.150		.036	
	6/7/79	1	.055	25	.014	
		2	.052	37	.019	
		3	.062	40	.025	
			.056		.019	
	6/18/79	1	.065	47	.031	
		2	.051	71	.036	
		3	.055	45	.025	
			.057		.031	
AVG. No 9			.087		.029	
No 2-FF	3/6/79	1	.033	57	.019	
		2	.030	86	.026	
		3	.034	85	.029	
			.032		.025	

SUMMARY OF NO. 9 BATTERY STACK TESTS

Date & Run Number		Temp. °F	H_2O %	Flow Rate DSCFM	Loading Gr/SCFD Front	Back	Total	Loading Lb/Hr
4-24-79	1	509	13.5	54,226	.106	-	-	
	2	506	15.5	49,341	.251	-	-	
	3	516	14.5	55,290	.093	-	-	
	Average	510	14.5	52,953	.150	-	-	68.1
6-7-79	1	518	16.4	39,689	.055	.022	.076	
	2	474	14.3	44,418	.052	.023	.075	
	3	555	15.7	38,249	.062	.018	.080	
	Average	516	15.5	40,785	.056	.021	.077	19.6
6-18-79	1	527	15.6	38,025	.065	.018	.083	
	2	460	11.4	40,751	.051	.019	.069	
	3	510	16.2	38,909	.055	.013	.068	
	4	513	15.1	36,002	.068	.040	.108	
	Average	503	14.6	38,422	.060	.023	.082	19.8
8-8-79	1	493	15.7	35,456	.071	.046	.117	
	2	488	16.1	35,742	.067	.053	.120	
	3	512	15.8	30,000	.069	.096	.165	
	Average	498	15.9	33,733	.069	.065	.134	18.5
3-4-80	1	521	15.4	72,900	.0122	-	-	
	2	522	15.1	70,900	.0084	-	-	
	Average	522	15.3	71,900	.0103	-	-	6.4
4-28-80	1	497	16.3	31,987	.088	.016	.105	
	2	493	16.3	37,651	.059	.013	.072	
	3	502	16.5	36,788	.066	.017	.083	
	Average	497	16.4	35,475	.071	.016	.086	21.6
3-31-81	1	302	5.3	45,001	.0303	-	-	
(Idle Hot)	2	301	4.1	47,709	.0516	-	-	
	Average	302	4.7	46,355	.0410	-	-	16.4

Table 2-1. Summary of Test Results - #9 Coke Underfire Stack

Parameter	Run 1	Run 2	Average
Date of Test	3/31/81	4/1/81	
Sampling Period (time of day)	1425-1608	0845-1011	
Stack Gas Temperature (°F)	302	301	302
Moisture Content (% vol.)	5.3	4.1	4.7
Stack Gas Velocity (fps)	7.03	7.35	7.19
Gas Volumetric Flow Rate (SDCFH)[a]	2,700,083	2,862,517	2,781,300
Particulate Emissions (grains/SDCF)	.0303	.0516	.0410
Particulate Emissions (lbs/hr)	11.7	21.1	16.4
Percent of Isokinetic Sampling	94	102	

[a] Dry basis, standard conditions of 68°F and 29.92 in. of Hg

Table 2-1. Summary of Test Results - #9 Coke Underfire Stack

Parameter	Run 1	Run 2	Average
Date of Test	3/31/81	4/1/81	
Sampling Period (time of day)	1425-1608	0845-1011	
Stack Gas Temperature (°F)	302	301	302
Moisture Content (% vol.)	5.3	4.1	4.7
Stack Gas Velocity (fps)	7.03	7.35	7.19
Gas Volumetric Flow Rate (SDCFH)[a]	2,700,083	2,862,517	2,781,300
Particulate Emissions (grains/SDCF)	.0303	.0516	.0410
Particulate Emissions (lbs/hr)	11.7	21.1	16.4
Percent of Isokinetic Sampling	94	102	

[a]Dry basis, standard conditions of 68°F and 29.92 in. of Hg

UNITED STATES ENVIRONMENT[illegible] [illegible]GENCY

Uni
Sta
Ste

DATE: MAY 15 1979

SUBJECT: Review of US Steel Coke Battery No. 2

FROM: Chief, Air Engineering Branch

TO: Chief, Air Enforcement Branch

SUMMARY

We have reviewed the test report by CH2M Hill on particulate emission tests on US Steel's Fairfield coke battery No. 2 underfire stack conducted March 6-7, 1979. The test procedures were reviewed and calculations spot checked for accuracy. The report appears to accurately reflect particulate emissions at the time of the test. Reported particulate emissions were 0.0324 gr/dscf which when rounded comes to 0.03 gr/dscf. This is the standard this point was required to meet.

ACTION

We recommend this test report be accepted as demonstrating compliance with the standard. If you have any questions on this review, contact Tom Lyttle.

BACKGROUND

Mr. Traina's memo of April 13, 1979 requested this review. Mr. Lyttle observed the test for EPA.

T. A. Gibbs

Tommie A. Gibbs

Attachment

EPA Form 1320-6 (Rev. 3-76)

United States Steel Corporation

GENEVA WORKS

P. O. BOX 510
PROVO, UTAH 84603

NOV 15 1982

AIR ... MATER... DIVISION

Kircher
~~Martin~~ Connally
Withdrawn ...

November 10, 1982

Mr. Brent C. Bradford
Director Air Quality
Utah State Department of Health
150 West North Temple, Suite 426
P. O. Box 2500
Salt Lake City, Utah 84110

Mr. Robert L. Duprey, Director
Air and Waste Management Division (8AWM)
Environmental Protection Agency
Region VIII
1860 Lincoln Street
Denver, Colorado 80295

Dear Sirs,

Please find enclosed the test report for the compliance demonstration of Geneva's No. 2 battery coke pushing emission shed. These tests were performed on October 19, 20, 1982 with three modules in operation. The stack opacity limitation of not to exceed 20% and the particulate concentration of .010 Gr/DSCF were both met for the stacks. The flow weighted particulate concentration averaged .0054 Gr/DSCF for the four modules tested. The shed fugitive emission limitation of not to exceed 20% opacity was also met. The results of the test indicate this facility is in compliance with the consent decree limitations.

The requested process data is also enclosed and is listed on the following page.

Yours very truly,

R W Pett

R. W. Pett
Chief Engineer
Geneva-Pittsburg Works

Enclosures

cc: D. R. Cronin wo/e
T. W. Goettge w/e
D. Wyse wo/e
W. R. Hawkins wo/e
J. Hawthorne w/e
R. W. Raybuck wo/e

NOV 16 1982

PROCESS DATA FOR COMPLIANCE DEMONSTRATION OF GENEVA'S
No. 2 BATTERY COKE PUSHING EMISSION SHED

- ✓ Coke Oven Temperature Report - October 19-20, 1982
- ✓ Charging and Pushing Report - October 19-20, 1982
- ✓ Analysis of Coal - October 15, 1982
- ✓ Daily Operating Report - October 19-20, 1982
- ✓ Daily Heating Report - October 19-20, 1982
- ✓ Fuel Gas Temperature Chart - October 19-20, 1982
- ✓ Fuel Gas Pressure Chart - October 19-20, 1982
- ✓ Fuel Gas Volume Chart - October 19-20, 1982
- ✓ Stack Draft Chart - October 19-20, 1982
- ✓ Annubar Flow-Measurement Tape - October 19-20, 1982 during test period

This process data was sent to Brian Hobbs, GCA on October 25, 1982.

Explanation Sheet
for the
Coke Oven Temperature Report

1. Due to low production levels, oven temperatures are taken on only one side each turn. Temperatures are recorded on the pusher side Turn 1 and on the coke side for Turns 2 and 3. The side measured is written at the top of each report.

2. The first and last digits of the oven temperatures have been omitted. A zero should be added after the last recorded digit and a one or two added before the first. Whether a one or two is used depends on what the recorded digits are. The oven temperatures should be between 1800° F. and 2200° F.

3. The north, south, and average flue temperatures are recorded in the remarks section of the report.

1 P.S.

G-C-47
R 2-77

COKE OVEN TEMPERATURE REPORT

BATTERY NO. 1&2

OCT 1 9 1982 19___
MIDNIGHT TO MIDNIGHT

FLUE TEMPERATURES, °F

PUSHER SIDE 1	WALL NO.	COKE SIDE 2	PUSHER SIDE 1	WALL NO.	COKE SIDE 2
11	1	03	79	36	11
10	2	12	76	37	15
12	3	13	80	38	10
13	4	10	80	39	04
14	5	11	80	41	97
13	6	16	80	42	91
12	7	13	82	43	74
09	8	02	84	44	87
01	9	98	86	45	75
91	11	93	79	46	97
91	12	13	79	47	00
84	13	92	86	48	98
91	14	10	83	49	04
90	15	03	80	51	05
86	16	09	81	52	05
82	17	05	81	53	01
82	18	05	81	54	01
83	19	08	81	55	01
84	21	04	82	56	00
86-	22	99	82	57	94
87	23	86	85	58	82
84	24	82	87	59	00
84	25	12	92	61	91
86	26	95	94	62	00
83	27	99	95	63	02
82	28	06	92	64	10
82	29	93	92	65	11
82	31	05	91	66	02
78	32	99	95	67	01
78	33	02	98	68	05
79	34	10	97	69	02
78	35	06	99	70	01

AVERAGES: PUSHER SIDE ________ COKE SIDE ________

CROSS WALL TEMPERATURES, °F

WALL NO. 69 cr 1			WALL NO. ______		
PUSHER SIDE	FLUE NO.	COKE SIDE	PUSHER SIDE	FLUE NO.	COKE SIDE
91	1	86		1	
93	2	94		2	
94	3	00		3	
99	4	01		4	
01	5	03		5	
03	6	04		6	
05	7	05		7	
05	8	05		8	
05	9	04		9	
05	10	98		10	
05	11	06		11	
99	12	07		12	
06	13	07		13	
07	14	07		14	

CHARGING HOLE TEMPERATURES, °F

OVEN NUMBER	NO. 1	NO. 2	NO. 3
TOPS			
12-8			
8-4			
4-12			
AVERAGES			
BOTTOMS			
12-8			
8-4			
4-12			
AVERAGES	1	2	

HEATING DATA

OVEN PUSHING SCHEDULE	12	S	1841
AIR BOX OPENING. SQ. IN.		N	1854
COKE OVEN GAS PRESSURE. M.M.	23	S	1845
STACK DRAFT. M.M.		N	1850
	185	S	2014
	22	N	2000
	23	S	2055
		N	2029

REMARKS: No. 1852 2015
So. 1843 2035
BA. 1848 2025

CROSS WALLS INSPECTED

TURN	HEATER	WALL INSP.	WALL INSP.
#1			
#2			
#3			

Heater Foremen

-47
2-77

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COKE OVEN TEMPERATURE REPORT

Oct 19th, 1982
MIDNIGHT TO MIDNIGHT

BATTERY NO. 1+2

COKE SIDE

FLUE TEMPERATURES, °F

PUSHER SIDE 1	WALL NO.	COKE SIDE 2	PUSHER SIDE 1	WALL NO.	COKE SIDE 2
(16)	1	(06)	75	36	15
17	2	17	73	37	(27)
17	3	15	74	38	(21)
16	4	18	73	39	08
16	5	18	73	41	00
14	6	13	74	42	(98)
12	7	09	81	43	(88)
06	8	04	81	44	(84)
95	9	04	79	45	(85)
86	11	00	77	46	06
83	12	(90)	80	47	07
81	13	(90)	81	48	04
82	14	20	77	49	02
82	15	05	80	51	(90)
81	16	06	80	52	10
75	17	07	76	53	09
75	18	05	74	54	17
77	19	04	75	55	17
77	21	05	78	56	14
77	22	02	77	57	09
76	23	04	84	58	(96)
88	24	(86)	87	59	13
81	25	(93)	89	61	10
80	26	(89)	89	62	10
79	27	03	93	63	16
81	28	07	91	64	( )
81	29	(–)	85	65	20
80	31	07	85	66	12
78	32	05	92	67	11
77	33	05	99	68	08
80	34	01	01	69	95
75	35	13	(02)	70	(04)

AVERAGES: PUSHER SIDE ~~76~~ ~~84~~ ~~52~~ ~~40~~ ~~28~~ COKE SIDE ~~36~~ 40 ~~88~~

CROSS WALL TEMPERATURES, °F

WALL NO. #47

PUSHER SIDE	FLUE NO.	COKE SIDE
90	1	95
01	2	06
04	3	07
04	4	11
04	5	10
98	6	06
97	7	07
97	8	08
90	9	08
88	10	07
96	11	07
98	12	07
97	13	07
95	14	00

WALL NO.

PUSHER SIDE	FLUE NO.	COKE SIDE
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	11	
	12	
	13	
	14	

CHARGING HOLE TEMPERATURES, °F

OVEN NUMBER	NO. 1	NO. 2	NO. 3
	60 96	06 37	54
TOPS	15 900 16 1540	15 1090 16 1440	12 1100
12.8	144	32	184
8.4	12 1130 12 870		
4.12	87 2/175		
AVERAGES			
BOTTOMS			
12.8			
8.4 1847			
4.12			
2087 AVERAGES	(1)	(2)	

Margin working: 61 2/123; 2/94; 94, 22; 16 8/33; 2/156; 2/94

REMARKS: NO 1816 2097
SO 1878 2078
BA 1847 2087

HEATING DATA

1-4-5 {S 1860 / N 1806} 1833
2-3 {S 1896 / N 1827} 1861
1-4-5 {S 2084 / N 2094} 2089
2-3 {S 2072 / N 2100} 2086

OVEN PUSHING SCHEDULE (1)
AIR BOX OPENING. SQ. IN.
COKE OVEN GAS PRESSURE. M.M.
STACK DRAFT. M.M. (2)

CROSS WALLS INSPECTED

TURN	HEATER	WALL INSP.	WALL INSP.
#1			
#2			
#3			

Heater Foreman

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'De
-47
2-77

COKE OVEN TEMPERATURE REPORT

BATTERY NO. 1-2

K-19, 1982
MIDNIGHT TO MIDNIGHT

FLUE TEMPERATURES, °F

PUSHER SIDE 1	WALL NO.	COKE SIDE 2	PUSHER SIDE 1	WALL NO.	COKE SIDE 2
19	1	06	76	36	19
17	2	15	72	37	12
17	3	18	73	38	10
19	4	12	76	39	06
20	5	16	75	41	01
14	6	17	75	42	00
13	7	77	83	43	88
08	8	06	83	44	84
00	9	04	81	45	86
86	11	01	76	46	03
84	12	90	80	47	06
83	13	90	82	48	03
85	14	13	79	49	99
83	15	03	80	51	90
81	16	08	80	52	07
78	17	08	80	53	07
78	18	08	76	54	15
77	19	04	73	55	20
77	21	06	78	[illegible]	25
79	22	00	79	[illegible]	06
78	23	01	85	58	96
80	24	85	87	59	09
82	25	98	88	61	14
82	26	88	92	62	05
81	27	05	93	63	15
81	28	0	91	64	22
80	29	–	85	65	19
82	31	08	86	66	15
78	32	98	93	67	10
80	33	05	99	68	10
70	34	99	01	69	93
77	35	16	05	70	01

AVERAGES: PUSHER SIDE ________ COKE SIDE ________

CROSS WALL TEMPERATURES, °F

WALL NO. #9 (1) — WALL NO. ________

PUSHER SIDE	FLUE NO.	COKE SIDE	PUSHER SIDE	FLUE NO.	COKE SIDE
85	1	90		1	
97	2	99		2	
01	3	89		3	
02	4	00		4	
03	5	93		5	
02	6	02		6	
95	7	95		7	
02	8	03		8	
95	9	95		9	
03	10	04		10	
96	11	97		11	
04	12	06		12	
98	13	98		13	
06	14	06		14	

HEATING DATA

HEATING DATA	(s	1801	1813
OVEN PUSHING SCHEDULE (1)	145 { n	1825	
AIR BOX OPENING, SQ. IN.	23 { s	1809	1817
COKE OVEN GAS PRESSURE, M.M.	(n	1826	
STACK DRAFT, M.M.	(s	2073	2073
(2)	145 { n	2074	
	23 { s	2077	2075
	(n	2073	

CHARGING HOLE TEMPERATURES, °F

OVEN NUMBER	NO. 1	NO. 2	NO. 3
TOPS			
12.8			
8.4			
4.12			
AVERAGES			
BOTTOMS			
12.8			
8.4			
1815			
4.12			
2074			
AVERAGES	(1)	(2)	

REMARKS:

NO	1825	2073
SO	1805	2075
RA	1815	2074

CROSS WALLS INSPECTED

TURN	HEATER	WALL INSP.	WALL INSP.
#1			
#2			
#3			

____
Heater Foreman

Pusher side

G-C-47
R 2-77

COKE OVEN TEMPERATURE REPORT

OCT 20 1982 19___
MIDNIGHT TO MIDNIGHT

BATTERY NO. 1&2

FLUE TEMPERATURES, °F

PUSHER SIDE 1	WALL NO.	~~COKE SIDE~~ 2	PUSHER SIDE 1	WALL NO.	~~COKE SIDE~~ 2
(15)	1	(03)	81	36	09
09	2	09	77	37	08
12	3	17	81	38	(L)
15	4	16	81	39	02
18	5	14	81	41	00
12	6	14	81	42	(94)
12	7	06	82	43	(73)
11	8	02	86	44	(86)
03	9	97	86	45	(74)
91	11	(97)	82	46	92
91	12	14	84	47	95
91	13	(91)	86	48	00
93	14	06	84	49	03
89	15	03	81	51	03
86	16	05	82	52	09
85	17	02	82	53	04
86	18	04	82	54	03
83	19	05	81	55	97
84	21	07	83	56	95
87	22	01	84	57	(91)
87	23	(85)	85	58	(82)
85	24	(81)	89	59	95
85	25	09	94	61	95
88	26	(85)	84	62	04
85	27	00	86	63	07
83	28	07	94	64	11
83	29	(93)	94	65	06
84	31	08	91	66	00
79	32	01	96	67	97
79	33	07	00	68	05
80	34	10	01	69	02
79	35	06	(01)	70	(01)

AVERAGES: PUSHER SIDE ~~78~~ ~~73~~ X X COKE SIDE ~~46~~ ~~48~~

CROSS WALL TEMPERATURES, °F

WALL NO. (1) #58

PUSHER SIDE	FLUE NO.	COKE SIDE
65	1	60
79	2	74
81	3	74
85	4	85
90	5	86
91	6	-79
91	7	85
-82	8	-81
88	9	91
-82	10	-80
89	11	86
-82	12	-80
88	13	87
-80	14	-80

WALL NO. ______

PUSHER SIDE	FLUE NO.	COKE SIDE
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	11	
	12	
	13	
	14	

CHARGING HOLE TEMPERATURES, °F

OVEN NUMBER	NO. 1	NO. 2	NO. 3
	15 66	87 10	
TOPS	16/1240 16/1060	13/1130 13/1130	
12.82/578	76/30 50	104/80	
48 / 2.97			
8.4 / 33			
4.12			
AVERAGES			
BOTTOMS			
12.8			
8.4			
1889			
4.12			
2042			
AVERAGES	1	2	

HEATING DATA

OVEN PUSHING SCHEDULE
AIR BOX OPENING, SQ. IN.
COKE OVEN GAS PRESSURE, M.M.
STACK DRAFT, M.M.

1	145	S	1927	1888
		N	1850	
	73	S	1915	1890
		N	1866	
2	145	S	2047	2036
		N	2026	
	73	S	2087	2048
		N	2010	

REMARKS: No. 1858 2018
So. 1921 2067
BA. 1889 2042

CROSS WALLS INSPECTED

TURN	HEATER	WALL INSP.	WALL INSP.
#1			
#2			
#3			

Heater Foreman

G-C-47
R 2-77

Coke side

COKE OVEN TEMPERATURE REPORT

BATTERY NO. 1&2

10-20, 1982
MIDNIGHT TO MIDNIGHT

FLUE TEMPERATURES, °F

~~PUSHER SIDE~~ 1	WALL NO.	COKE SIDE 2	~~PUSHER SIDE~~ 1	WALL NO.	COKE SIDE 2
~~22~~	1	06	78	36	19
(17)	2	28	73	37	15
(18)	3	21	75	38	11
(22)	4	14	78	39	10
(22)	5	16	76	41	00
(15)	6	11	74	42	(75)
(15)	7	07	82	43	(89)
(11)	8	05	85	44	(85)
01	9	07	83	45	(65)
86	11	01	77	46	07
84	12	(88)	81	47	12
85	13	(89)	50	48	08
87	14	20	82	49	04
82	15	00	80	51	91
86	16	05	90	52	08
80	17	05	81	53	09
51	18	06	78	54	11
78	19	06	70	55	12
77	21	08	77	56	16
82	22	10	79	57	(08)
79	23	(02)	(88)	58	(97)
80	24	(82)	88	59	15
83	25	98	88	61	15
83	26	(86)	95	62	12
82	27	01	76	63	20
81	28	(02)	91	64	20
81	29	(–)	85	65	15
83	31	09	67	66	11
80	32	04	94	67	12
79	33	16	98	68	11
75	34	94	02	69	98
77	35	11	16	70	05

AVERAGES: PUSHER SIDE ______ COKE SIDE ______

HEATING DATA

OVEN PUSHING SCHEDULE
AIR BOX OPENING, SQ. IN.
COKE OVEN GAS PRESSURE, M.M.
STACK DRAFT, M.M.

1	15	S	1833	
		N	1838	1836
	23	S	1808	
		N	1829	1819
2	15	S	2093	
		N	2101	2097
	23	S	2078	
		N	2104	2091

CROSS WALLS INSPECTED

TURN	HEATER	WALL INSP.	WALL INSP.
#1			
#2			
#3			

CROSS WALL TEMPERATURES, °F

WALL NO. 33-2 | WALL NO. ______

PUSHER SIDE	FLUE NO.	COKE SIDE	PUSHER SIDE	FLUE NO.	COKE SIDE
97	1	83		1	
06	2	96		2	
10	3	00		3	
09	4	05		4	
05	5	09		5	
05	6	08		6	
05	7	08		7	
05	8	08		8	
05	9	09		9	
06	10	11		10	
05	11	12		11	
07	12	11		12	
07	13	11		13	
09	14	11		14	

CHARGING HOLE TEMPERATURES, °F

OVEN NUMBER	NO. 1	NO. 2	NO. 3
TOPS			
12.8			
8.4			
4.12			
AVERAGES			
BOTTOMS			
12.8			
8.4			
4.12			
AVERAGES	1	2	

REMARKS:

	1	2
No.	1834	2103
So.	1821	2086
BA.	1828	2094

Heater Foreman

C-47
R 2-77

Coke side

COKE OVEN TEMPERATURE REPORT

Oct 20, 19__
MIDNIGHT TO MIDNIGHT

BATTERY NO. 1 + 2

FLUE TEMPERATURES, °F

PUSHER SIDE 1	WALL NO.	COKE SIDE 2	PUSHER SIDE 1	WALL NO.	COKE SIDE 2
17	1	10	73	36	13
17	2	17	73	37	25
17	3	14	74	38	21
16	4	11	72	39	08
16	5	09	71	41	98
13	6	08	74	42	95
13	7	04	81	43	87
06	8	05	70	44	83
94	9	04	79	45	85
76	11	21	78	46	07
81	12	97	87	47	08
80	13	87	79	48	10
81	14	14	76	49	12
81	15	97	80	51	71
79	16	03	79	52	07
74	17	10	74	53	07
74	18	09	73	54	10
77	19	03	75	55	08
77	21	08	77	56	16
70	22	—	76	57	07
75	23	16	84	58	96
79	24	57	88	59	77
80	25	91	89	61	13
79	26	88	88	62	12
78	27	02	73	63	27
81	28	04	92	64	22
80	29	—	86	65	13
79	31	09	84	66	14
75	32	99	91	67	11
72	33	02	99	68	12
78	34	97	02	69	77
74	35	09	02	70	04

59 58 AVERAGES: PUSHER SIDE 54 61 63 78 COKE SIDE 69 40

CROSS WALL TEMPERATURES, °F

WALL NO. 48

PUSHER SIDE	FLUE NO.	COKE SIDE
	1	
99	2	07
02	3	14
01	4	16
02	5	16
03	6	15
03	7	10
03	8	09
02	9	09
02	10	07
01	11	07
02	12	07
02	13	06
03	14	04

WALL NO. ______

PUSHER SIDE	FLUE NO.	COKE SIDE
12	1	15
1783	2	795
990	3	1170
96	4	155
130	5	[illegible]
	6	
	7	
12	8	16
798	9	850
1180	10	[illegible]
108	11	
120	12	
	13	
	14	

CHARGING HOLE TEMPERATURES, °F

OVEN NUMBER	NO. 1	NO. 2	NO. 3
TOPS 11	11	11	11
12.8 2074 990	2110 1100	2050 211	2106 1190
8.4 2210			
4.12			
AVERAGES			
BOTTOMS			
12.8			
8.4			
4.12			
AVERAGES	1		2

HEATING DATA

S 1783 1789
OVEN PUSHING SCHEDULE 185 ← N 1795
AIR BOX OPENING, SQ. IN. S 1798 1814
COKE OVEN GAS PRESSURE, M.M. 23 ← N 1830
STACK DRAFT, M.M. S 2074 2092
165 ← N 2110
S 2050 2078
23 ← N 2106

CROSS WALLS INSPECTED

TURN	HEATER	WALL INSP.	WALL INSP.
#1			
#2			
#3			

REMARKS: 1812 — 2108
1790 — 2062
1802 — 2085

Heater Foreman

C-219
8-75

COKE PLANT OVENS — CHARGING & PUSHING REPORT

DATE 10-19 19 82 SHIFT NO. 3

	OVEN NUMBER		TIME PUSHED		TIME RECHARGED		DELAYS
	BAT.	BAT.					
1		34	—		4	08	
2		37	4	06	7	30	DC3K5
3		54	4	27	4	51	
4		64	4	49	5	13	
5		6	5	11	5	35	
6		16	5	33	5	57	
7		36	5	55	6	19	
8		46	6	17	6	41	
9		56	6	39	7	03	
10		66	7	01	7	25	
11		8	7	23	7	47	
12		18	7	45	8	09	
13		38	8	07	8	31	
14		48	8	29	8	53	
15		68	8	51	9	15	
16		1	9	13	9	37	
17		11	9	35	9	59	
18		21	9	57	10	21	
19		31	10	19	10	43	
20		41	10	41	11	05	
21		51	11	03	11	27	
22		61	11	25	11	49	
23		3	11	47			
24							
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							

	OVEN NUMBER		TIME PUSHED		TIME RECHARGED		DELAYS
	BAT.	BAT.					
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							
60							
61							
62							
63							
64							
65							
66							
67							
68							

TOTAL OVENS SCHEDULED THIS TURN 22

ACTUAL OVENS PUSHED THIS TURN 22

ACTUAL OVENS CHARGED THIS TURN 22

OVENS CHEM COKE PUSHED ______

OVENS CHEM COKE CHARGED ______

REMARKS:

I CERTIFY THAT THE DOORS AND JAMS HAVE BEEN CLEANED PER PROVISIONS OF THE INCENTIVE APPLICATION.

Higgins
PUSHER OPERATOR

[signature]
TURN FOREMAN

COKE PLANT OVENS — CHARGING & PUSHING REPORT

DATE 10-19 19 82 SHIFT NO. 2

	OVEN NUMBER BAT.	BAT.	TIME PUSHED		TIME RECHARGED		DELAYS
1	15		—		8	18	Benches P.S
2	35		8	14		37	
3	55			31		56	
4	65			51	9	16	
5	7		9	11		37	
6	17			31		56	
7	27			51	10	24	Chip P.S
8	47		10	27		45	
9	67			41	11	06	
10	9		11	00		26	
11	19			21		46	Chip P.S
12	39			42	12	07	Chip P.S
13	49		12	03		40	
14	59			37		58	
15	69		1	08	1	17	Pad car
16	2			20		37	
17	22			33	2	07	
18	32		2	13		27	Benches
19	52			22		47	
20	62			43	3	07	
21	4		3	03		27	
22	14			23		47	
23	34			43		—	
24							
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							

Job Well done

	OVEN NUMBER BAT.	BAT.	TIME PUSHED		TIME RECHARGED		DELAYS
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							
60							
61							
62							
63							
64							
65							
66							
67							
68							

TOTAL OVENS SCHEDULED THIS TURN 22

ACTUAL OVENS PUSHED THIS TURN 22

ACTUAL OVENS CHARGED THIS TURN 22

OVENS CHEM COKE PUSHED —

OVENS CHEM COKE CHARGED —

REMARKS:

I CERTIFY THAT THE DOORS AND JAMS HAVE BEEN CLEANED PER PROVISIONS OF THE INCENTIVE APPLICATION.

R R Hatch
PUSHER OPERATOR

[illegible signature]
TURN FOREMAN

COKE PLANT OVENS — CHARGING & PUSHING REPORT

DATE 10-19 19 82 SHIFT NO. 1

	OVEN NUMBER BAT.	OVEN NUMBER 2 BAT.	TIME PUSHED		TIME RECHARGED		DELAYS
1		36			12	20	
2		46	12	06		45	
3		56		29		54	
4		66		52	1	17	
5		8	1	15		40	
6		18		38	2	02	
7		38	2	00		28	
8		48		26		49	
9		68		47	3	12	
10		1	3	10		35	
11		11		33		58	
12		21		56		22	
13		31	4	20		44	
14		41		42	5	27	
15		51	5	05		30	
16		61		28		52	
17		3		50	6	18	
18		33	6	16		39	
19		53		37	7	02	
20		63	7	00		25	
21		5		23		48	
22		15		46			
23							
24							
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							

	OVEN NUMBER BAT.	OVEN NUMBER BAT.	TIME PUSHED		TIME RECHARGED		DELAYS
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							
60							
61							
62							
63							
64							
65							
66							
67							
68							

TOTAL OVENS SCHEDULED THIS TURN 21

ACTUAL OVENS PUSHED THIS TURN 21

ACTUAL OVENS CHARGED THIS TURN 21

OVENS CHEM COKE PUSHED ______

OVENS CHEM COKE CHARGED ______

REMARKS:

I CERTIFY THAT THE DOORS AND JAMS HAVE BEEN CLEANED PER PROVISIONS OF THE INCENTIVE APPLICATION.

Christensen
PUSHER OPERATOR

[signature]
TURN FOREMAN

COKE PLANT OVENS — CHARGING & PUSHING REPORT

DATE 10 - 20 19 82 SHIFT NO. 1

	Oven Number Bat.	Oven Number 2 Bat.	Time Pushed		Time Recharged		Delays
1		3			12	10	
2		33	12	06		31	
3		53		29		54	
4		63		52	1	17	
5		5	1	15		40	
6		15		38	2	02	
7		35	2	00		28	
8		55		26		49	
9		65		47	3	12	
10		7	3	10		35	
11		17		33		58	
12		27		56		23	
13		47		21		44	
14		67		42	5	07	
15		9	5	05		30	
16		29		28		52	
17		39		50	6	18	
18		49	6	16		39	
19		59		37	7	02	
20		69	7	00		25	
21		2		23		48	
22		22		46			
23							
24							
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							

	Oven Number Bat.	Oven Number Bat.	Time Pushed		Time Recharged		Delays
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							
60							
61							
62							
63							
64							
65							
66							
67							
68							

TOTAL OVENS SCHEDULED THIS TURN 21

ACTUAL OVENS PUSHED THIS TURN 22

ACTUAL OVENS CHARGED THIS TURN 20

OVENS CHEM COKE PUSHED ______

OVENS CHEM COKE CHARGED ______

REMARKS:

I CERTIFY THAT THE DOORS AND JAMS HAVE BEE[N] CLEANED PER PROVISIONS OF THE INCENTIVE APPLICATION.

Christensen
PUSHER OPERATOR

TURN FOREMAN

COKE PLANT OVENS — CHARGING & PUSHING REPORT

DATE 10 - 20 19 82 SHIFT NO. 2

	OVEN NUMBER BAT.	OVEN NUMBER BAT.	TIME PUSHED		TIME RECHARGED		DELAYS
1	32		8	14	8	31	
2	52			27		51	
3	62			47	9	11	
4	4		9	07		33	
5	14			30		55	
6	34			52	10	29	[illegible]
7	54		10	26		44	
8	64			40	11	02	Low, Coke wall
9	6			57		24	
10	16		11	20		45	
11	36			41	12	07	
12	46		12	03		39	
13	56			36		57	C.S. [illegible]
14	66			53	1	17	
15	8		1	13		37	
16	18			34		57	
17	38			54	2	27	
18	48		2	32		47	
19	68			44	3	07	
20	1		3	03		27	
21	11			23		47	
22	21			43	—		
23							
24							
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							

	OVEN NUMBER BAT.	OVEN NUMBER BAT.	TIME PUSHED		TIME RECHARGED		DELAYS
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							
60							
61							
62							
63							
64							
65							
66							
67							
68							

TOTAL OVENS SCHEDULED THIS TURN 22

ACTUAL OVENS PUSHED THIS TURN 22

ACTUAL OVENS CHARGED THIS TURN 21

OVENS CHEM COKE PUSHED —

OVENS CHEM COKE CHARGED —

REMARKS:

I CERTIFY THAT THE DOORS AND JAMS HAVE BEEN CLEANED PER PROVISIONS OF THE INCENTIVE APPLICATION.

R R Hatch
PUSHER OPERATOR

[signature]
TURN FOREMAN

COKE PLANT OVENS – CHARGING & PUSHING REPORT

DATE 10-20 19 82 SHIFT NO. 3

	OVEN NUMBER BAT. 2	OVEN NUMBER BAT.	TIME PUSHED		TIME RECHARGED		DELAYS
1	27			X	4	18	
2	31		4	14		99	
3	37			25		54	
4	41			50	5	12	
5	51		5	10		33	
6	41			31		59	
7	3			55	6	21	
8	23		6	37		50	DB
9	53			41	7	08	
10	63		7	06		25	
11	5			27		46	
12	15			42		59	
13	25			55	8	36	
14	55		8	39		54	
15	65			50	9	14	
16	7		9	10		36	
17	17			32		55	
18	27			49	11	25	
19	47		10	28		46	
20	17			42	11	04	
21	0		11	00		29	
22	19			25		51	
23	29			47		X	
24	22		11	10			
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							

	OVEN NUMBER BAT.	OVEN NUMBER BAT.	TIME PUSHED	TIME RECHARGED	DELAYS
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					
51					
52					
53					
54					
55					
56					
57					
58					
59					
60					
61					
62					
63					
64					
65					
66					
67					
68					

TOTAL OVENS SCHEDULED THIS TURN 22

ACTUAL OVENS PUSHED THIS TURN 23

ACTUAL OVENS CHARGED THIS TURN 22

OVENS CHEM COKE PUSHED ______

OVENS CHEM COKE CHARGED ______

REMARKS:

I CERTIFY THAT THE DOORS AND JAMS HAVE BEEN CLEANED PER PROVISIONS OF THE INCENTIVE APPLICATION.

Johnson
PUSHER OPERATOR

Fill Cope
TURN FOREMAN

G-MCI-251 A
R 5-82

CHEMICAL LABORATORY – COKE PLANT

ANALYSIS REPORT FOR 24 HOURS ENDING 11:59 PM 10-15-82

COAL

SAMPLE	C-16					
TIME	965A					
MOISTURE	5.1					
VOL. MAT.	35.5					
FIX. CAR.	57.7					
ASH	6.8					
SULFUR	.66					
+ 1/2"	0					
+ 1/4"	5					
+ 1/8"	14					
1/8"	81					
12 MESH	17					
20 MESH	18					
30 MESH	8					
80 MESH	27					
100 MESH	0					
100 MESH	11					
ENSITY	44.9					

ULTIMATE ANALYSIS	
CARBON	
HYDROGEN	
NITROGEN	
ASH	
SULFUR	
OXYGEN	
FIXED H_2O	

LARRY CAR DENSITY	
SOUTH	NORTH
45.9	

SIEVE	
+ 4"	7
+ 3"	17
+ 2"	27
+ 1"	40 (91)
+ 3/4"	3
+ 1/2"	1
- 1/2"	5

COKE

	SHIFT COMP.	B.F.	F.B.	C.B.	BK.WH
MOISTURE	3.5	2.9			
VOL. MAT.	2.2				
FIX. CAR.	88.9				
ASH	8.9				
SULFUR	.71				

TUMBLERS

WHARF TURN	12-8	8-4	4-12
+ 2"	4.3		
+ 1 1/2"	23.5		
+ 1"	30.5 (58.3)	( )	(
+ 1/2"	9.2		
+ 1/4"	1.8 (69.4)	( )	(
- 1/4"	30.6		

TAR

SAMPLE	Truck Comp.								
TIME	#3625,6,7,8,9								
MOISTURE	2.0								
SP. GR.	1.216								
	11.90								
	.16								
SULFUR									
C.									
E C.									
/GAL.									
/LB.									
/GAL.									

WEAK AMMONIA LIQUOR

GM/L.	12-8	8-4	4-12
FREE NH_3			
FIX. NH_3			
TOT. NH_3			

AMMONIA STILL WASTE

GM/L.	12-8	8-4	4-12
NH_3			
CAO			

COLLECTING TANKS

	12-8	8-4	4-12
H_2O	3.3	9.0	3.7
Q. I.		9.53	
ASH		.16	

AMMONIUM SULFATE

WET SALT	
NH_3	
H_2O	
H_2SO_4	

RESIDUES

	CRUDE STILL	PURE STIL
SP. GR.		
WT/GAL.		
BTU/LB		
BTU/GAL.		

MISCELLANEOUS

MATERIAL RECEIVED

SULFURIC ACID

TRUCK NO.	GRAVITY	% H_2SO_4

LIQUID CAUSTIC

CAR NO.	GRAVITY	% NAOH

WASH OIL

CAR NO.	UTLX 877
SP. GR.	.850
VISC.	49 Sec
ST. DIST.	12.0 Ml
F. D.	263°
DRY	407°
FLASH	277°F
FIRE	296°F
% OLE.	20.7

METALLURGICAL, CHEMICAL AND INSPECTION DEP

BY [illegible signature]

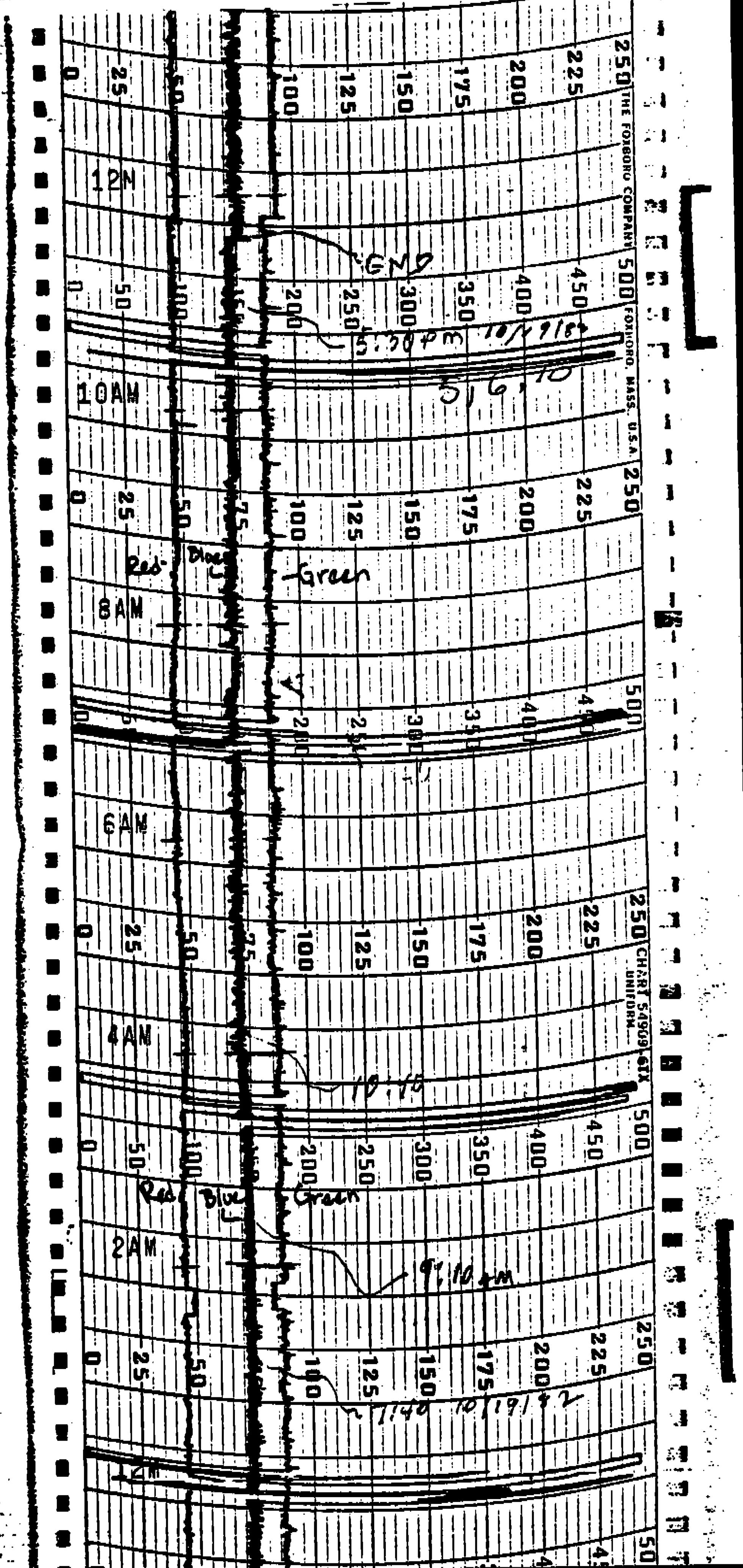
South Coke Shed Test
Oct. 19, 1982

Recorded Flows

high scale > Blue - Main

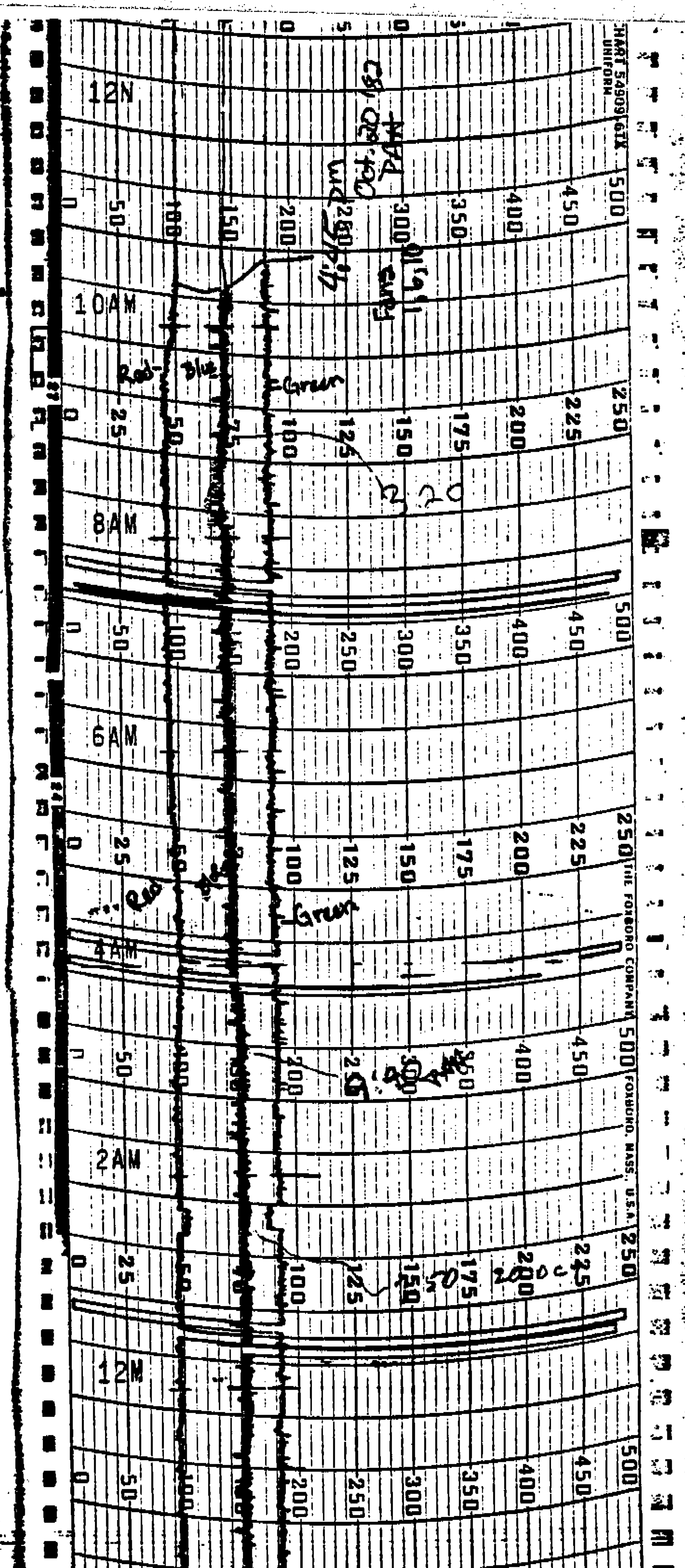
low scale < Red - Batt. #1
Green - Batt #2

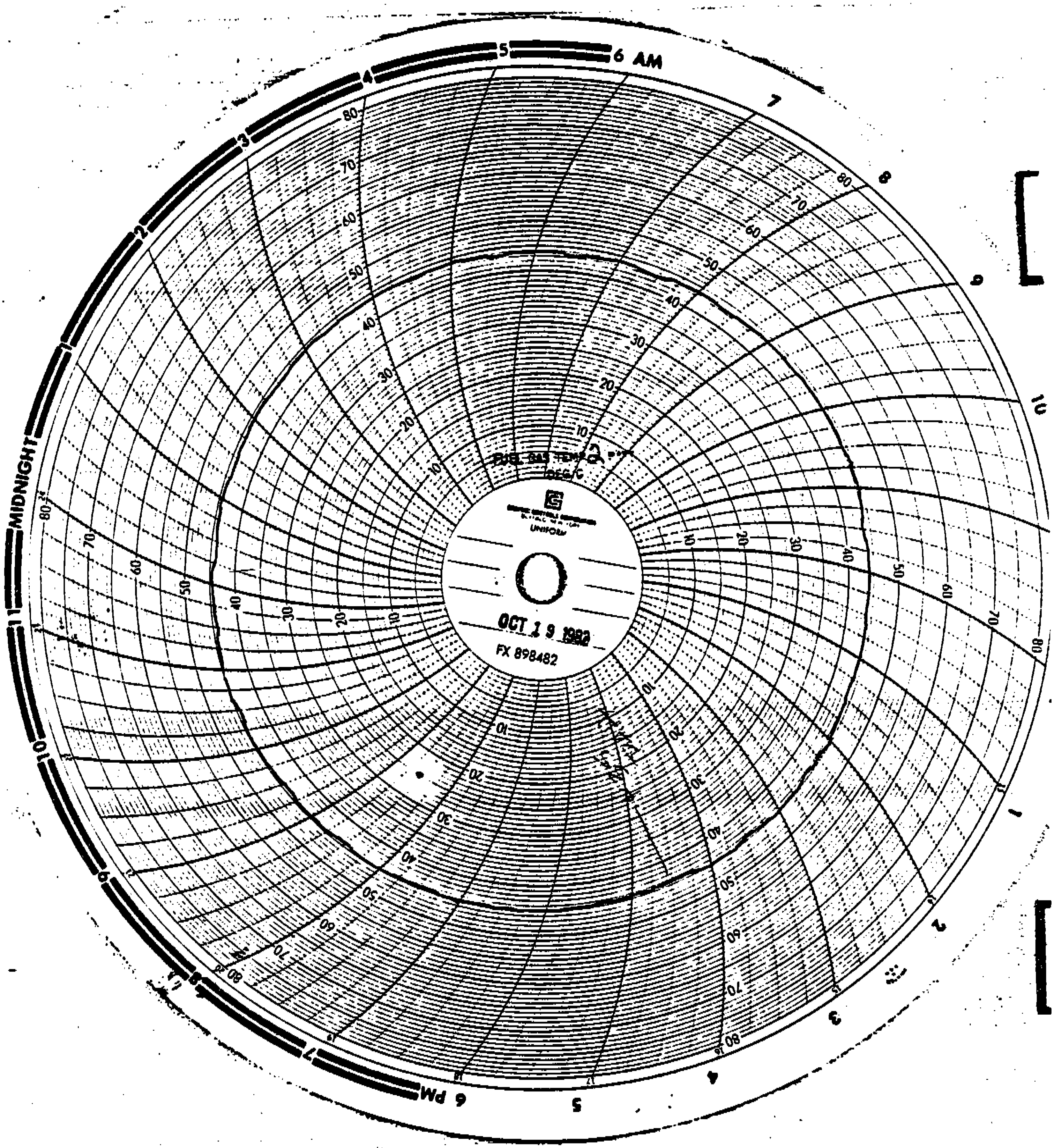
acfm?



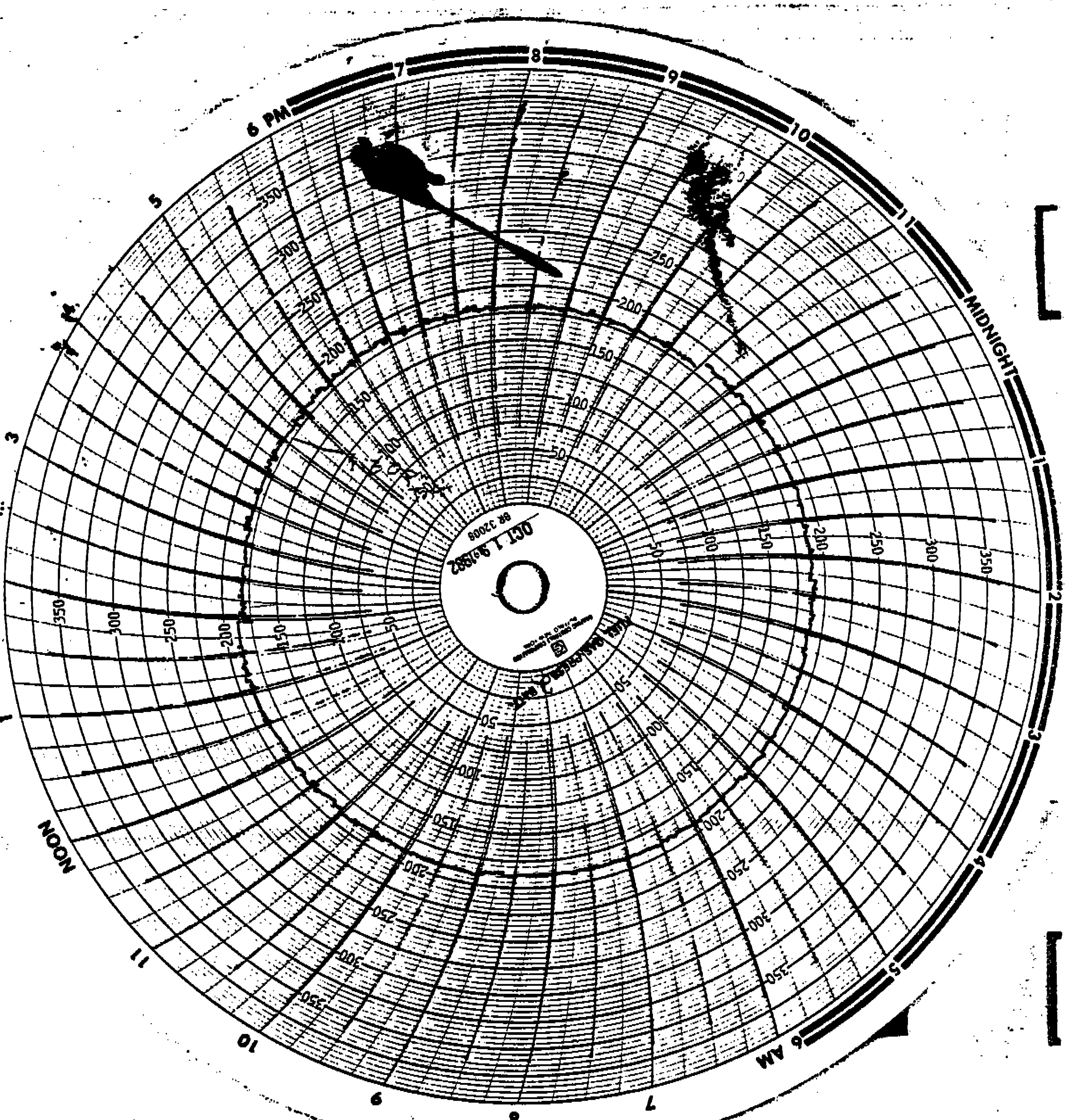
South Coke Shed Test
Oct. 20, 1982
Recorded flows
Blue - Main (high scale)
Red - Batt #1 (low scale)
Green - Batt #2

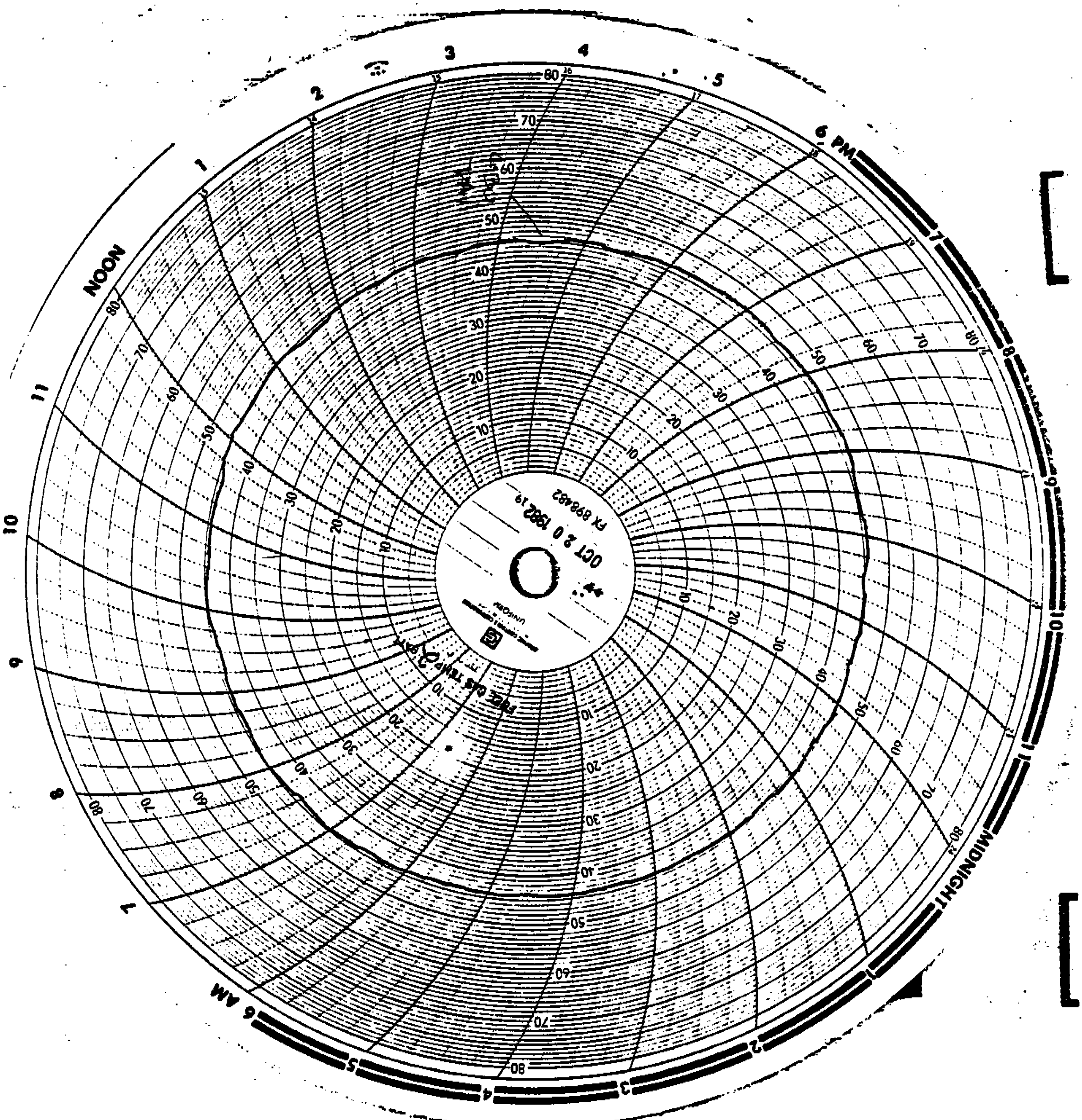
acfm?

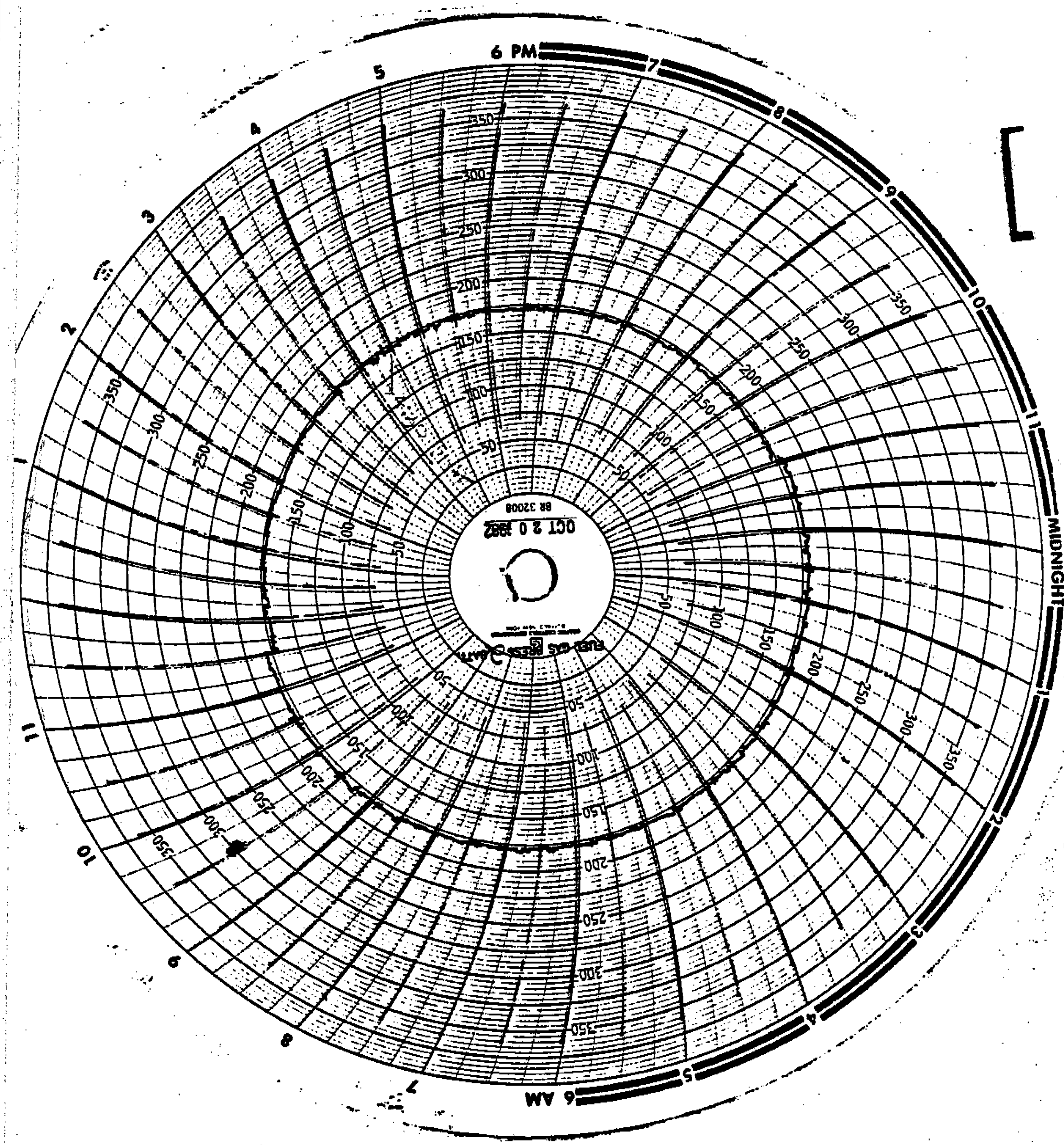


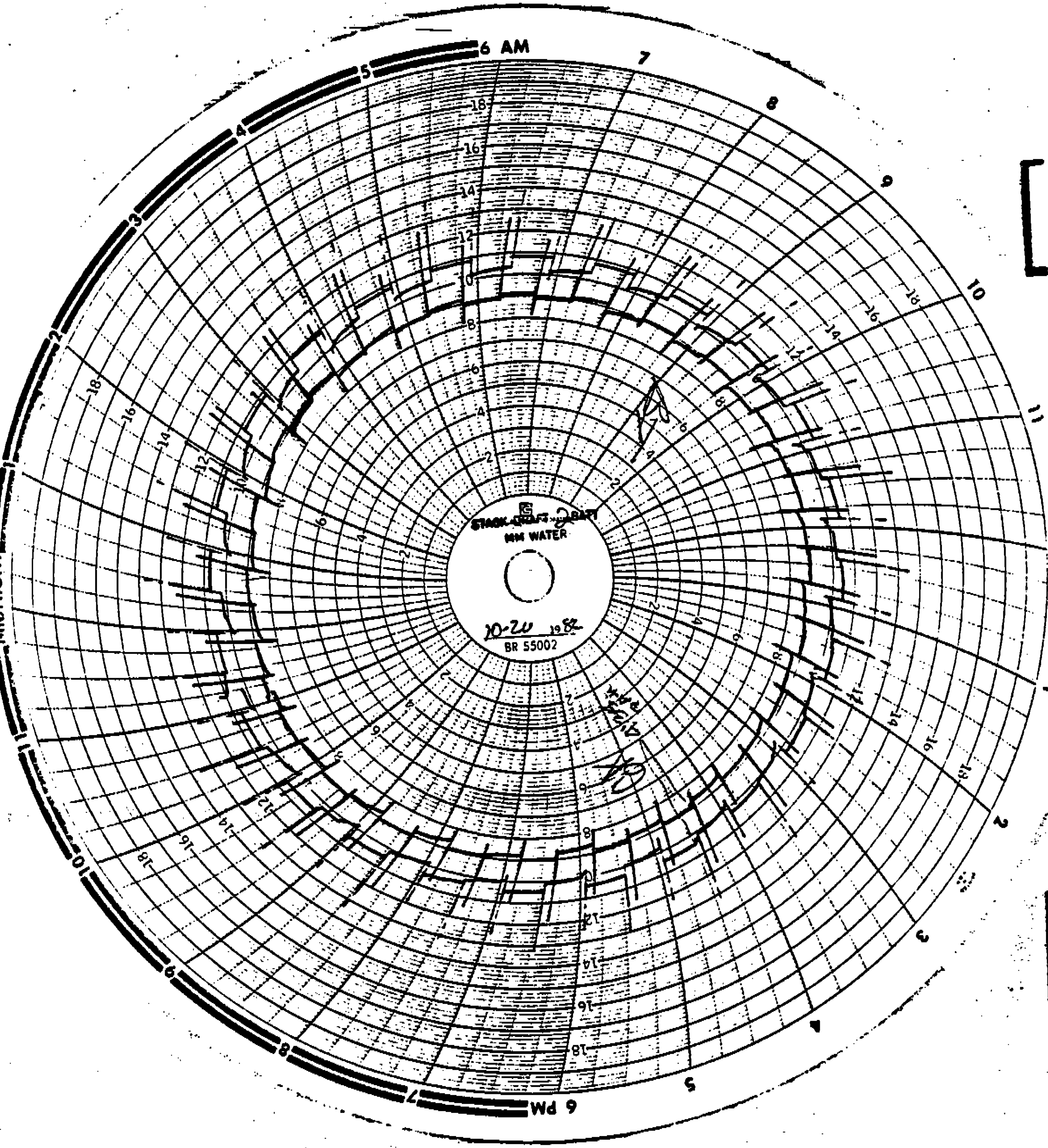


6 AM
7
8
9
10
MIDNIGHT
6 PM
FUEL GAS TEMP
DEG/C
UNIFORM
OCT 19 1982
FX 898482

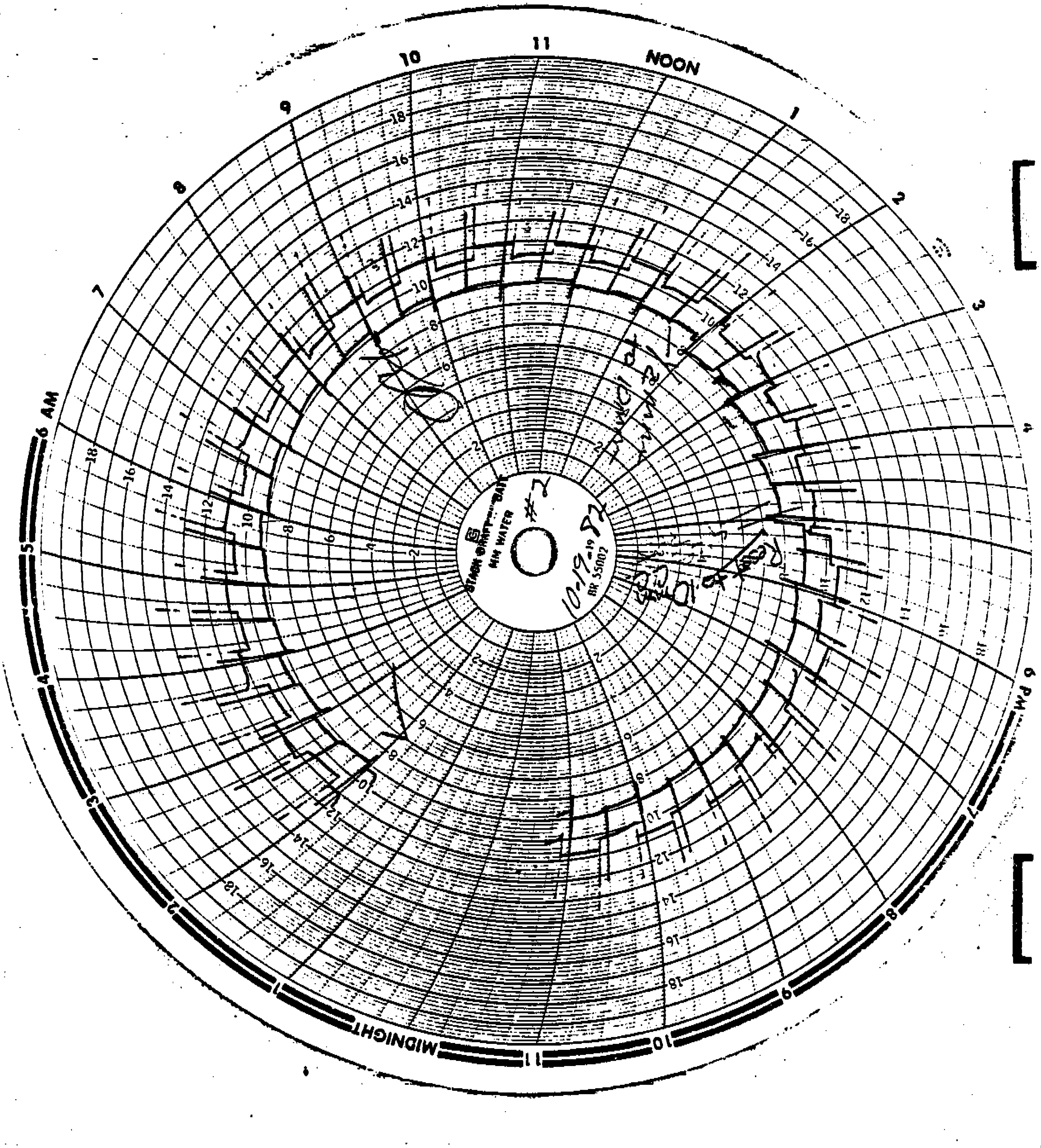

6 PM
MIDNIGHT
6 AM
NOON

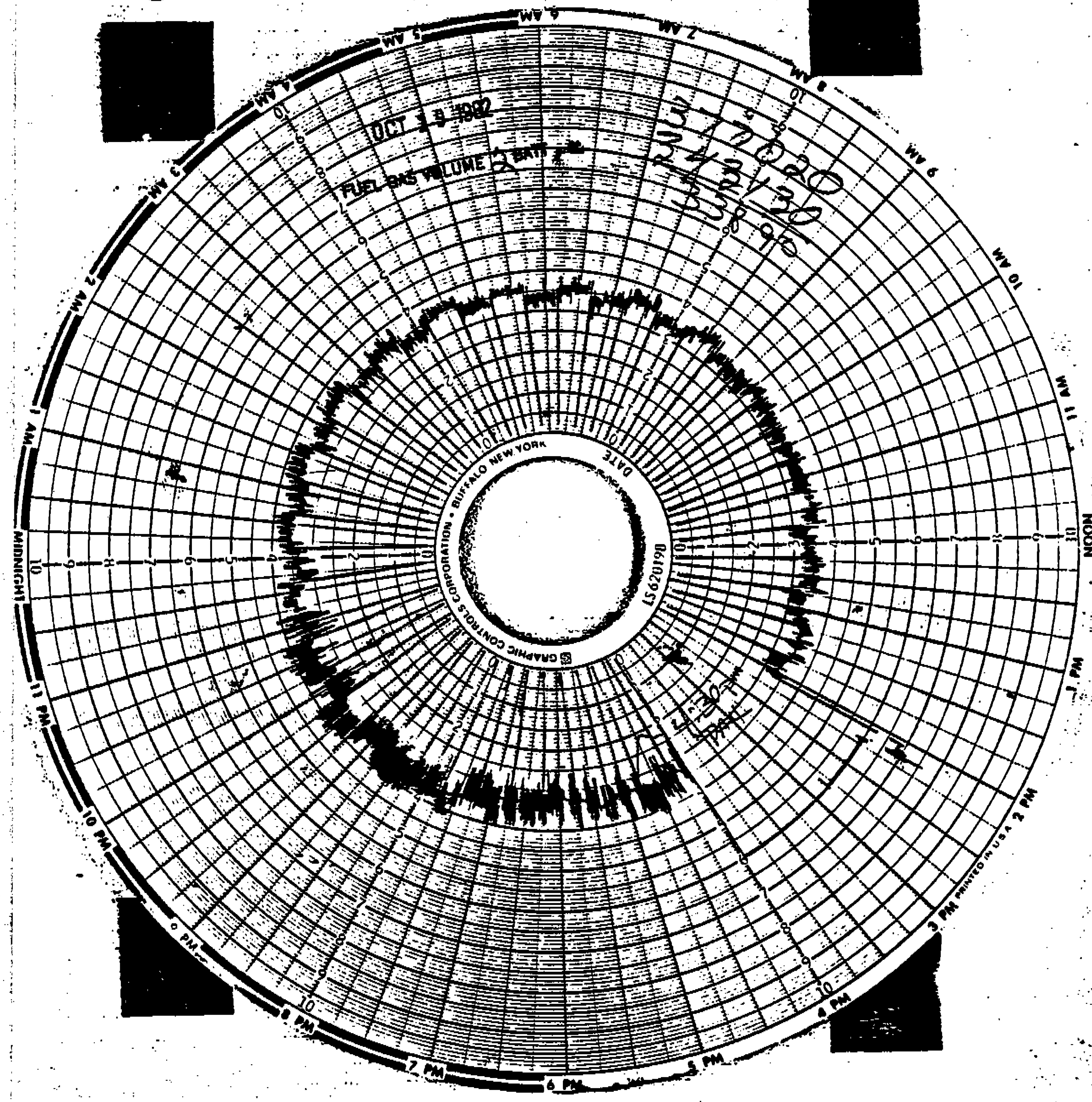

OCT 2 0 1982 19
FX 898482
FLUE GAS TEMP
NOON
6 PM
MIDNIGHT
6 AM


6 PM
MIDNIGHT
6 AM
OCT 2 0 1982
BR 32008

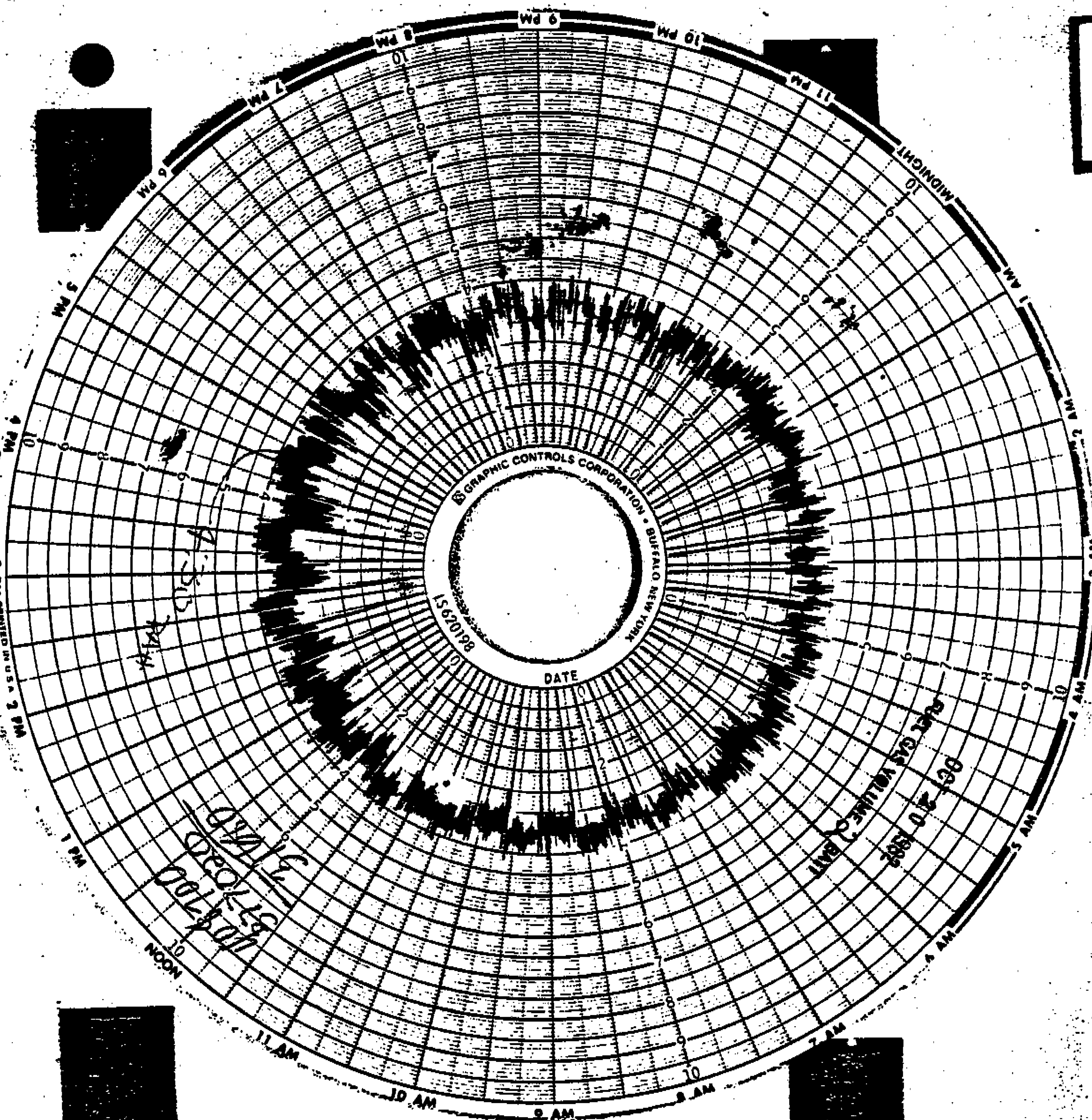


6 AM
MIDNIGHT
6 PM
STACK DRAFT
MM WATER
10-20 1982
BR 55002


NOON
6 AM
MIDNIGHT
6 P.M.
BR 55002



OCT 1 9 1982
FUEL GAS VOLUME
GRAPHIC CONTROLS CORPORATION • BUFFALO NEW YORK
DATE
NOON
MIDNIGHT
PRINTED IN U.S.A.


GRAPHIC CONTROLS CORPORATION • BUFFALO NEW YORK
DATE
MIDNIGHT
1 AM
2 AM
3 AM
4 AM
5 AM
6 AM
7 AM
8 AM
9 AM
10 AM
11 AM
NOON
1 PM
2 PM
3 PM
4 PM
5 PM
6 PM
7 PM
8 PM
9 PM
10 PM
11 PM
PRINTED IN USA

UNITED STATES STEEL CORPORATION
WESTERN STEEL DIVISION

COKE & COAL CHEMICALS DIVISION
COKE PRODUCTION - GENEVA WORKS

DAILY OPERATING REPORT

DATE *Oct. 20, 1982*

SHIFT	OVENS SCHEDULED PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4	OVENS PUSHED PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4	OVENS CHARGED PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4	OVENS LOSS PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4	STICKERS PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4
1		21				20				20				-1						
2		22				22				22										
3		22				23				22				+1						
SUB TOTAL		65				65				64										
TOTAL		65				65				64										

	12X8	PREVIOUS 24 HR.		
B.F. BIN LEVEL	40	80	95	75
COKE UNLOADED				
CHEM. COKE LOADED				
OVENS SCHEDULED	21			
CHARGES SCHEDULED	21			

COKING TIME PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4
	18		

MT OVENS PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4	24-HOUR OVENS PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4	OUT OF SERIES OVENS PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4
	12, 13, 22, 23, 24, 25, 26, 28, 29, 42, 43, 44, 45, 57, 58								37		

Oil Pints Per Ton ______

L.C. Bulk Density N______ S______

Pulverization 9 am______ 11 am______ 1 pm______

Coal Moisture 9 am______ 11 am______ 1 pm______

Stability 1______ 2______ 3______

Hardness 1______ 2______ 3______

Ash ______ Sulphur ______

B.F. Coke Moisture ______

C.P. Coke Moisture ______

FURNACE COKE LOADED PREVIOUS 24-HR TURN 1 TRK	TURN 1 GS	TURN 2 TRK	TURN 2 GS	TURN 3 TRK	TURN 3 GS	FCE COKE LOADED 12X8 TRK	GS
			1 UF				

EXPLANATION OF COKE LOSS

12X8 22 B-2 WAS STICKER (-1)

★ 4X12 PUSHED 22 B-2 LEFT M.T. (+1)

Planned Mtc
Change west Larry rail above Door 5
Quencher baffles cleaning

ACCIDENTS

NONE - per [illegible]

.d States Steel Corporation
.ern Steel Division

Coke & Coal Chemicals Division
Coke Production - Geneva Works

DAILY HEATING REPORT

DATE OCT 2 0 1982

SHIFT	SCHEDULE B 1	SCHEDULE B 2	ACTUAL PUSH B 1	ACTUAL PUSH B 2	COKING TIME B 1	COKING TIME B 2	F PUSH B 1	F PUSH B 2	HEATER
1	X	21	X	21	X	18.1	X	13	Peterson
2	X	22	X	22	X	18.1	X	32/2	JR
3	X	22	X	22	X	18.1	X	31/7	Pulley

THROTTLED WALLS

SHIFT	WALL	REASON	TIME CUT
BATTERY 1			
1			
2			
3			
BATTERY 2			
1	Cut 22 [illegible]		
	Cut [illegible] 925		
2			
3	[illegible]		
	for 2 hrs		
	— Too hot —		

VOLUME CHANGES

SHIFT	BATTERY 1 GAS CHANGE	BATTERY 1 DRAFT	BATTERY 1 TIME	BATTERY 2 GAS CHANGE	BATTERY 2 DRAFT	BATTERY 2 TIME
1						
2						
3						

PERMANENT GAS & DRAFT CHANGE

BAT	CHANGE	REASON
2	Cut 5000	to Hot

BLAST FURNACE HOLDER

SHIFT	PUMP COUNT 1	PUMP COUNT 2	OIL LEVEL
1	7½	0	Neutral
2	7½	0	time
3	7½	0	

METER READINGS (MARK X IF OUT OF ORDER)

SHIFT	GAS PRESSURE BAT 1	GAS PRESSURE BAT 2	GAS VOLUME BAT 1	GAS VOLUME BAT 2	GAS TEMPERATURE BAT 1	GAS TEMPERATURE BAT 2	STACK DRAFT BAT 1	STACK DRAFT BAT 2	WASTE HEAT BAT 1	WASTE HEAT BAT 2	FLUE TEMP. BATTERY 1 PS	FLUE TEMP. BATTERY 1 CS	FLUE TEMP. BATTERY 2 PS	FLUE TEMP. BATTERY 2 CS
1	125	180	100	125	49	45	10	10	85/150	185/215	1889	—	2042	—
2	125	170	100	125	49	46	10	10	85/150	145/210	—	1828	—	2094
3	125	170	100	125	50°	45°	10	10	85/150	185/210	—	1802	—	2085

BASEMENT WORK

HEATING LABOR WORK

Checked steam valves on manifolds 1 & 2 Bat

REMARKS (INCLUDE COKE COND

. States Steel Corporation
ern Steel Division

Coke & Coal Chemicals Division
Coke Production - Geneva Works

DAILY HEATING REPORT

DATE OCT 20 1982

SHIFT	SCHEDULE B 3	SCHEDULE B 4	ACTUAL PUSH B 3	ACTUAL PUSH B 4	COKING TIME B 3	COKING TIME B 4	F PUSH B 3	F PUSH B 4	HEATER
1									Searle
2									[illegible]
3									H. Gant

THROTTLED WALLS

SHIFT	WALL	REASON	TIME CUT
BATTERY 3			
1			
2			
3			
BATTERY 4			
1			
2			
3	Throttled #46-47	— Too Hot —	

VOLUME CHANGES

SHIFT	BATTERY ___ GAS CHANGE	DRAFT	TIME	BATTERY ___ GAS CHANGE	DRAFT	TIME
1						
2						
3						

PERMANENT GAS & DRAFT CHANGE

BAT	CHANGE	REASON

BLAST FURNACE HOLDER

SHIFT	PUMP COUNT 3	PUMP COUNT 4	OIL LEVEL
1	9½	8½	Neutral
2	9–	[illegible]	time
3	9½	8½	

METER READINGS (MARK X IF OUT OF ORDER)

SHIFT	GAS PRESSURE BAT 3	GAS PRESSURE BAT 4	GAS VOLUME BAT 3	GAS VOLUME BAT 4	GAS TEMPERATURE BAT 3	GAS TEMPERATURE BAT 4	STACK DRAFT BAT 3	STACK DRAFT BAT 4	WASTE HEAT BAT 3	WASTE HEAT BAT 4	FLUE TEMP. BATTERY 3 PS	FLUE TEMP. BATTERY 3 CS	FLUE TEMP. BATTERY 4 PS	FLUE TEMP. BATTERY 4 CS
1	85	85	115	off	50	50	11	9½	75/175	105/125	1837	—	1875	—
2	85	85	115	off	50	50	11	9½	75/175	[illegible]/120	—	1902	-	1966
3	85	85	115	off	52°	52°	11	9½	80/175	105/120	—	1901	—	1952

BASEMENT WORK

2 Cleaned nozzles in #14 x-wall.

HEATING LABOR WORK

REMARKS (INCLUDE COKE COND)

#4 Batt. Flow meter not working. Also [illegible] #4 pressure chart not marking well.

UNITED STATES STEEL CORPORATION
WESTERN STEEL DIVISION

COKE & COAL CHEMICALS DIVISION
COKE PRODUCTION - GENEVA WORKS

DAILY OPERATING REPORT

DATE 10/19/82

SHIFT	OVENS SCHEDULED PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4	OVENS PUSHED PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4	OVENS CHARGED PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4	OVENS LOSS PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4	STICKERS PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4
1		21				21				21						-				
2		22				22				22						-				
3		22				22				22										
SUB TOTAL	65				65				65											
TOTAL	65				65				65											

	12X8	PREVIOUS 24 HR.		
B. F. BIN LEVEL	80%	60%	85%	100%
COKE UNLOADED				
CHEM. COKE LOADED				
OVENS SCHEDULED	21			
CHARGES SCHEDULED	21			

COKING TIME PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4
	18.1		

MT OVENS PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4	24-HOUR OVENS PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4	OUT OF SERIES OVENS PER BATTERY BAT 1	BAT 2	BAT 3	BAT 4
	12, 13, 23, 24, 25, 26, 28, 29, 42, 43, 44, 45, 57, 58								57		

2 G.S. Loaded Buckwheat

FURNACE COKE LOADED PREVIOUS 24-HR TURN 1 TRK	TURN 1 GS	TURN 2 TRK	TURN 2 GS	TURN 3 TRK	TURN 3 GS	FCE COKE LOADED 12X8 TRK	FCE COKE LOADED 12X8 GS

Oil Pints Per Ton 1.48

L.C. Bulk Density N ______ S 45.0

Pulverization 9 am 79 11 am 78 1 pm ______

Coal Moisture 9 am ______ 11 am ______ 1 pm ______

Stability 1 ______ 2 ______ 3 ______

Hardness 1 ______ 2 ______ 3 ______

Ash ______ Sulphur ______

B.F. Coke Moisture ______

C.P. Coke Moisture ______

EXPLANATION OF COKE LOSS

ACCIDENTS

NONE - AS PER DISPENSARY

_ed States Steel Corporation
_stern Steel Division

Coke & Coal Chemicals Division
Coke Production - Geneva Works

DAILY HEATING REPORT

DATE OCT 1 9 1982

SHIFT	SCHEDULE B 1	SCHEDULE B 2	ACTUAL PUSH B 1	ACTUAL PUSH B 2	COKING TIME B 1	COKING TIME B 2	F PUSH B 1	F PUSH B 2	HEATER
1	/	21	/	21	/	18'	X	46/15	Pete
2	/	22	/	22	/	18.1	X	35/34	Massey
3	/	22	/	22	/	18.1	X	(87)/3	Butler

THROTTLED WALLS

SHIFT	WALL	REASON	TIME CUT
BATTERY 1			
1			
2			
3			
BATTERY 2			
1			
2			
3	Shut off hot x-wall 37&38 for 2hrs hot		

VOLUME CHANGES

SHIFT	BATTERY ONE GAS CHANGE	DRAFT	TIME	BATTERY Two GAS CHANGE	DRAFT	TIME
1						
2						
3						

PERMANENT GAS & DRAFT CHANGE

BAT	CHANGE	REASON
2	-5,000 cfH	@ 1/2 m/m Stack Coke Too Hot.

NEUTRAL TIME
~~BLAST FURNACE HOLDER~~

SHIFT	PUMP COUNT 1	PUMP COUNT 2	OIL LEVEL
1	7½	0	
2	7½	0	
3	7½	0	

METER READINGS (MARK X IF OUT OF ORDER)

SHIFT	GAS PRESSURE BAT 1	GAS PRESSURE BAT 2	GAS VOLUME BAT 1	GAS VOLUME BAT 2	GAS TEMPERATURE BAT 1	GAS TEMPERATURE BAT 2	STACK DRAFT BAT 1	STACK DRAFT BAT 2	WASTE HEAT BAT 1	WASTE HEAT BAT 2	FLUE TEMP. BATTERY 1 PS	FLUE TEMP. BATTERY 1 CS	FLUE TEMP. BATTERY 2 PS	FLUE TEMP. BATTERY 2 CS
1	135	190	100	130	48°	46°	10	10½	90/155	185/220	1848	—	2025	—
2	135	160	100	125	49°	44°	10	10	85/150	183/215	/	1815	/	2074
3	135	160	100	125	49	45	10	10	85/150	185/215	—	1847	—	2087

BASEMENT WORK

#1 Cleaned Nozzles On X walls # 40-42 #1 Batt.

#3 Cleaned nozzles #47 x-wall 2 batt.

HEATING LABOR WORK

REMARKS (INCLUDE COKE COND)

.d States Steel Corporation
.ern Steel Division

Coke & Coal Chemicals Division
Coke Production - Geneva Works

DAILY HEATING REPORT

DATE OCT 1 9 1982

SHIFT	SCHEDULE B 3	B 4	ACTUAL PUSH B 3	B 4	COKING TIME B 3	B 4	F PUSH B 3	B 4	HEATER
1									MARSHBANKS
2									HANSEN
3									HIGHT

THROTTLED WALLS

SHIFT	WALL	REASON	TIME CUT
BATTERY 3			
1			
2			
3		Throttled down 59c/61 (hot) perm.	
BATTERY 4			
1			
2			
3			

VOLUME CHANGES

SHIFT	BATTERY ___ GAS CHANGE	DRAFT	TIME	BATTERY ___ GAS CHANGE	DRAFT	TIME
1						
2						
3						

PERMANENT GAS & DRAFT CHANGE

BAT	CHANGE	REASON
4	-½mm Stack.	Gas cut on the 18th

BLAST FURNACE HOLDER

SHIFT	PUMP COUNT 3	4	OIL LEVEL
1	9½	8½	Neut.
2	9½	8½	Time
3	9½	8½	

METER READINGS (MARK X IF OUT OF ORDER)

SHIFT	GAS PRESSURE BAT 3	BAT 4	GAS VOLUME BAT 3	BAT 4	GAS TEMPERATURE BAT 3	BAT 4	STACK DRAFT BAT 3	BAT 4	WASTE HEAT BAT 3	BAT 4	FLUE TEMP. BATTERY 3 PS	CS	FLUE TEMP. BATTERY 4 PS	CS
1	85	85	115	130	54	52	11	10	55/165	116/130	1835	—	1869	—
2	85	85	115	130	53	52	11	10	85/180	115/120		1897		1935
3	85	85	115	130	51	51	11	9½	75/175	105/125	—	1898	—	1926

BASEMENT WORK

HEATING LABOR WORK

REMARKS (INCLUDE COKE COND)

SOTDAT/STEEL LIBRARY SYSTEM

Report Title: Particulate Matter Compliance Tests Conducted at U. S. Steel - Geneva Works, Coke Pushing Baghouse System

Plant and Location: U. S. Steel ~~Geneva~~ Geneva

SCC: 30300303
~~30300308~~

Testing Date(s): 10/19-20/82

By Whom: TETCo

Stack Test Review Attached: Yes

Reviewed By: GCA, EPA

Problems Seen by Reviewer: No

Confidentiality Status: Unknown

If status is confidential, list confidential pages or sections:

Source of Determination of the Confidentiality Status:

Report Encoded By:

Date Encoded:

Form Numbers:

Comments:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Rex Callaway
8RC

OCT 15 1982

REF: 8AM-AP

Mr. Boyd C. Erickson, General Supervisor
Environmental Control Engineering
United States Steel Corporation
P. O. Box 510
Provo, Utah 84601

OFFICE OF
OCT 20 1982
REGIONAL COUNSEL

Dear Mr. Boyd:

The following is a summary of the discussion I had with you and Jim Starley on October 14, 1982, concerning the compliance demonstration for the coke plant pushing control systems:

1. U.S. Steel will operate three modules during the test. One of the modules will be switched on the second day of testing so that four separate stacks will be tested.

2. U.S. Steel will be demonstrating compliance for emissions from #2 battery only. There will be no determination of the compliance status of #1 battery with respect to visible emissions, except for emissions from the quench car serving #2 battery as it passes under the #1 battery shed on the way to the quench tower.

3. The pre-test meeting will be at 3:00 p.m. on October 18, 1982.

If your understanding of our conversation differs from the above, please let me know.

Sincerely yours,

/S/

Marius J. Gedgaudas

cc: Brent C. Bradford
bcc: Rex Callaway
Connally Mears

8AM-AP:MGEDGAUDAS:ct:10/15/82:6131

CONCURRENCES

SYMBOL								
SURNAME								
DATE								

EPA Form 1320-1 (12-70)

OFFICIAL FILE COPY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

...1 2/ 1982

Trip Report, U.S. Steel, October 18-20, 1982

Marius J. Gedgaudas /s/
Technical Advisor

Robert R. DeSpain, Chief
Air Programs Branch

David S. Kircher, Chief
Utah, Montana, and Wyoming Section /s/

On October 18, 1982, I attended a pre-test meeting at the U.S. Steel-Geneva Works for the coke plant pushing control compliance demonstrations. Representatives of U.S. Steel, Utah Bureau of Air Quality, GCA, TETCO, and Mikro Pul participated in the discussions. An agenda and an attendance roster are attached. Several minor revisions were made to the protocol related to process parameters and U.S. Steel revised the section on visible emissions observations as requested by EPA in earlier negotiations. U.S. Steel agreed that the number of partially charged ovens tested would be representative of current battery operations.

During the two days of testing, I made opacity observations of the baghouse stacks, the west side of the sheds on No. 1 and No. 2 batteries, and the east side shed of No. 2 battery from the topside of the battery. All of the stack observations were 0% opacity. On several occasions emissions from the sheds during pushing were instantaneously observed at 5% opacity. During non-pushing periods, no visible emissions were observed from the sheds on either side of No. 2 battery.

During the first morning of the tests, visible emissions were observed from two doors on No. 1 battery which were mistakenly left open. Once the doors were closed, no further visible emissions occurred. During several quenches, the south end of the shed on No. 1 battery had several minor leaks (mostly steam) which lasted only until the quench was finished. In general, the control system was quite successful, even though only three baghouse modules (out of ten) were operating. The only significant visible emissions during the tests occurred when the quenched coke was dumped on the wharf and occasionally when the gooseneck lids on the topside of the battery were opened prior to pushing.

Apart from the coke plant tests, I noticed occasional heavy visible emissions (__20%) from the open hearth roof monitor and visible emissions close to 20% from the sinter plant windbox stacks.

Attached are my observations and comments during the coke plant tests

Attachments (4)

cc: Rex Callaway (8RC)
Keith Tipton (8ES-FO)
Connally Mears (8AW-AP)

CONCURRENCES

SYMBOL	8AW-AP	8AW-AP						
SURNAME	Gedgaudas	[illegible]						
DATE	10/26/82	[illegible]						

EPA Form 1320-1 (12-70) OFFICIAL FILE COPY

COKE PLANT PUSHING CONTROL TESTS - OCTOBER 19, 1982
(Stacks #5 and #10)

PUSH #	OVEN #	TIME	COMMENTS
1	35	8:12 a.m.	0% opacity from stacks
2	55	8:31	0-5% opacity on west side of shed, doors on #1 battery shed open (5-10% opacity)
3	65	8:51	0% opacity on west side; doors on #1 battery shed still open
4	7	9:10	0% opacity from stacks
5	17	9:31	0% opacity from stacks
6	27	9:52	0% opacity from stacks
7	47*	10:29	0% opacity on west side of shed, doors closed on #1 battery shed
8	67	10:39	0% opacity from stacks
9	9	11:00	0% opacity from stacks
10	19	11:20	0% opacity from stacks (P. Wolf)
11	39	11:45	0% opacity from stacks (P. Wolf)
12	49	12:03 p.m.	0% opacity on west side
13	59	12:41	0% opacity from stacks
14	69	1:08	0-5% opacity from topside shed
15	2	1:20	0-5% opacity from topside shed
16	22	1:32	0% opacity from stacks
17	32	2:12	0% opacity from stacks; 0% opacity from shed (observed from stack area)
18	52	2:22	0% opacity on west side
19	62*	2:48	0-5% opacity on west side, 0% opacity during non-pushing
20	4	3:02	0-5% opacity on west side; 0% opacity - non-pushing
21	14	3:23	0-5% opacity on west side; 0% opacity non-pushing
22	24	3:43	0% opacity on west side; and non-pushing and #1 battery shed until quench over
23	37	4:08	0% opacity on west side; and non-pushing and #1 battery shed until quench over
24	54	4:27	0% opacity on west side and #1 battery shed until quench over

*PARTIALLY CHARGED OVENS

Notes:
1. Pushes 2&4 missed on #5 stack - frozen impinger
2. Push 11 missed on both stacks - Radio failure -
3. Additional pushes sampled to obtain 24/stack - observed by GCA

COKE PLANT PUSHING CONTROL TESTS - OCTOBER 20, 1982
(Stacks #1 and #6)

PUSH #	OVEN #	TIME	COMMENTS
1	32	8:13 a.m.	0% opacity from stacks
2	52	8:26	0% opacity from stacks
3	62*	8:47	0% opacity from west side shed and #1 battery shed
4	4	9:06	0% opacity from topside non-pushing period
5	14	9:29	0% opacity from topside shed; 0% opacity non-pushing
6	34	9:52	0% opacity from topside shed
7	54	10:26	0% opacity from west side 0% opacity from #1 battery shed
8	64	10:40	0% opacity from west side and non-pushing and #1 battery shed
9	6	10:57	0% opacity from stacks
10	16	11:18	0% opacity from stacks
11	36*	11:40	0% opacity from west side non-pushing and #1 battery shed
12	46*	12:07 p.m.	0-5% opacity from west side; 0% non-pushing and #1 battery shed
13	56	12:45	0-5% opacity from west side; 0% non-pushing and #1 battery shed
14	66	12:53	0% opacity from stacks (P. Wolf)
15	8	1:13	0% opacity from stacks (P. Wolf)
16	18	1:30	0% opacity from stacks (P. Wolf)
17	28	1:53	0% opacity from west side and #1 battery shed
18	48	2:23	0% opacity from stacks and non-pushing; 0-5% from west side (from stack area)
19	68	2:43	0% opacity from west side and #1 battery shed
20	1	3:02	0-5% opacity from west side 0% non-pushing and #1 battery shed
21	11	3:23	0% opacity from west side, non-pushing and #1 battery shed
22	21	3:43	0% opacity from west side, non-pushing and #1 battery shed
23	31	4:15	0% opacity from #1 battery shed (observed from sinter plant)
24	41*	4:23	0% opacity from west side, non-pushing and #1 battery shed

* PARTIALLY CHARGED OVENS

Notes:
1. All pushes sampled on both stacks.
2. Shed on #1 battery observed until quench finished.
3. Occasional minor leaks on south end of #1 battery shed during quenching (mostly steam)

8987D:MGEDGAUDAS

COKE SHED TESTS 10/19/82

#5 + 10 STACKS

* PUSH 1 (35) 8:2a — OPACITY FROM STACKS — 0
8:17

PUSH 2 (55) 8:31 — 0-5% NEAR GT — DOORS ON CHIMNEYS OPEN
• 2 SPOTS
• W. SIDE

PUSH 3 (65) 8:51 — 0% OPACITY — DOORS STILL OPEN ON #1 & 5 STACKS
IMPINGER FROZEN IN #5 STACK — NO READINGS FOR PUSHES 2-3

PUSH 4 (7) 9:10 OPACITY FROM STACKS — 0
— STACK 5 STILL NOT STARTED

PUSH 5 (17) 9:31 — OPACITY FROM STACKS — 0
• SAMPLING RESUMED ON STACK 5

PUSH 6 (27) 9:52 — OPACITY FROM STACKS — 0

* PUSH 7 (47) 10:23 — 0 OPACITY — W. SIDE DOORS CLOSED ON #1

PUSH 8 (67) 10:39 — 0% FROM STACKS
— 10:45-46 HEAVY EMISSIONS FROM ~~[illegible]~~ #69 OVEN — CLEANING
10:48-52 — " " ~~[illegible]~~ GOOSENECKS

PUSH 9 (9) 11:00 — % FROM STACKS

(PC) PUSH 10 (19) 11:20 — LUNCH —
— 0% STACKS

(PC) PUSH 11 (39) — 11:45 PUSH ON #39 MISSED — RADIO FAILURE
— 0% STACKS

PUSH 12 (49) 12:03 P — 0 OPACITY — WEST SIDE

PUSH 13 (59) 12:41 — 0 OPACITY FROM STACKS

PUSH 14 (69) 1:08 — 05 OPACITY FROM TOPSIDE — 1 min

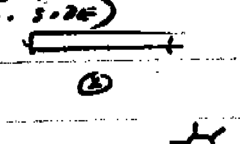
10/19

PUSH 15 (2) 1:20 0-5% OPACITY FROM TOPSIDE

PUSH 16 (22) 1:32 0% OPACITY FROM STACKS

PUSH 17 (32) 2:12 0% OPACITY FROM STACKS

0% OPACITY FROM SHED (W. SIDE) (OBS. FROM SAME AREA)



PUSH 18 (52) 2:22 0 OPACITY FROM W. SHED

2:30 TOURED COKE PLANT CONTROL ROOM

— WITH BRIAN HOBBS + PATTI HAYDEN

- GAS VOLUME RECORDER BEING CALIBRATED —

* PUSH 19 (62) 2:48 , 0-5% FROM SHED

- 0% - NON-PUSHING PERIOD

PUSH 20 (4) 3:03 0-5% FROM SHED

0% - NON-PUSHING PERIOD

PUSH 21 (14) 3:23 0-5% FROM SHED

0% - NON-PUSHING PERIOD

PUSH 22 (34) 3:43 0% FROM SHED ; 0% NON-PUSHING PERIOD

0% FROM #1 BATT. SHED - UNTIL QUENCH FINI.

PUSH 23 (37) 4:08 0-5% FROM SHED ; 0% NON-PUSHING PERIOD

0% FROM #1 BATT. SHED UNTIL QUENCH FINISHED

PUSH 24 (54) 4:27 0% FROM SHED

0% FROM #1 BATT. SHED UNTIL QUENCH FINISHED

* PARTIALLY CHARGED OVENS

10/20/82

COKE PUSH TESTS

PUSH 1 (52) 8:13 0% OPACITY FROM STACKS
[illegible]

PUSH 2 (52) 8:26 0% OPACITY FROM STACKS

* PUSH 3 (62) 8:47 0 % OPACITY FROM W. SIDE
0 % OPACITY FROM #1 BATT. SHED UNTIL QUENCH FINISHED

PUSH 4 (4) 9:06 0 % OPACITY FROM TOPSIDE SHED
(SOME EMISSIONS FROM OPEN STANDPIPES)
0 % OPACITY – DURING NON-PUSHING ALSO

PUSH 5 (14) 9:29 0 % OPACITY FROM TOPSIDE SHED
0% OPACITY DURING NON-PUSHING

PUSH 6 (34) 9:52 0 % OPACITY FROM TOPSIDE SHED

PUSH 7 (54) 10:26 0 % OPACITY FROM WEST SIDE; 0% NON-PUSH
– minor leaks – shed near [illegible] – during quench
0 % OPACITY FROM #1 BATT SHED UNTIL QUENCH FINISHED

PUSH 8 (64) 10:40 0 % OPACITY FROM WEST SIDE; 0% – NON-PUSH
– minor leaks near [illegible] during quench
0 % OPACITY FROM #1 BATT. SHED UNTIL QUENCH FINISHED

PUSH 9 (6) 10:57 0 % OPACITY FROM STACKS
[illegible]

PUSH 10 (16) 11:18 0 % OPACITY FROM STACKS

* PUSH 11 (36) 11:40 0 % OPACITY FROM W. SIDE; 0% NON-PUSH
0 % OPACITY FROM #1 B SHED UNTIL Q FIN.

* PUSH 12 (46) 12:02 0-5 % OPACITY FROM W. SIDE; 0% NON-PUSH
0 % OPACITY FROM #1 B SHED UNTIL Q FIN

PUSH 13 (56) 12:45 0-5 % OPACITY FROM W. SIDE; 0 % NON-PUSH
minor leaks [illegible]
0 % OPACITY FROM #1 B SHED UNTIL Q FIN.

10/20/82 P4

PUSH 14 (66) 12:53 0% ON STACKS (PW)

PUSH 15 (8) 1:13 0% ON STACKS (PW)

PUSH 16 (18) 1:33 0% ON STACKS (PW)

PUSH 17 (38) 1:53 0% FROM W. SIDE
0% FROM BATT #1 UNTIL QUENCH FINISHED

PUSH 18 (48) 2:33 0% ON STACKS
0-5% ON W. SIDE SHED (FROM STACK AREA)
0% DURING NON-PUSH PERIOD

PUSH 19 (68) 2:43 0% ON W. SIDE SHED
0% FROM BATT #1 UNTIL Q FIN - NO LEAKS

PUSH 20 (1) 3:22 0-5% ON W. SIDE SHED ; 0% - NON-PUSH
0% FROM BATT #1 UNTIL Q FIN. - NO LEAKS

PUSH 21 (4) 3:23 0% ON W. SIDE SHED ; 0% NON-PUSH
0% FROM BATT #1 UNTIL Q FIN - MINOR LEAKS

PUSH 22 (21) 3:43 0% FROM W. SIDE SHED ; 0% NON-PUSH
0% FROM BATT #1 UNTIL Q FIN. - MINOR LEAKS

PUSH 23 (31) 4:15 OBSERVED FROM SINTER PLANT -
0% OPACITY ON BATT. #1 SHED

* PUSH 24 (41) 4:23 0% FROM W. SIDE SHED ; 0% NON-PUSH
0% FROM BATT #1 UNTIL Q FIN - NO LEAKS

* PARTIALLY CHARGED OVENS

NOTES: SIGNIFICANT EMISSION FROM COKE WHARF
PERIODIC EMISSIONS TOPSIDES FROM ROOSEVELT LIDS
OCCASIONAL HEAVY EMISSIONS FROM OH ROOF MONITOR
SINTER PLANT [illegible] WINDBOX STACK NEAR 20%

Scott M. Matheson
Governor

James O. Mason, M.D., Dr.P.H.
Executive Director
801-533-6111

STATE OF UTAH
DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH

150 West North Temple, P.O. Box 2500, Salt Lake City, Utah 84110-2500

Marv H. Maxell, Ph.D., Acting Director
Room 474 801-533-6121

DIVISIONS

Community Health Services
Environmental Health
Family Health Services
Health Care Financing

OFFICES

Administrative Services
Community Health Nursing
Management Planning
Medical Examiner
State Health Laboratory

January 5, 1983
533-6108

Mr. Marius Gedgaudas
Air & Waste Management Division (8 AW)
Environmental Protection Agency
Region VIII
1860 Lincoln Street
Denver, Colorado 80295-0699

RE: UDH Inspectors Observation Compliance Stack Test of Baghouse Shed, Coke Batteries 1 & 2 at U.S. Steel, Geneva Works, Orem, Utah

Dear Mr. Gedgaudas:

As requested, enclosed are copies of two memorandums by members of our enforcement staff, who observed the initial compliance stack test of the baghouse sheds covering No. 1 and No. 2 coke batteries at U.S. Steel, Geneva Works at Orem, Utah, on October 19-20, 1982.

Sincerely,

Montie Keller

Montie Keller, Section Manager
Enforcement/Engineering
Bureau of Air Quality

JES:wml
Enclosures (2)
2139

Scott M. Matheson
Governor

STATE OF UTAH
DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH

150 West North Temple, P.O. Box 2500, Salt Lake City, Utah 84110-2500

James O. Mason, M.D., Dr.P.H.
Executive Director
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Marv H. Maxell, Ph.D., Acting Director
Room 474 801-533-6121

DIVISIONS
Community Health Services
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State Health Laboratory

U.S.

FILE COPY

October 27, 1982
533-6108

MEMORANDUM TO: Brent C. Bradford, Executive Secretary, Utah Air Conservation Committee BB

THROUGH: Montie Keller, Section Manager, Enforcement/Engineering MK

FROM: David McNeill, Air Quality Technician

SUBJECT: Initial Compliance Stack Test of Baghouse Serving the Shed Covering Coke Batteries 1 & 2 at U.S. Steel, Geneva Works

On October 19-20, 1982, Jim Stephens and I observed the EPA sponsored initial compliance stack test of the baghouse on coke batteries 1 and 2 at the U.S. Steel, Geneva Works. Those present for the test were:

Marius Gedgaudis from EPA
Paul Wolf and Brian Hobbs for GCA Corp.
Mark Peotter from Mikro Pul
Mel Kitchen and crew from TETCO
Boyd Erickson and others from U.S. Steel

On the morning of October 19, 1982, the crew testing module #5 developed problems after the first sample because one of the impingers froze, causing that crew to miss four pushes. Also, another push was missed because of communication problems between the testers and the plant operators.

It had been agreed upon in the pre-test conference that modules 5 and 10 would be tested on October 19, 1982, and #'s 4 and 9 would be tested on October 20, 1982; however, I noticed that the module nearest the baghouse inlet was cycling almost continuously during the day, and those in the back cycled once during the same time. After conferring with Mikro Pul, Marius, Boyd, and Dave Kopta, we decided to test modules 1 and 6 on October 20, 1982.

The rest of the testing went smoothly.

While we were on the baghouse, on October 19, 1982, we saw two separate occurrences when the opacity from the east side of the battery exceeded 80% for more than six mi

Scott M. Matheson
Governor

STATE OF UTAH
DEPARTMENT OF HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
150 West North Temple, P.O. Box 2500, Salt Lake City, Utah 84110-2500

Marv H. Maxell, Ph.D., Acting Director
Room 474 801-533-6121

James O. Mason, M.D., Dr.P.H.
Executive Director
801-533-6111

DIVISIONS
Community Health Services
Environmental Health
Family Health Services
Health Care Financing

OFFICES
Administrative Services
Community Health Nursing
Management Planning
Medical Examiner
State Health Laboratory

December 16, 1982
533-6108

MEMORANDUM TO: Brent C. Bradford, Executive Secretary, Utah Air Conservation Committee

THROUGH: Montie Keller, Section Manager, Enforcement/Engineering

FROM: James E. Stephens, Air Quality Technician

SUBJECT: Particulate Emissions Testing for Compliance, U.S. Steel, Geneva Works, Provo

On October 18, 1982, Dave Kopta, Dave McNeill, and I attended a compliance demonstration pre-test meeting at U.S. Steel, Geneva Works Administration Building. The protocol outlined specific compliance testing procedures to be employed during the testing of the #2 coke battery pushing emission control baghouse. Each item of the protocol was heard, discussed and agreed upon by all present.

The #2 baghouse had ten modules testing was done on four of them, in two separate runs. The first run commenced on October 19, 1982 with the first coke oven push after 8 a.m., and involved two stacks. The following day, a second run for the other two stacks was tested in a similar manner.

Each test consisted of 24 coke oven pushes. Sampling started at the start of the coke oven push cycle and continued for 2 1/2 minutes at 24 different transverse points. This method resulted in a total sampling time of 60 minutes per stack. Sampling was to be done according to EPA Methods 1-5. The sampling probes were removed from the exhaust stacks during nonsampling periods.

Continuous VEO's were taken of the stack and fugitive emissions according to EPA Method 9, during the entire sampling period.

I was not present during the clean-up phase of the test.

In my opinion, the sampling phase of the test was done according to EPA Method 1-5.

JES:wml
2057

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Region VIII
Denver, Colorado

Assignment Managers

Connally Mears | Keith Tipton

Contract No. 68-01-6316
Technical Service Area 1

Assignment 42 | Assignment 31

FINAL

REVISED OBSERVATION REPORT

PARTICULATE EMISSIONS TESTING FOR COMPLIANCE - U.S. STEEL GENEVA WORKS

10/19-20/82

COKE BATTERY NOS. 1 and 2 PUSH CONTROL SHED AND BAGHOUSE

December 1982

Prepared by

Brian Hobbs
Paul Wolf

GCA CORPORATION
GCA/TECHNOLOGY DIVISION
Bedford, Massachusetts

CONTENTS

TABLES

SECTION 1

INTRODUCTION

At the request of EPA Region VIII, GCA observed process and emission control operations along with stack testing procedures during the coke battery Nos. 1 and 2 Pushing Compliance Test at U.S. Steel Geneva Works 19-20 October 1982. The compliance test consisted of EPA Method 5 particulate emission measurement on four of the ten baghouse module stacks, and EPA Method 9 Visible Emission Observations (VEOs) of the shed system and baghouse stacks. During the test period, only battery No. 2 was operating.

GCA's duties were to record battery and baghouse operating conditions and to verify that the stack testing and VEOs, performed by U.S. Steel's Contractor-Timp Environmental Testing Company (TETCO) were done in accordance with methodologies specified by the test protocol (Appendix A). GCA provided two observers: one for process observations and one for stack test observations. They were assisted by personnel from the Utah Department of Health (UDH).

A pretest meeting was conducted at Geneva Works on 18 October 1982. The following concerns/resolutions were discussed:

- Modules proposed for testing Nos. 5 and 10 on 10/19, Nos. 9 and 4 on 10/20.
- Number of ovens pushed per shift; 22.
- Preliminary traverses and velocity checks were run on 10/18.
- Visual emissions observers would read continuously and be positioned at the following locations:
  - Top side (battery No. 2) catwalk: shed emissions
  - On the ground, adjacent to and watching battery No. 2: shed emissions
  - On the ground, between battery No. 1 and No. 2, watching battery No. 1: shed emissions
  - On the walkway connecting the baghouse compartments, on top of the compartments: baghouse stack emissions
- VEOs would be read from 8:00 am until emissions from the final push have been sampled.
- Only three baghouse modules would be run during the test period resulting in a maximum shed exhaust rate of 120,000 cfm.

- The three annubar flow measurement devices would be used to measure gas flow rates exiting the two sheds and the total flow in the main duct leading to the baghouse. Damper positions in the shed ducts would be at an intermediate position for battery No. 1, and full open for battery No. 2. These damper settings would produce flow rates of approximately 40,000 cfm and 80,000 cfm respectively. No adjustments have been made to the annubars since the calibration tests conducted in September (Appendix C).

  The September calibration tests were performed with four modules running and not with three modules as planned for this test. Comparison of the flow rates measured by pitot tube in the preliminary traverse (on 10/18) with the flow rate recorded by the annubars, resulted in a 4,000 cfm difference (3.3 percent). A differential pressure cell transducer was replaced on one of the annubars.

- Mel Kitchen claimed that flowrates in the three baghouse modules to be run during the test (Nos. 5, 6 and 10) were found to vary by approximately 5,000 cfm (4 percent).

- Boyd Erickson suggested waiving the 50 mg. minimum catch requirement stated in the protocol due to estimates of a 10 mg. total catch (based on an estimated total sample volume of approximately 40 cubic feet).

- The ultimate analysis of the coal charged to the coke ovens is taken once per week.

- The battery No. 1 shed would be exhausted for the purpose of collecting emissions from the quench car as it passes through the shed on the way to the quench tower.

The following people participated in the compliance test:

- U.S. Steel

  - Jim Starley - test coordinator
  - D. Trozzo - process observer
  - P. Helton - stack test observer
  - R. Harris - stationed on battery top

- EPA

  - M. Gedgaudas - process observer

- UDH

  - D. Kopta - pretest only
  - J. Shephens - stack test observer
  - D. McNeil - stack test observer

- MikroPul

  - M. Peotter – control equipment observer

- GCA (EPA Contractor)

  - B. Hobbs – process observer
  - P. Wolf – control equipment and stack test observer

- TETCO (U.S. Steel Contractor)

  - M. Kitchen and Stack Test/VEO Crew

The following data were requested by GCA and received at the conclusion of the test program for the 19-20 October test days:

- Coke Oven Temperature Report (push side and coke side),
- Coke Plant Ovens - Charging and Pushing Report,
- Chemical Laboratory - Coke Plant (ultimate analysis, one test),
- Daily Operating Report,
- Daily Heating Report,
- Circular Charts for;
  - fuel gas temperature,
  - fuel gas pressure,
  - stack draft,
  - fuel gas volume,
- Strip Charts for;
  - exhaust duct annubar flow measurement (from baghouse control room).

PROCESS OBSERVATIONS

The GCA process observer was responsible for documenting the No. 2 coke battery operating conditions in order to verify that the conditions were consistant with those specified in the test protocol. In addition, the process observer verified that the U.S. Steel topside observer was accurately notifying the test crew of the push start times and documenting the frequency of partially charged ovens and stickers.

<u>Process Operating Conditions</u>

Table 1 compares the coke battery No. 2 operating conditions stated in the test protocol with those observed during testing. The range of battery

TABLE 1. COMPARISON OF COKE BATTERY NO. 2 OPERATING CONDITIONS - PROPOSED AND ACTUAL DURING THE 19-20 OCTOBER COMPLIANCE TEST

Process parameter	Proposed during test		Actual during test	
Number of Ovens Unavailable	14		14	
Number of Ovens Partially Charged	6		5	
Ovens Blank Off	14		14	
Approximate Length of Coking Cycle in General (Hrs.)	18		18	
Charging sequence for the ovens	-10 (21-31-41)		-10[a] (21-31-41)	
Amount of Coal charged and length of a charge in general, partially charged ovens	13.7 tons; 2-2 1/2 min. Approx. 10 tons About 1 min.		NR	
Battery pressure, as measured at the Askania house	5-6.5 mm Hg		6.3-9 mmHg[a]	
Quantity and quality of oil sprayed on the coal prior to charging	1-2 pts/ton #2 fuel oil		NR	
Oven temperature range, including variations from oven to oven and/or through the coking cycle	7th flue			
	PS	CS	PS	CS
	1980	2050	2120	2040
	2030	2100	2150	2130
Frequency of change of gas flow direction through the checkers	30 min.		30 min.	
Bulk density	48 #/CF at Larry Car		45	
Pulverization	77-80% - 1/8"		78-79	
Stability (Std. ASTM D-3402 - 76 Test)	54 (56-58)		NR	

(continued)

TABLE 1 (continued)

Process parameter	Proposed during test	Actual during test
Hardness (Std. ASTM D-3402 - 76 Test)	68-72	NR
Moisture	Avg. 5.3% may vary depending on weather	NR
Ovens Unavailable	12, 13, 24, 25, 26, 28, 29, 45, 57, 58, 23, 42, 43, 44	12, 13, 22[b], 23, 24, 25, 26, 28, 29, 42, 43, 44, 45, 57, 58
Ovens Partially Charged	35, 36, 41, 46, 47, 62	22[b], 35, 36, 47, 62

[a]Based on observations taken by GCA.

[b]Partially charged 19 October and left empty 20 October after being a sticker.

NR = not reported.

pressure was greater than proposed, however, the proposed range does not consider the routine fluccuations which occur during each charge. The GCA observations represent instantaneous readings only and does not represent average readings.

The push side oven temperature was 6 to 7 percent higher than stated in the protocol. Knowing that the increased temperature was not large enough to affect the length of coking cycle, GCA does not consider this difference from the protocol to be a concern.

The bulk density of coal charged to the ovens was found to be 6 percent lower then that specified. U.S. Steel indicated a more realistic range of bulk density would be 45 to 47. If so, U.S. Steel should modify the protocol for future tests. All other operating conditions either compared with the specified conditions or were not reported in the data given to GCA.

Table 2 compares the coal quality measure by ultimate analysis. Unfortunately, the data supplied by U.S. Steel only included data for two of the seven components specified by the protocol. The ash and sulfur, for which data did exist, were within the expected ranges.

Table 3 summarizes the coke battery No. 2 process operating conditions documented by GCA during testing. There appears to be no abnormalities based on comparison with conditions observed by GCA during previous Geneva Works coke plant testing.

Pushes During Testing

Table 4 lists the ovens pushed during the overall test period with a total which represent the number of ovens pushed while tests were in progress. Note that U.S. Steel anticipated 22 ovens per shift at the protocol meeting. The partially charged ovens were noted accordingly. At the test meeting, U.S. Steel indicated that 12 percent of the ovens would be partially charged. The data shows that 16.7 and 8.3 percent of all ovens pushed during testing were partially charged 10/19/82 and 10/20/82, respectively.

One sticker occurred on battery No. 2 (oven 5) on the second day of testing. The method used by U.S. Steel to call out the pushes to the testing crew included a 2 minute warning, announcement at the start of the push and at the finish of the push. This information was relayed from the topside observer. During the first day of the testing, one radio call was missed, resulting in a testing delay, as no testing could occur without proper communication.

CONTROL EQUIPMENT OBSERVATIONS

The GCA process and stack test observers shared duties to document the operating conditions of the push control system. The process observer noted any occurrences of emissions escaping capture by the push side shed. The stack test observer documented operating conditions of the baghouse.

TABLE 2. COMPARISON OF COAL QUALITY AS MEASURED BY AN ULTIMATE ANALYSIS

Coal component	Range in Percent	
	Expected[a] during test	Actual[b] during test
Carbon	76.70 - 79.61	NR
Hydrogen	4.41 - 6.13	NR
Nitrogen	1.68 - 1.82	NR
Ash	6.80 - 7.20	6.8
Sulphur	.62 - .67	.66
Oxygen	6.10 - 9.04	NR
Fixed H_2O	5.947 - 6.890	NR

[a]As stated in the test protocol.

[b]Based on limited data on a U.S. Steel "Chemical Laboratory - Coke Plant" data sheet for one sample.

TABLE 3. COKE BATTERY NO. 2 PROCESS OPERATING DATA RECORDED DURING THE 19-20 OCTOBER COMPLIANCE TEST

Process parameter	Data recorded during testing[a]
Heater Room	
Gas pressure (mm H_2O)	172 - 190
Gas consumption (%q 400 K CFH)	32.5 - 32.8
Flue gas temperature (°C)	
PS	180 - 215
CS	200 - 220
Flue gas temperature (°C)	43 - 45
Stack Draft (mm H_2O)	
PS	10 - 11.2
CS	9.2 - 11
Topside	
Collector main pressure (mm Hg)	
North - PS	7.0 - 7.3
CS	6.5 - 7.0
South - PS	7.0 - 9.0
CS	6.3 - 8.0
Flushing liquor (psi)	
North	11 - 32
South	14.5 - 23.5
Steam pressure (psi)	
North	100 - 106
South	75 - 110

[a]Based on three sets of readings taken over the two day test periods.

TABLE 4. RECORD OF OVENS PUSHED DURING THE PUSH SHED AND BAGHOUSE COMPLIANCE TEST

Scheduled Push time	Ovens Pushed (oven ID number)			
	10/19/82		10/20/82	
	Module 5 Test	Module 10 Test	Module 1 Test	Module 6 Test
08 06	35 (M)	35 (M)	32	32
27		55	52	52
49		65	62 (M)	62 (M)
09 11		7	4	4
33	17	17	14	14
55	27	27	34	34
10 17	47 (M)	47 (M)	54	54
39	67	67	64	64
11 01	9	9	6	6
23	19	19	16	16
45	(39 not tested)		36 (M)	36 (M)
12 07	49	49	46	46
29	59	59	56	56
51	69	69	66	66
13 13	2	2	8	8
35	22 (M)	22 (M)	18	18
57	32	32	38	38
14 19	52	52	48	48
41	62 (M)	62 (M)	68	68

(continued)

TABLE 4 (continued)

Scheduled Push time	Ovens Pushed (oven ID number)			
	10/19/82		10/20/82	
	Module 5 Test	Module 10 Test	Module 1 Test	Module 6 Test
15 03	4	4	1	1
25	14	14	11	11
47	34	34	21	21
16 06	37	37	31	31
27	54	54	37	37
49	64	64		
17 11	6			
33	16			
54	36			
TOTAL DURING TEST	24	24	24	24
PERCENT OF PARTIALLY CHARGED OVENS DURING TESTS	16.7	16.7	8.3	8.3

(M) = partially charged oven.

Shed Capture

Detection of emissions escaping capture by the shed was often complicated by intermittent emissions from the topside charge lids and standpipes. Emissions were also rising up from the coal wharf on the west side of the sheds. The TETCO VE observer was positioned on the push side catwalk near the flushing liquor lines. Pushing of oven 68 on 10/20 was observed from within the shed. Oven 68 is located near the north end of battery No. 2, which enabled an unobstructed view of emission during the push. Emissions from the push appeared to be effectively collected by the shed duct. Some smoke lingered in the shed but did not appear to escape.

Baghouse Operation

The design and actual operating conditions of the baghouse is presented as Table 5. In the opinion of GCA, baghouse operation was acceptable. There was a concern regarding the inordinate number of cleaning cycles initiated by the No. 6 module on 19 October. As this module was not being tested, there was a concern that perhaps the design at the manifold was putting more particulate through this compartment. This could cause the cleaning cycle to actuate itself, as an increased particulate load would correspondingly increase the pressure drop across the module.

In order to satisfy these concerns, the modules to be tested on 20 October were changed to the first two modules, on a flow basis, in the ten module baghouse. These first two modules were No. 1 and 6. The additional module chosen for operation was No. 10.

On 20 October, the baghouse operating controls showed a variation in current drawn by the three fans exhausting the operating modules. Module No. 1 and 6 (closest to the inlet plenum) were drawing a range of 135-140 amps and 152-157 amps respectively based on data recorded during testing. Module No. 10 (farthest from the inlet plenum) was drawing 122-130 amps. Module No. 6 was also noted to be continuously pulsing throughout the test. The magnehelic indicated a pressure drop near the upper set point (4" W.C.) throughout the test. This may have indicated that the pressure drop across the bags was not sufficiently reduced by pulse cleaning to deactivate the automatic pulse cleaning device. Alternatively, the pressure sensing/pulse activation mechanism may have been malfunctioning. Mark Peotter (MikroPul) stated that the reason that module No. 6 drew more current than No. 1 was because it had a thicker filter cake due to recent use. Module No. 6 had most recently operated for 3-4 days prior to the test, whereas No. 1 had most recently only been run for one day prior to the test. Peotter also claimed that continuous pulsing was not unusual in these types of fabric filters. He also claimed that all modules were precoated with lime dust to minimize the emissions differential between a well broken in module versus a recently brought on line module. Although the continuous pulsing of Module No. 6 apparently did not appear to affect the efficiency of the module based on visual observations, a defective module cleaning mechanism or "blinded" bags could potentially result in future excess emissions.

TABLE 5. COMPARISON OF COKE BATTERY NOS. 1 AND 2 PUSH CONTROL BAGHOUSE OPERATING CONDITIONS - PROPOSED AND ACTUAL DURING THE 19-20 OCTOBER COMPLIANCE TEST

Control parameter	Proposed during test[a]	Actual during test[b]
Baghouse temperature (°F)	100 - 150	121 - 137
Pressure drop (in. W.C.)	3 - 4	NR
Pulse-air pressure (psig)	100 - 120	NR
Flow rate (1000 CFM)		
Battery No. 1 Shed	NR	45 - 50
Battery No. 2 Shed	NR	85 - 93
Total	NR	139 - 155
Fan Current (amperes)		
Day 1[c] - Module 5	NR	135
- Module 10	NR	128
- Module 6	NR	157
Day 2[d] - Module 1	NR	135 - 140
- Module 10	NR	122 - 130
- Module 6	NR	152 - 157

[a]As stated in the test protocol.

[b]Based on GCA recorded observations. Detailed readings are attached in Appendix B, Table B-1.

[c]Modules 5, 6, and 10 were operating on Day 1; testing was performed on Modules 5 and 10.

[d]Modules 1, 6, and 10 were operating on Day 2; testing was performed on Modules 1 and 6.

NR = Not Reported

STACK TEST OBSERVATIONS

There were no serious problems with the stack test procedures. The observation checklist is included as Appendix D. On 19 October, during the time between the first and second pushes the water in an impinger during the sampling of stack and module No. 5 froze. The testing on Module 5, therefore, missed the second, third, and fourth pushes. These missed pushes were "picked up" at the end of the day. The train was leak checked and disassembled to replace the impinger, releak checked and prepared for the next push.

Also on 19 October, the 1145 push was not sampled due to mechanical problems with the radio communication system. On 20 October, sampling trains on both stacks started sampling while there was no push. This was remedied by resampling the point when a push was occuring.

CONCLUSIONS

In the opinion of GCA, there were no serious observations with either the process, emission control, or actual testing procedures which would affect the integrity of these tests.

APPENDIX A

TEST PROTOCOL FOR THE COKE BATTERY NOS. 1 and 2 PUSH SHED AND BAGHOUSE COMPLIANCE TEST

GENEVA WORKS

United States Steel Corporation

P. O. BOX 510
PROVO, UTAH 84601

October 6, 1982

Received 10/8/82

Mr. Brent C. Bradford
Director Air Quality
Utah State Department of Health
150 West North Temple, Suite 426
P. O. Box 2500
Salt Lake City, Utah 84110

Mr. Robert L. Duprey, Director
Air and Waste Management Division (8AWM)
Environmental Protection Agency
Region VIII
1860 Lincoln Street
Denver, Colorado 80295

Dear Sirs,

Please find enclosed revision No. 1 of the coke plant pushing emission control baghouse and fugitive test protocol. Changes have been made pursuant to Mr. Duprey's letter of September 20 and we trust you will find this revision acceptable. However, there are several points which we do not have agreement. These are listed below.

1. The selection of the modules to be tested should be done several days in advance to the beginning of the test to allow the contractor sufficient set up time. Since neither agency has expressed any preference and in order to expedite the testing, USSC will select the modules prior to the pretest meeting and notify the contractor. Agencies will be notified in the pretest meeting of the number of modules to be running during the test and the modules which will be tested.

2. We feel it is important to have the sample probe removed from the stack during waiting times which will be approximately 20 minutes between each of the 24 sample times. The test period will only consist of 2 1/2 minutes and the results of impact build-up in the probe during the non-test periods could be significant. Extra care will be taken to prevent nozzle damage and retain the integrity of the sample train as they are removed and re-inserted.

3. This point is perhaps a point of clarification rather than disagreement. The VEO reading the module discharge stack will read only during the sampling periods of 2 1/2 minutes during each push and the other three observers will read the sheds continuously with one observer rotating

so as to provide a rest every half hour. One reader will be located on the top side of the battery, the other two on the ground on the west side of the battery. We assume this is as per our agreement arrived at earlier during the visits of Marius Gedgaudas, Steve Piper and Steve Gronberg.

4. The flow rate to be used during the compliance demonstration will be specified at the pretest meeting. Due to Mikropul's delay in calibrating the annubar flow meters, we were unable to begin our flow rate evaluations as scheduled and are currently in the process of determining the proper flow.

5. It is not intended to investigate filter weight gain due to gas adsorption during these tests. This procedure is not a requirement for the compliance demonstration and although such data may be beneficial, it requires additional time and expense to acquire. This was not provided for in our original plans.

Aside from these items, we feel your recommendations have been incorporated into this protocol revision. Unless otherwise notified, we will follow the enclosed protocol during the upcoming pushing emission compliance demonstration on the south baghouse.

Yours very truly,

R. W. Pett Eco

R. W. Pett
Chief Engineer
Geneva-Pittsburg Works

Enclosure
cc: T. F. Bernarding w/e
D. R. Cronin wo/e
M. R. Curtis w/e
T. W. Goettge w/e
J. Hawthorne w/e
D. Wyse w/e
R. W. Raybuck wo/e

PARTICULATE EMISSION TESTING FOR COMPLIANCE - U. S. STEEL GENEVA WORKS

PROVO, UTAH

COKE PLANT PUSHING EMISSION CONTROL BAGHOUSE AND FUGITIVE TEST PROTOCOL

I. Project Organization and Responsibility

The following personnel and the testing contractor are presently anticipated to be involved in the testing program. EPA and UDH are invited to have their own personnel or contractor to observe all phases including the process.

Testing Contractor:

Timp Environmental Testing Company, Mel Kitchen, President

USSC Personnel:

Boyd C. Erickson, General Supervisor, Environmental Control Engineering

Jim R. Starley, Sr. Environmental Control Engineer - USSC Coordinator

Patti Hatton, Environmental Control Engineer - USSC Coordinator

During these tests only USSC personnel listed above or an assigned personnel from the operation are authorized to answer or obtain answers to pertinent questions on the process conditions or the test protocol.

II. Project Description

This protocol outlines the specific test procedures to be employed in demonstrating compliance with the mass, opacity, and flow rate limitations of the Geneva Consent Decree as specified in Appendixes 1.2, 1.3 and 1.6 as applied to Nos. 1 and 2 coke battery pushing-emission-control baghouse. This protocol specifically covers testing the south baghouse and Nos. 1 and 2 batteries. Battery No. 2 will be operating on normal coking cycle and No. 1 battery is idle hot. Testing will be done on the basis that No. 2 battery is the operating battery for all pushes and

and No. 1 the idle battery for all pushes. Geneva employs two identical pushing-emission-control systems, each consisting of two shed-type enclosures (one per battery) for the capture and containment of pushing emissions and one Pulsaire-type baghouse for two batteries, comprised of 10 identical modules for dust removal. Cleaned gases are discharged to the atmosphere via separate fans and exhaust stacks located on each module. The number of modules in service during the compliance demonstration will be determined by USSC and this information will be given to the agencies in the pre-test meeting on Monday, October 18, 1982. The testing procedure will include accumulating process data and production data as well as testing for particulate emissions using EPA Method 5. Visible stack and fugitive emissions will be determined during each test run using Method 9. The total particulate will be determined under current operating levels with No. 1 battery idle hot and No. 2 battery operating on normal coking cycle to demonstrate compliance of the subject emission points with limitations provided in consent decree case No. C-80 paragraph B.2(f)(1)(2)(3) and (4).

III. Test Schedule

Compliance test for the pushing emission controls requires the testing of four (4) out of the 10 stacks on each of two baghouses. Testing will start on two of the stacks of the south baghouse running simultaneously. One test run will be made on two stacks and then a second test run on the other two stacks, the second pair of stacks will be completed the following day. Each test will take approximately 10 hours to sample the 24 pushes. A pre-test meeting will be held at 10 a.m. on Monday, October 18, 1982. The tentative time schedule for testing activities is as follows:

On Monday, October 18, 1982, at 08:00 a.m. Contractor and USS Representatives will meet at Geneva Administration Building in the environmental control lab for orientation, safety and final test preparation and review meeting. The Contractor will set up his equipment in Geneva's Air Quality laboratory and on the stack for taking preliminary data. The lab crew will clean all probes and set up a complete set of equipment. Then the crew will begin preliminary tests for moisture, temperature and velocities on two of the stacks of the south baghouse. When complete, secure equipment for next day's testing.

On October 19, 1982, shortly before 0800, pick up equipment and move to the stacks on the south baghouse. Begin test run No. 1 and continue until 24 pushes have been sampled. Each for 2 1/2 minutes at each of 24 points in the two stacks being tested. There will be VEO's made during the test run by four observers and one relief observer rotating every half hour to provide relief. This same schedule will be repeated the next day, October 20, on the other two stacks to be tested on the south baghouse.

IV. Test Procedures

A General

Stack testing will follow Appendix 1.6 of the consent decree and Appendix 1.3 as modified in Appendix 1.6.

B. Other Detail Procedures

1. Prior to any testing, simultaneous velocity traverses will be performed at a suitable location in the outlet duct from each shed before the baghouse, to verify attainment of the maximum exhaust rate specified in the Consent Decree for the shed system and to correlate the continuous measurements of the annubar probe device for each battery. This determination will be made with 10 modules in operation. However, Mass-emissions

measurements for compliance purposes will be performed with the number of modules in operation that has been determined by USSC pursuant to Par. B.2(f)(7)(A).

2. To help assure the representativeness of mass-emission rates determined for each baghouse pushing-emission-control system, one test run will be performed on each of four modules. Selection of the stacks to be tested has been made by consulting with agency personnel prior to test set-up period which will allow the contractor adequate time to install his test equipment prior to start-up. Simultaneous testing, although not a requirement of this protocol, may be performed if desired.

3. Sampling will be performed in accordance with Methods 1 through 5 of 40 CFR, Part 60, Appendix A, for the determination of volumetric flow rate and particulate mass emissions. 24 point points (12 per diameter), will be sampled at the rate of one point per coke-oven push in each exhaust stack tested (stack drawing attached). Sampling will commence at the start of the push and continue for a duration of 2-1/2 minutes, resulting in a total sampling time of 60 min. Based on an estimated pushing rate of three ovens per hour for one battery in operation, approximately ten hours will be required to complete one test run. During nonsampling periods, the sampling probe will be removed from the exhaust stack.

4. If the vacuum exceeds the value to maintain isokinetic flow during the tests, the filter will be changed in the field with an extra loaded filter holder which will be ready if needed.

5. No cyclone will be used ahead of the filter.

6. An integrated sample of the flue gas will be taken from the exhaust line after the orifice of the dry gas meter during the first run. These gases will be analyzed with an orsat to determine the molecular weight. If the samples are essentially air, sampling will be discontinued on further tests.

7. Any necessary preparation and clean-up by the contractor will be performed in the laboratory at Geneva Works Administration Building. The laboratory work and analyses will be done by the contractor as soon as possible after each test in Geneva's Air Quality Lab.

8. Back half will be determined by the UDH Method dated October 19, 1981. Back half particulate should be included in the report and not used to determine compliance with State Regulations.

9. Testing will be performed only during periods of normal production and at normal coking times on No. 2 battery. Partially charged ovens will be counted the same as normally charged ovens because emissions appear the same as with a normal size push. The temperatures maintained on partially charged ovens are essentially the same as the normally charged ovens. Green pushes or "sticker" ovens are not considered abnormal conditions. In the event of any non-representive plant activity or any equipment malfunction, testing will be temporarily suspended until the problem is corrected and normal production resumes. This determination will be made in the field by USSC coordinator upon consultation with EPA and UDH representatives.

10. <u>Data Reduction</u>

Data reduction will include the calculation of volumetric flow rate for each module tested. Individual and average dust concentrations will be calculated on the basis of front-half particulate weight. Compliance with the emission standard in par. B.2(f)(3)(A)(i) shall be determined by flow weight averaging the test results in grains/DSCF for all stacks tested.

V. Process Information

A. Specific Data

The process conditions that exist now, as proposed during the compliance demonstration and as can best be projected subsequent to the compliance demonstration are as follows:

Nos. 1, 2, 3 and 4 Coke Plant Batteries
Process Operating Conditions

	Now Batt. No.				Proposed During Test Batt. No.				Projected Following Test Batt. No.			
	1	2	3	4	1	2	3	4	1	2	3	4
Identity of Ovens Unavailable		14				14				14		
Identity of Ovens Partially Charged	Idle Hot	6	Idle Hot	Idle Hot	Idle Hot	6	Idle Hot	Idle Hot	Idle Hot	6	Idle Hot	Idle Hot
Ovens Blank Off		14				14				14		

	Now Batt. No. 1 2 3 4	Proposed During Test Batt. No. 1 2 3 4	Projected Following Test Batt. No. 1 2 3 4
Approximate Length of Coking Cycle in General (Hrs.)	18	18	18
Applies to All Batteries			
Charging sequence for the ovens	-10 (21-31-41)	-10 (21-31-41)	-10 (21-31-41)
Amount of Coal charged and length of a charge in general, partially charged ovens.	13.7 tons 2-2½ min. Approx. 10 Tons About 1 min.	13.7 tons 2-2½ min. Approx. 10 Tons About 1 min.	13.7 tons 2-2½ min. Approx. 10 Tons About 1 min.
Battery pressure, as measured at the Askania house.	5-6½ mm Hg	5-6½ mm Hg	5-6½ mm Hg
Quantity and quality of oil sprayed on the coal prior to charging	1-2 pts/ton #2 fuel oil	1-2 pts/ton #2 fuel oil	1-2 pts/ton #2 fuel oil
Oven temperature, including variations from oven to oven and/or through the coking cycle.	7th flue P.S.&C.S. Avg. Range 1980 2050 2030 2100	7th flue P.S.&C.S. Avg. Range Same	7th flue P.S.&C.S. Avg. Range Same
Frequency of change of gas flow direction through the checkers	30 min.	30 min.	30 min.
* Bulk density - leans coal in hopper	48#/CF at Larry Car (→ 45-47)	Same	Same
* Pulverization 1) total coal = 79-83 2) Hi vol coal	77-80% -1/8" → also good	Same	Same
* Stability (Std. ASTM D-3402 - 76 Test)	54 (56-58)	Same	Same
Hardness (Std. ASTM D-3402 - 76 Test)	68-72	Same	Same
Moisture	Avg. 5.3% May vary depending on weather.	Same	Same

	Battery No.			
	1	2	3	4
Ovens Unavailable		12, 13, 24, 25, 26, 28, 29, 45, 57, 58, 23, 42, 43, 44		
Ovens Partially Charged*		35, 36, 41, 46, 47, 62		

Quality of coal charged, as measured by an ultimate analysis.

	Range in Percent
Carbon	76.70 - 79.61
Hydrogrn	4.41 - 6.13
Nitrogen	1.68 - 1.82
Ash	6.80 - 7.20
Sulphur	.62 - .67
Oxygen	6.10 - 9.04
Fixed H_2O	5.947 - 6.890

*Partially charged ovens - the reason for short or modified charges is because of wall damage to the ovens. The procedure in charging these ovens, is to charge the No. 3 hole then the No. 2 hole followed by charging No. 1 until it hangs up and then cut the charge off and then level. When pushed emissions are about the same.

B. Process data that is recorded and is available is as follows:

1. Stack draft in mm H_2O.
2. Flue temperature.
3. Oxygen analyzer.
4. Fuel gas volume.
5. Fuel gas temperature.

6. Gas pressure - Fuel
7. Charging-pushing report.
8. Oven schedules.
9. Daily operator's report.
10. Spraying log.
11. Flue leakage log.
12. Daily battery emission monitoring data.
13. Daily heating report.
14. Collector main pressure.
15. Oven temperature report.
16. Ultimate analysis of the coal.

C. Control Facilities Operating Parameters

1. Baghouse temperature. 100°F - 150°F.
2. Pressure drop. - 3" - 4" W.C.
3. Bag cleaning frequency - automatic with pressure drop.
4. Pulse-air pressure 100-120 psig.
5. Flow rate from each of No. 1 and No. 2 battery sheds and total flow rate during pushing and non-pushing modes.
6. Bag material - polyester - felt.
7. Bag weight - 16 oz./sq. yard.

VI. Test Area

The test area shall include the Nos. 1 and 2 coke batteries, process control center for both batteries and the south baghouse stacks and control center. Also areas appropriate for visible observations outside the coke plant proper and the laboratory area for preparation, clean-up and laboratory activities located in the administration building at Geneva Works.

VII. The Visible Emissions Observation Program Method

Concurrent with mass-emission determinations, visible emission observations will be recorded by certified smoke observers in accordance with 40 CFR, Appendix A, Method 9. A single observer will make simultaneous observations of the discharge of the two baghouse stacks being tested during each 2-1/2-minute sampling period. Three other visual emission observers will be making continuous observations of emissions escaping from any part of either shed. These readings will be made as specified in par. B.2(f)(6) and (7)(B) and Appendix 1.2 of the consent decree. An additional observer will rotate making observations every one-half hour to allow rest time for the other four observers.

VIII. Contacts by Agencies or Their Representatives During Tests and Process Observations

1. The contractor will have complete responsibility for all test work and analysis, including preparation and clean-up.
2. The U. S. Steel representative will make all necessary clearances for entering and leaving the plant.
3. The contractor may be continuously monitored by UDH, EPA and USS representatives but no information will be given out or made available either verbally or in writing to any person or organization without first clearing with the USSC coordinator in charge of the test.
4. All agencies agree to provide notice to USSC before arranging to make any observations performed under this protocol. Notice shall be sufficient to give USSC an opportunity to have a representative present.

5. The agencies agree that agency observers will make all reasonable effort to identify and report to USSC conditions in the field which may constitute a basis for invalidating the tests while in the field. However, each agency reserves its right to assess the validity of inspections based on later review and evaluation.

6. The agencies agree that agency observers will act as observers only, and will not physically participate in any of the pretest, testing, cleanup, and laboratory procedures, including personally making any adjustments or changes to the operating facilities.

7. During the inspections and observations of the process, agency representatives and/or their representatives, shall not question any operating personnel. If information is needed, which is pertinent to the testing evaluation, contact will be made with the USSC coordinator, who will obtain the required data. USSC shall make a coordinator available at all times during the inspections.

IX. Quality Assurance (General)

1. Quality assurance will be applied to assure consistency with all inspections and all observers. United States Steel Observers will review and be completely familiar with the protocol and the consent decree for demonstration for compliance.

2. UDH, EPA and USSC personnel will meet to agree on definitions, inspection methods and reporting to assure accuracy and quality assurance.

X. Reporting

Reports will be prepared by USS contractor and copies of raw data and calculations will be submitted as verification of compliance. All requested process and production data will be provided by U. S. Steel to EPA and UDH.

Distribution of test reports:

R. W. Pett, Chief Engineer - Geneva-Pittsburg Works

John Hawthorne, USS Research

D. R. Cronin, USS Pittsburgh Environmental Control

T. W. Goettge, Division Supt. Coke and Coal Chemicals - Geneva Works

M. R. Curtis, Division Supt. Maintenance and Utilities

B. C. Bradford, Bureau of Air Quality, UDH

R. L. Duprey, EPA

Distribution of this Protocol:

John Hawthorne, USS Research

D. R. Cronin, USS Pittsburgh, E/C

Brent Bradford, UDH

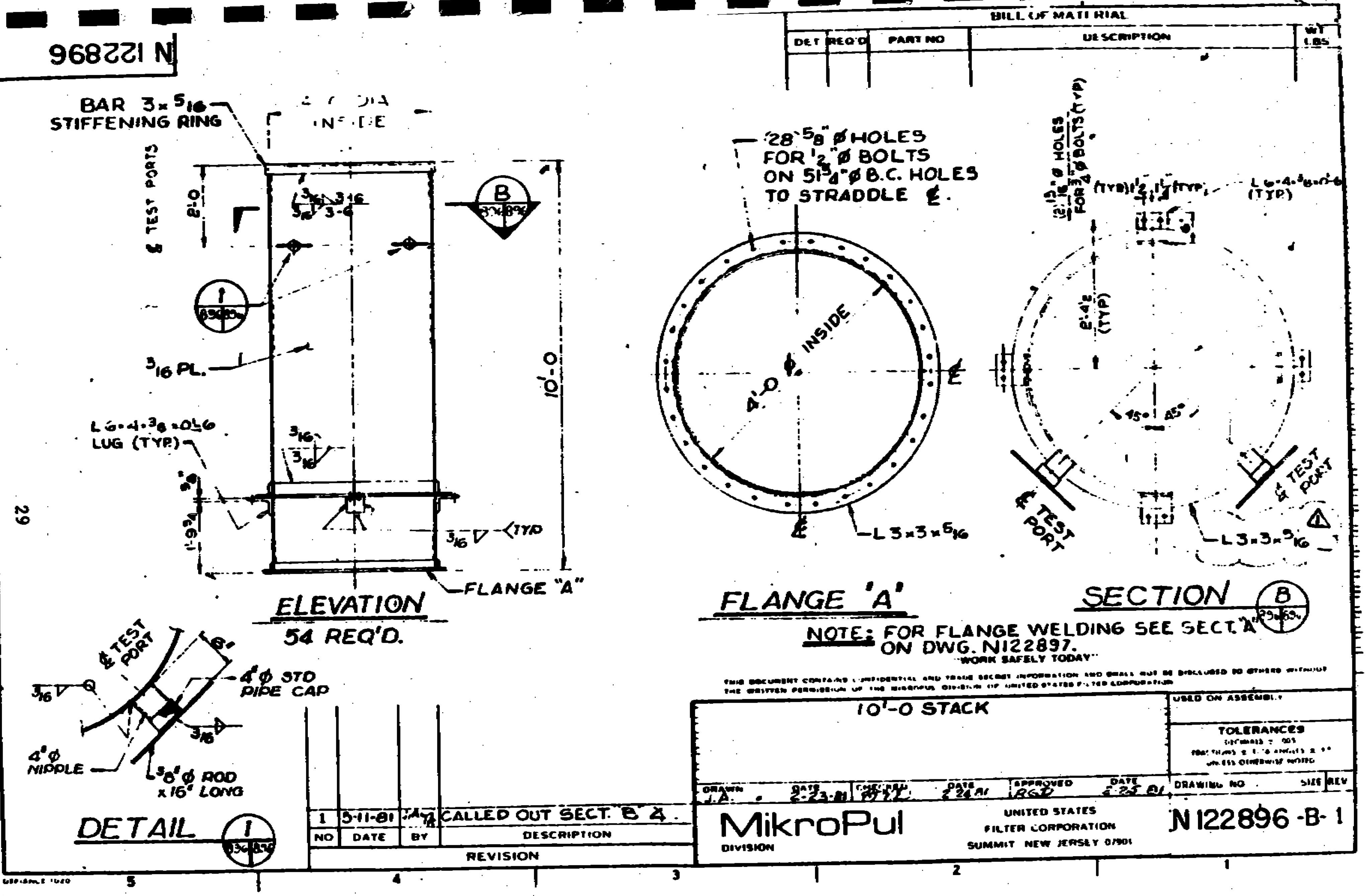
T. W. Goettge, Geneva Works

M. R. Curtis, Geneva Works

T. F. Bernarding, Geneva Works

Dick Wyse, Pittsburgh C.E.

R. L. Duprey, EPA


N 122896
BILL OF MATERIAL
DET | REQ'D | PART NO | DESCRIPTION | WT LBS
BAR 3 x 5/16
STIFFENING RING
INSIDE
℄ TEST PORTS
3/16 PL.
L 6 x 4 x 3/8 x 0'-6
LUG (TYP)
10'-0
FLANGE "A"
ELEVATION
54 REQ'D.
28 - 5/8" ø HOLES
FOR 1/2" ø BOLTS
ON 51 3/4" ø B.C. HOLES
TO STRADDLE ℄
4'-0 ø INSIDE
L 3 x 3 x 5/16
FLANGE 'A'
℄ TEST PORT
SECTION B
NOTE: FOR FLANGE WELDING SEE SECT. "A" ON DWG. N122897.
"WORK SAFELY TODAY"
4" ø STD PIPE CAP
4" ø NIPPLE
5/8" ø ROD x 16" LONG
DETAIL 1
1 | 5-11-81 | CALLED OUT SECT. B 4
NO | DATE | BY | DESCRIPTION
REVISION
10'-0 STACK
USED ON ASSEMBLY
TOLERANCES
DRAWN J.A. DATE 2-23-81 CHECKED DATE 2-24-81 APPROVED RGD DATE 2-25-81
MikroPul DIVISION
UNITED STATES FILTER CORPORATION
SUMMIT NEW JERSEY 07901
DRAWING NO SIZE REV
N122896 -B- 1

APPENDIX B

COKE BATTERY NOS. 1 and 2
PUSH CONTROL BAGHOUSE OPERATING CONDITION OBSERVATIONS
AND FLOW RECORDINGS

TABLE B-1. BAGHOUSE OPERATING DATA FOR COKE BATTERY NOS. 1 AND 2 BAGHOUSE DURING THE OCTOBER 1982 COMPLIANCE TEST

			Flow Rate (1000 CFM)			FAN Current (amps)		
Date	Time	Temp. (°F)	Shed #1	Shed #2	Total	Module 5	Module 10	Module 6
10/19	850	NR	40	82	149	130	130	160
	1127	NR	40	70	140	130	130	160
	1239	NR	40	85	140	130	130	160
	1425	132	45	85	140	135	128	157
						Module 1	Module 10	Module 6
10/20	800	135	49	85	155	135	130	160
	850	140	48	85	153	135	130	160
	1020	127	45	85	140	135	127	155
	1230	121	46	90	155	140	130	157
	1400	132	46	92	143	135	130	155
	1510	133	45	93	139	140	125	152
	1547	137	45	90	143	135	122	152
	1600	131	50	89	142	137	127	154

TABLE 1. ANNUBAR CALIBRATION RESULTS, U.S. STEEL CORPORATION, GENEVA WORKS

Damper Settings	Both Dampers 100% Open						#1 Damper Intermediate			#2 Damper Intermediate		
Baghouse Operating Level	10 fans	10 fans	10 fans	8 fans	6 fans	4 fans	4 fans			4 fans		
Measurement Location	Main	#1 shed	#2 shed	Main	Main	Main		Main			Main	
Average Measurement Results												
Velocity (afpm)	5,309	5,846	4,942	4,409	3,401	2,504		2,360			2,658	
Average Temperature (°F)	114	90	108	116	120	125		113.2			109.3	
Actual Flow (acfm)	416,968	286,478	242,654	346,311	256,752	196,639		185,392			208,892	
Standard Flow (dscfm)	317,087	229,163	187,635	263,585	202,860	148,468		143,250			162,428	
Recorded Flow												
High (acfm)	422,000	215,000	215,000	345,000	272,000	190,000	73,000	105,000	190,000	101,000	76,000	195,000
Average (acfm)	405,000	207,000	207,000	333,000	255,000	182,000	68,000	102,000	182,000	98,000	73,000	185,000
Low (acfm)	375,000	200,000	200,000	325,000	245,000	170,000	65,000	98,000	170,000	95,000	70,000	179,000

TABLE 2. CALIBRATION DATA, U.S. STEEL CORPORATION, GENEVA WORKS

Damper Settings	Both Dampers Full Open						#1 Damper Intermediate	#2 Damper Intermediate
Baghouse Operating Level	10 fans	8 fans	6 fans	4 fans	10 fans	10 fans	4 fans	4 fans
Measurement Location	Main	Main	Main	Main	#1 shed	#2 shed	Main	Main
Barometric Pressure (in. Hg)	25.63	25.63	25.63	25.63	25.70	25.70	25.70	25.70
Static Pressure (in. H_2O)	-5.30	-3.70	-2.15	-1.135	-3.50	-3.25	-1.20	-1.20
Stack Temperature (°F)	114	116	120	125	90	108	113	109
$\sqrt{\Delta P_{ave}}$ (in. H_2O)	1.39	1.55	0.89	0.656	1.57	1.31	0.623	0.704
Stack Area (in.^{2})	11,310	11,310	11,310	11,310	7,056	7,056	11,310	11,310
Moisture* (%)	2	2	2	2	2	2	2	2
Pilot Coefficient* (unitless)	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Molecular Weight* (g/g mole)	28.95	28.95	28.95	28.95	28.95	28.95	28.95	28.95

*Assumed.

APPENDIX D

STACK TEST OBSERVATION CHECKLIST

Estimated moisture content ______________ %

How estimated ______________.

C Factor ________ Estimated Stack Temperature ________ °F

nozzle diameter = ________ desired; ________ actual.

10. Filter medium type GlAss Fiber

11. Impinger, condenser cooling system 4 impingers ; ICE

12. Silicone grease ✓

13. Filter holder: Borosilicate glass ✓ ,

other ______________.

Filter support:

Glass frit with silicone rubber gasket ✓

Glass frit ______________

Stainless steel screen ______________

Neoprene rubber gasket ______________

Other ______________

14. Brushes: Nylon bristles ✓ , other ________.

15. Storage bottles: glass ________, polyethylene ✓ ,

teflon ________, other ________.

16. Capliner: teflon ________, other ✓ .

17. Petri dishes: polystyrene ________, glass ✓ ,

polyethylene ________.

[signature] Signature of Observer

GCA Affiliation of Observer

10/29/82 Date

______________ Signature of Test Team Representative

______________ Date

H. Notes: Include (1) General Comments; (2) Changes to Pretest agreement with with justification; (3) Identify (manufacturer) and describe condition of sampling equipment; (4) any abnormal occurrences during test program. (Additional pages attached: Yes _____, No _____.)

Paul J. [signature]
Signature of Observer

GCA
Affiliation of Observer

10/29/82
Date

Signature of Test Team Representative

Date

		Test Run 1	Test Run 2	Test Run 3	Sootblow
	Date				
2. Train leak check at nozzle: (≤0.02 cfm @ 15 in. Hg initial. Intermediate and final at highest vacuum during test run.)	initial (R)	N.O.	N.O.		
	intermediate (R)				
	intermediate (R)				
	intermediate (R)				
	final (M)	✓	✓		
3. Pitot lines leak check: (hold 3 in. H_2O on manometer for 15 sec.)	initial positive line (R)	N.O.	N.O.		
	negative line (R)	N.O.	N.O.		
	final positive line (M)	✓	✓		
	negative line (M)	✓	✓		
	pitot tube undamaged	✓	✓		
4. Orsat sampling train leak check: (should hold 10 in. vacuum for 1/2 min.)	initial (M)	Squeeze NO	Bulb NO		
	final (M)	NO	NO		
Orsat: Initial leak check (M) Tedlar bag: Should hold 2 to 4 in. H_2O pressure for 10 minutes. Alternate: Completely fill bag and let stand overnight - no deflation.		✓	✓		
5. Time test started					
Time test ended					

Paul [signature] — Signature of Observer

GCA — Affiliation of Observer

8/29/82 — Date

______ Signature of Test Team Representative

______ Date

		Test Run 1	Test Run 2	Test Run 3	Sootblow
	Date				
6. Dry gas meter volumes:	port initial				
	final				
	port initial				
	final				
	port initial				
	final				
	port initial				
	final				
7. Train operation during run	pitch and yaw of probe OK	✓	✓		
	nozzle not scrapped on nipple	✓	✓		
	effective seal around probe	✓	✓		
*	probe moved at proper time	✓	✓		
	probe heated	✓	✓		
	nomograph changed when TS and/or TM changes significantly	✓	✓		
	average time to set isokinetics after probe moved to next point	15 sec	15 sec		
Average values:	impinger temperature should be <70°F	✓	✓		
	~~filter box~~ temperature (250°F ±25, ≤320°F) circle one	✓	✓		
	stack temperature	98°F	95°F		

*specific problem detailed in report

[signature]
Signature of Observer

GCA
Affiliation of Observer

10/29/82
Date

Signature of Test Team Representative

Date

		Test Run 1	Test Run 2	Test Run 3	Sootblow
	Date				
	barometric P taken	✓	✓		
	was probe ever disconnected from filter holder while in stack?	NO	NO		
	was filter changed during run?	NO	NO		
Check on filter holder -	loosening of clamping device	yes*	NO		
	was silica gel changed during run?	NO	NO		
	was any particulate lost?	NO	NO		
Accurate readings of:	ΔP	✓	✓		
	ΔH	✓	✓		
	meter temperature	✓	✓		
	stack temperature	✓	✓		
	meter vacuum	✓	✓		
	time per point	✓	✓		
	impinger temperature	✓	✓		
	filter box temperature	✓	✓		
8. Post test:	- All openings sealed	✓	✓		
	- recovery area clean sheltered	✓	✓		
	- filter handled with ~~gloves~~, forceps only	✓	✓		
	- petri dish sealed, labeled	✓	✓		
	- any particulate lost	✓	✓		

* Frozen impinger required changing

Paul [signature] — Signature of Observer

SCA — Affiliation of Observer

10/29/82 — Date

________ Signature of Test Team Representative

________ Date

	Test Run 1	Test Run 2	Test Run 3	Sootblow
Date				
- water measured: grad cylinder (d.v. ≤2 mℓ) mℓ	✓ 3.2/5.0	✓ 5.5/22.9		
- silica gel weighed, balance net gms	8.2/5.6	8.9 11.5		
condition	✓	✓		
- probe cooled sufficiently	✓	✓		
- nozzle removed and brushed	✓	✓		
- probe brushed - 6 times	✓	✓		
- nozzle brushes clean	✓	✓		
- glass wash bottles clean	✓	✓		
- acetone clean	✓	✓		
- water clean				
- blanks taken: acetone, water/other	✓	✓		
Probe brush and extension clean, type Guglod	✓	✓		
Sample jars: Clean	✓	✓		
Capped	✓	✓		
Sealed Drydowns + Recovery was performed at GSS facility	N.A.	N.A.		
Labeled	N.A.	N.A.		
Liquid level marked.	N.A.	N.A.		
9. Post test Orsat Analysis of Integrated Bag Sample				
Orsat analyzer - initial (M) (levels should not fall below cap. tubing and not more than 0.2 mℓ in burrette for 4 min.) — Initial	✓			
Orsat analyzer - final (M) — Final	✓			

Paul [signature] — Signature of Observer

GCA — Affiliation of Observer

10/29/82 — Date

______ Signature of Test Team Representative

______ Date

	Test Run 1	Test Run 2	Test Run 3	Sootblow
Date				
Orsat samples: * Type: Pretest agreement				
Observed				
Reported				
Number: Pretest agreement	—	—		
Observed	—	—		
Reported	—	—		
Sample time/point: Pretest agreement	—	—		
Observed	—	—		
Reported	—	—		
Analysis at end of test Orsat analyzer checked against air	—	—		
Orsat Analysis CO_2, %	0.0%	0.0%		
O_2, %	21.0%	21.0%		
CO, %	0.0%	0.0%		
10. All samples locked up	✓	✓		
All sampling components clean and sealed	✓	✓		
All data sheets submitted to observer **	NO	NO		
- Orsat	NO	NO		
- Run - isokinetic	NO	NO		
- Particulate cleanup	NO	NO		
- Process data	Yes	Yes		
- Charts	Yes	Yes		

* See Note #1
** See Note #2

[signature] GCA 10/29/82

Signature of Observer   Affiliation of Observer   Date

Signature of Test Team Representative   Date

NOTES: (1) The pretest agreement regarding orsats was that if orsats proved to the gas composition were to be air, then orsats would not be required. Analysis of the first day's two runs proved that the gas composition was that of air. Orsats were therefore not run on the second day

(2) During the pretest meeting it was decided that data sheets would be supplied after the last test. Whereas testing ended late in the day, it was mutually agreed that all data sheets (process and field testing) would be mailed on Fri. Oct 22 1982. this data was not mailed until the subsequent week. When it was received, the only data included was process data. No particulate test data was received until the final report was received.

[signature]
Signature of Observer

GCA
Affiliation of Observer

10/29/82
Date

____
Signature of Test Team Representative

____
Date

Equipment Calibrated	Methods	Limits	Frequency
Pitot tube (Type S)	Adherence to design specifications in Federal Register:* pages 41760 to 41761** or, comparison to standard pitot in wind tunnel - Federal Register pages 41764 to 41767**	Listed in specifications or σ of A & B values $\leq$ 0.01, and $(C_p(A) - C_p(B)) \leq 0.01$	Before initial field use and after each field use
Temperature Gauges: stack	Calibration within 10 percent of average absolute stack temperature < 761°F: ASTM Hg-in.-glass ref. NBS-calibrated thermocouple and potentiometer-or-thermometric fixed points > 761°F: NBS-calibrated thermocouple	gauge being calibrated and reference gauge within 1.5 percent.	After each field use
gas meter, condenser outlet	Hg-in.-glass thermometer.		
Probe nozzle	average 3 micrometer measurements of internal diameter.	highest-lowest $\leq$ 0.004 in.	Before initial use, when showing wear
Metering system	Initial: comparison of a range of ΔH values to volumes measured with wet test meter - see APTD-0576 After each field use: 3 runs at a single, intermediate ΔH, with vacuum set at maximum reached during test series.**	Initial: see APTD-0576† After each field use: Within 5 percent of last calibration	Check after each use in field.
Probe heater	use graphs in APTD-0576†		Before initial use.
Barometer	Hg barometer		

*Alternatives possible if approved.

**Federal Register, Vol. 42, No. 160, Thursday, August 18, 1977.

†Rom, Jerome J. Maintenance, Calibration, and Operation of Isokinetic Source Sampling Equipment. EPA. Research Triangle Park, North Carolina. APTD-0576. March 1972.

Signature of Observer ______ Affiliation of Observer ______ Date ______

Signature of Test Team Representative ______ Date ______

GCA

GCA CORPORATION
Technology Division

213 Burlington Road
Bedford, Massachusetts 01730
Telephone: 617-275-5444
Telex: 92-3339

23 December 1982

Mr. Marius Gedgaudas (8 AW-AP)
U.S. EPA, Region VIII
1860 Lincoln Street
Denver, Colorado 80295

FINAL

Dear Marius:

Enclosed please find 5 copies of GCA's revised observation report for the coke battery Nos. 1 and 2 push control shed and baghouse compliance test at U.S. Steel Geneva Works 19-20 October 1982. The report was modified to address comments made by yourself and Connally Mears on the original observation report issued 6 December 1982.

If there are any additional problems or concerns, please call myself or Paul Wolf.

Sincerely,

Stephen G. Piper
Senior Environmental Engineer

SGP/jmc
Enclosure

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

MAR 29 1983

REF: 8AW-AP

Brent C. Bradford, Director
Bureau of Air Quality
Department of Health
Division of Environmental Health
150 W.N. Temple
P.O. Box 2500
Salt Lake City, UT 84110

Dear Mr. Bradford:

We have prepared the attached update (to our letter of April 19, 1982) of EPA's reviews of compliance demonstrations conducted at the U.S. Steel Geneva Works through December 31, 1982. Our indication of a successful compliance demonstration refers only to the periods covered by the tests.

Other tests* conducted prior to agreement on the amended decree, including controversial tests at the nitrogen plant and open hearth stack #2, are considered resolved as a result of the negotiations resulting in stipulated penalties for any violations of which we knew prior to March 25, 1982. If you have any questions or comments regarding our conclusions, please contact Marius Gedgaudas at (303) 837-3711.

Sincerely yours,

~~(s) original~~ signed by Robert L. Duprey

Robert L. Duprey, Director
Air and Waste Management Division

not addressed:
slag spray study
OH VIS. mon. study
OH flow balance study
CP CEM cert's.

Attachment

cc: R.W. Pett, U.S. Steel

* OH #2, 4/80, private (company) test (not observed, adjusted controls during test) (unreported)
nitrogen plant dryer-cooler, 11+12/80, private (company) test (not observed, unreported)
FM soaking pits #2+6, 9/81 (non-complying)
FM reheat furnace #2, 9/81 (")
power house bypass #2/3, 10/81 (")
OH #1,3+8, 11/81 (")
power house bypass #5, 12/81 (")
sinter plant windbox N+S, 2/82 (")

OK. B.F. 3/29/83

CONCURRENCES

SYMBOL	8AW-AP	bcc: G. Phillips		8AW-AP			
SURNAME	Gedgaudas	D. Woljan	Phillips	8AW-AP			
DATE	3/26/83	C. Mears / M. Gedgaudas	3/25	3/29/83			

EPA Form 1320-1 (12-70) OFFICIAL FILE COPY

8AW-AP:MGedgaudas:dl:2501E:03/21/83:3711.

Coke Pushing Shed Battery #2 (#1 Hot Idle)	10/19-20/82	Compliance	Compliance (stack and shed fugitives)
Blast Furnace Casthouse #2	11/29-12/3/82	NA	Non-Compliance
Coke Plant Stack #2	12/20-22/82	Compliance	Compliance
Coke Pushing Shed Batteries #3&4 (24 hour coke)	12/28-29/82	Compliance	Compliance (stacks and shed fugitves)

B. Unacceptable Compliance Demonstration

Open Hearth Fugitive Emissions	9/20-24/82	NA	NA

*With Standards in amended Decree

REF: 8AW-TS

A. G. Everist, Inc.
IA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: JAN 14 1983

SUBJECT: Audit of Compliance Demonstration Report for U.S. Steel - Geneva Works Coke Battery #2 Pushing Shed; October 19-20, 1982

FROM: Dennis Woljan, Air Operations Section DMW
Keith Tipton, Chief, Air Operations Section, 8ES-FO KT

TO: John Philbrook, Acting Chief
Utah, Wyoming, and Montana Section

I. Introduction

On October 19-20, 1982, U.S. Steel - Geneva conducted a series of particulate emission tests on its' #2 coke shed baghouse. Requirements for the compliance demonstration are outlined in the consent decree under paragraph B.2(f) and Appendices 1.3 and 1.6. Also applicable is the visible emission standard of 20% maximum opacity from the shed area and baghouse stacks, paragraphs B.2.(f)(3)(B), (C).

II. Summary

Table I presents emission loadings based on the test data reported by the source. Audit computations are made in accordance with reference methods 1-5 (40 CFR 60, App. A). I recommend that the test be accepted as reported. According to our field observers, the test was conducted professionally and in a cooperative atmosphere.

III. Source-Test Procedural Errors

1. Loaded filters showed net weight losses of several milligrams each. The loss of filter weight is especially significant when, as in this test, the loadings are extremely light. We have consistently requested the processing of blank filters as a QA measure and have cited the appropriate QA handbook references which are specific to this issue. We believe that blank filters are an essential QA tool in evaluating handling and processing techniques and laboratory equipment.

2. Isokinetics were slightly low on one of the test runs. This parameter, when depressed, tends to bias the results slightly high.

IV Report Deficiencies

1. No list of filter numbers and tare weights prior to testing.

2. No description of how operating parameters were obtained.

3. No description of analytical procedures.

Technology Division

November 30, 1982

Mr. Marius Gedgaudas
8AW-AP
U.S. EPA Region VIII
1860 Lincoln Street
Denver, Colorado 82095

Subj: Review of Final Report on the Compliance Tests at U.S. Steel Corporation - Geneva Works Coke Pushing Baghouse System - South Shed Stacks 5 & 10 and 1 & 6

Dear Marius:

Enclosed please find the Final Report review of the particulate matter compliance tests conducted on Stacks 1, 6, 5 and 10 of the Coke Pushing Baghouse System - South Shed at U.S. Steel Corporation - Geneva Works. 10/19-20/82

The report, submitted by Timp Environmental Testing Company Company, (TETCO), is acceptable. The weighted average emissions of 0.0054 gr/dscf is well below the allowable emission rate of 0.01 gr/dscf.

If you require additional information or have any questions regarding this review, please call me at 617/275-5444, Extension 4050.

Sincerely,

John Fitzgerald

John Fitzgerald

JF/mm

Enclosure

	Pretest Report Yes	Pretest Report No	Final Report Yes	Final Report No
d. fuel feed rate	—	—	—	—
e. description of fuel feed rate measurement method	—	—	—	—
f. description and feed rate of any fuel additives	—	—	—	—
g. list and values of operating parameters (to be) obtained during tests	—	—	—	—
h. time interval of recording data	—	—	—	—
i. data as obtained	NA		—	—
j. instrumentation calibration dates	—	—	—	—
4. Process data:				
a. list of raw materials	—	—	—	✓
b. description of raw material feed rate/production rate measurement method	—	—	✓	—
c. list and values of operating parameters (to be) obtained during tests	—	—	✓	—
d. time interval of recording data	—	—	✓	—
e. data obtained	NA		✓	—
f. description of how operating parameters are (to be) obtained	—	—	—	✓
g. raw production data (final)	NA		✓	—
h. instrumentation calibration dates	—	—	—	✓
5. Pollution control device:				
a. description	—	—	✓	—
b. operating parameters (to be) obtained during test	—	—	✓	—
c. values of design or normal operating parameters	—	—	—	✓
d. time interval of recording data	—	—	—	—
e. data obtained	NA		✓	—
6. Estimate or actual flue gas conditions at sampling location:	—	—	—	—
a. particulate loading	—	—	✓	—
b. stack temperature	—	—	✓	—

Pretest, Signature of Reviewer	Affiliation of Reviewer	Date
John Fitzgerald	GCA/Tech Div.	
Final Report, Signature of Reviewer	Affiliation of Reviewer	Date

	Pretest Report Yes	Pretest Report No	Final Report Yes	Final Report No
12. Summary of results:				
a. emission results	NA		✓	__
b. process data, as related to determination of compliance	__	__	✓	__
c. allowable emissions	__	__	✓	__

E. Test Plan Evaluation:	Yes	No
1. Test plan submitted ≥ 30 days before test date	____	____
2. Sampling location/points conform to EPA Method 1	____	____
3. Sampling train, analytical methods, QA conforms to Method 5	____	____
4. Facility/source descriptions adequate for representative test	____	____
5. Test plan acceptable	____	____
F. Final Report Evaluation		
1. Emission results acceptable	✓	____
2. Source complies with allowable emission rate	✓	____
3. Report acceptable	✓	____
4. Return report for corrections:		
a. to calculations	____	____
b. to body of report	____	____

Pretest, Signature of Reviewer	Affiliation of Reviewer	Date
John Fitzgerald	GCA/Tech Div	
Final Report, Signature of Reviewer	Affiliation of Reviewer	Date

File No. ______

A. METER BOX NO. I + II

B. DRY GAS METER ______________

1. Pretest Calibration Factor, Y = .991 I + 1.02 II (should be within ±1% of proof)
2. Post-test check, Y = I 0.99 Y_2 = 1.01 II (must be within ±5% of pretest)
3. Recalibration required ______yes ✓ no
4. If yes; recalibration factor, Y = ______ (must be within ±2%)
5. Lower calibration factor, Y = ______ for calculations (pretest or post-test)

C. DRY GAS METER/STACK TEMPERATURE; THERMOMETER OR THERMOCOUPLE

1. Was a pretest temperature correction used? ______yes ✓ no
2. If yes, temperature correction ______ (within ±3°C (5.4°F) over range)
3. Post-test comparison with mercury-in-glass thermometer ______ (within ±3°C (5.4°F) over range)
4. Recalibration required ______yes ______no
5. Recalibration temperature correction, if used ______ (within ±3°C (5.4°F) over range)
6. If yes; no correction is necessary for calculations when meter thermometer temperature is higher. If recalibration temperature is higher, add correction to average meter temperature for calculations.

D. BAROMETER

1. Was pretest field barometer reading correct ______yes ______no
2. Post-test comparison ______mm Hg (in. Hg) (±2.5 mm Hg) (0.1 in.)
3. Was recalibration required ______yes ______no
4. If yes; no correction is necessary for calculations when the field barometer has the lower reading. If the mercury-in-glass reading is lower, then subtract the difference from the field data readings for the calculation.

E. JOY EPA-2 SAMPLING TRAIN ONLY

1. Dry gas meter temperature compensating unit operating properly, ______yes ______no.
2. If testing organization cannot prove proper unit operation, if above is no, permission to perform test is to be denied.

[signature] Signature of Reviewer

GCA/Tech Div Affiliation of Reviewer

______ Date

File No. ______

REPORT EVALUATION SHEET

Facility: U.S. Steel - Geneva Works Reviewer: GCA

Source: Stacks 1 & 6 Coke Plant Baghouse Date: 11/23/82

Run No.	1	1	6	6		
Parameter	Report	Reviewer	Report	Reviewer	Report	Reviewer
As - in.^{2}/ft^2	1809.5	1809.6	1809.5	1809.6		
Pst - in. Hg/H_2O	-0.67	-0.67	-0.64	-0.64		
PS in. Hg	25.58	25.58	25.58	25.58		
TS - °F	104.5	104.5	106.0	106.0		
$\sqrt{\Delta P}$ average	1.0938	1.0938	1.2434	1.2434		
Cp	0.84	0.84	0.84	0.84		
Vs - afpm	4125.55	4130.54	4695.97	4701.66		
QS - dscfm	41062.4	41,106.2	46612.4	46662.0		
QA - acfm	51843.2	51,907.1	59011.4	59084.2		
Percent I	95.218	95.10	102.649	102.50		
mg/collected Front 1/2	14.11	14.11	7.33	7.33		
mg/collected Total	31.01	31.01	39.23	39.23		
gr/dscf Front 1/2	0.0058	0.0058	0.0027	0.0027		
gr/dscf Total	0.0128	0.0127	0.0144	0.0144		
lb/hr Front Half	2.04	2.04	1.07	1.07		
lb/hr Total	4.49	4.49	5.75	5.75		
Allowable gr/Dscf Front Half	0.01	-				
Weighted Avg (4 runs) gr/Dscf	0.0054	0.0053				
Simple AVG (4 runs	0.0056	0.0056				
F factor oil and % of total						
F factor bark and % of total						

REPORT EVALUATION SHEET

Facility: U.S. Steel - Geneva Works Reviewer: GCA

Source: Stacks 5 & 10 Coke Plant Baghouse Date: 11/23/82

Run No.	5	5	10	10		
Parameter	Report	Reviewer	Report	Reviewer	Report	Reviewer
As - in.²/ft²	1809.5	1809.6	1809.5	1809.6		
Pst - in. Hg/H_2O	-0.51	-0.51	-0.80	-0.80		
PS in. Hg	25.72	25.72	25.70	25.70		
TS - °F	97.88	97.88	94.80	94.79		
$\sqrt{\Delta P}$ average	0.9567	0.9567	1.0939	1.0939		
Cp	0.84	0.84	0.84	0.84		
Vs - afpm	3584.56	3588.90	4081.79	4086.7		
QS - dscfm	35909.4	35947.6	41458.8	41503.3		
QA - acfm	45044.9	45100.5	51293.3	51356.1		
Percent I	89.726	89.60	100.030	99.88		
mg/collected Front ½	14.53	14.53	14.21	14.21		
mg/collected Total	31.53	32.03	24.36	24.36		
gr/dscf Front ½	0.0076	0.0075	0.0063	0.0063		
gr/dscf Total	0.0164	0.0166	0.0107	0.0107		
lb/hr Front Half	2.33	2.33	2.23	2.23		
lb/hr Total	5.05	5.13	3.82	3.82		
Allowable gr/dscf Fronthalf	0.01	-				
Weighted Avg gr/dscf	0.0054	0.0053				
Simple Avg gr/dscf	0.0056	0.0056				
F factor oil and % of total						
F factor bark and % of total						

SOTDAT/STEEL LIBRARY SYSTEM

Report Title: — #2 Push Control Car Scrubber

Plant and Location: US Steel Fairfield Alabama

SCC: 30300303

Testing Date(s): ~~10/[illegible]/78~~ 6/26-28/79

By Whom: Company

Stack Test Review Attached: yes

Reviewed by: EPA

Problems Seen by Reviewer: Gas meter correction factor not used

Confidentiality Status: Clear

If status is confidential, list confidential pages or sections:

Source of Determination of the Confidentiality Status: Memo entitled: "Steel Technical Support Materials", From: Edward Reich, Director DSSE. To: Tom Voltaggio.

Report Encoded by:

Date Encoded:

Form Numbers:

Comments:

(3)

Title: —

Plant and Location: US Steel Fairfield, Ala.

SCC: 30300303

Test Date: ~~10/17-19/78~~ 6/26-28/79

By Whom: Company

~~Scrubber~~ Push car - No. 2 battery

Encoded By:

Date Encoded:

Completed By:

Form No.:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: SEP 25 1979

SUBJECT: Review of U. S. Steel Coke Battery No. 2 Push Control Car Scrubber

FROM: Thomas P. Lyttle, Technical Advisor
Air Engineering Branch

TO: Robert R. Geddis
Air Enforcement Branch

SUMMARY

We have reviewed the test report by U. S. Steel on emissions from its push control car scrubber on the No. 2 coke battery at Fairfield. With the exception of some minor problems, the test is acceptable as submitted. The problems we noted were:

1. the failure to use a meter temperature correction factor in the test results. The test meter is supposedly temperature compensated, but we have questions as to the reliability of the temperature compensation. This conceivably could introduce an error of 4-5% low.

2. There is no indication that the nozzle was calibrated prior to the test.

3. There is no gas meter calibration after the test. The pre-test meter calibration was conducted more than three months prior to the test.

We suggest these calibration records be requested and reviewed before the test be accepted. You may also wish to ask for verification of the accuracy of the meter temperature compensation, although the amount of the possible error is not sufficient to affect the compliance status.

ACTION

With the reservations noted above, we recommend the test be accepted as demonstrating compliance with the .03 lb/ton of coke standard. We understand that the capture efficiency was found to be adequate during the test, so this test should satisfy the requirements for control of push emissions on battery No. 2.

AIR ENFORCEMENT BRANCH
RECEIVED
SEP 27 1979
EPA - REGION IV
ATLANTA, GA.

BACKGROUND

You requested this review on September 7.

Thomas P. Lyttle

Attachment

acknowledge

United States Steel Corporation

J. K. PETERSON
MANAGER
ENVIRONMENTAL CONTROL—SOUTH

FAIRFIELD WORKS
P. O. BOX 599
FAIRFIELD, ALABAMA 35064

August 31, 1979

Director, Enforcement Division
U. S. Environmental Protection Agency
345 Courtland Street, NE
Atlanta, Georgia 30308

Health Officer
Jefferson County Department of Health
P. O. Box 2646
Birmingham, Alabama 35202

Director
Alabama Air Pollution Control Commission
645 South McDonough Street
Montgomery, Alabama 36130

Gentlemen:

Enclosed is the test report covering the evaluation of the pushing-emission control car on Coke Battery No. 2. This test, which was performed by USS Research on June 26-28, was witnessed by representatives of all three agencies. Twenty-four (24) points were sampled isokinetically in each test; standard EPA test methods were followed.

The test results (Table I) show an average scrubber stack flow of 44,000 scfm (dry), an average dust concentration of 0.027 gr/scfd and average emissions from the device of 0.02 pounds per ton of coke.

The last figure is to be compared to an emission limitation of 0.03 lb/ton coke, which is contained in the Settlement Agreement of March 31, 1978, (Paragraph III B 4). Mr. Harvey's letter of July 10, 1979, confirms that the capture efficiency requirement was met during this evaluation.

We would be happy to review the contents of this report with you at your convenience.

Sincerely,

Attachment

AIR ENFORCEMENT BRANCH
RECEIVED
SEP 6 1979
EPA - REGION IV
ATLANTA, GA.

Table I

Fairfield Push Car
EPA Method 5 Test Results

Test No.	Date, 1979	Length of Test, min.	Stack Temp, °F	Percent H_2O by Volume	Volume Sampled, scf(dry)	Gas Flow, scfm (dry)	Weight of Dust, Acetone	Weight of Dust, Filter	Weight of Dust, Total	Dust Conc, gr/scfd	Dust Loading, lb/hr	Percent Isokinetic Sampling	Loading,[1] lbs/ton of coke pushed	Percent Scrubber Removal Efficiency	Stack Emissions lb/push	Scrubber Discharge[2] Water Loading, lb/push
1	6/26	70.48	123	15.0	48.81	43,400	0.0260	0.0517	0.0777	0.0245	9.1	103.4	0.018	93.4	0.445	6.26
2	6/27	75.21	124	13.8	48.50	44,100	0.0538	0.0513	0.1051	0.0334	12.6	94.8	0.027	94.0	0.658	10.[illegible]
3	6/28	68.20	123	14.2	46.56	47,000	0.0231	0.0461	0.0692	0.0229	9.2	94.3	0.018	93.5	0.436	6.28
Average				14.3		44,000				0.0269	10.3		0.021	93.6	0.513	

Orsat Flue Gas Analysis, % by Volume

	6-26-79	6-27-79	6-28-79
CO_2	1.0	1.3	Data Not Available
Illuminants	1.1	0.2	
O_2	16.5	17.4	
CO	0.3	0.6	
H_2	0.0	0.0	
CH_4	0.5	0.2	
N_2	80.6	80.3	

Scrubber Operating Data[3]

Date, 1979	Quencher Inlet, Temp, °F	Scrubber Inlet, Temp, °F	Venturi Temp, °F	Venturi ΔP in H_2O
6/26	445	154	114	23.5
6/27	427	120	113	26.6
6/28	448	125	112	24.1

1. Based on 24 tons of coke per push.
2. Based on 350 gallons per push.
3. Scrubber Design ΔP of 24-inch w.g.

Fairfield Push Car—EPA Sample Calculations
Taken from Test No. 1 - June 26, 1979

1. Average Velocity:

$$V_{s(avg)} = 2.9 \times C_p^* \times \left(\frac{29.92}{P_s} \times \frac{1.00}{G_d} \times T_s \times \Delta P \right)^{1/2}$$

$$V_{s(avg)} = 2.9\ (0.825) \left(\frac{29.92}{29.89} \times \frac{1.00}{0.94} \times (583)(1.716) \right)^{1/2} = 78.09 \text{ ft/sec}$$

* Pitot factor

2. Gas Volume:

$$Q_s = V_{s(avg)} \times \text{area of flue} \times 60 \times \frac{T_{(std)}}{T_{s(avg)}} \times \frac{P_s}{P_{(std)}} \times \left(1-B_{wo} \right)$$

$$Q_s = 78.09 \times 12 \times 60 \times \frac{530}{583} \times \frac{29.89}{29.92} \times 0.85 = 43{,}400 \text{ scfm (dry)}$$

3. Meter Rate: pt A-4

$$R_m = 2.9 \times C_p \times \left(\frac{29.92}{P_s} \times \frac{1.00}{G_d} \times T_s \right)^{1/2} (\Delta P)^{1/2} \times 0.4166$$

$$\times \left(1-B_{wo} \right) \times \frac{T_m}{T_s} \times \frac{P_s}{P_m} \times \text{area of sample nozzle, in.}^2$$

$$R_m = 2.9\ (0.825) \left(\frac{29.92}{29.89} \times \frac{1.00}{0.94} \times 580 \right)^{1/2} (0.97)(0.4166)$$

$$(0.85) \left(\frac{530^*}{580} \right) \left(\frac{29.89}{30.06} \right) (0.0266) = 0.49 \text{ cfm}$$

* With the Western Precipitation EPA equipment, this value will always be 530 since a 70°F temperature compensated gas meter is utilized.

4. Volume of Sampled Gas Corrected to Standard Conditions:

$$V_{m(std)} = V_m \left(\frac{P_{bar} + \frac{\Delta H}{13.6}}{P_{(std)}} \right)^* =$$

$$V_{m(std)} = (48.59) \left(\frac{30.00 + \frac{0.75}{13.6}}{29.92} \right) = 48.81 \text{ scf, dry}$$

* As previously stated, the Western Precipitator equipment requires no meter temperature correction $\frac{T_{std}}{T_m}$

5. Volume of Water Vapor:

$$V_{w(std)} = 0.0474 \frac{\text{cu ft}}{\text{ml}} \quad V_{lc}$$

$$V_{w(std)} = 0.0474 \ (181) = 8.58$$

6. Moisture Content:

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

$$B_{wo} = \frac{8.58}{48.81 + 8.58} = 0.150$$

% Moisture by volume = $100 \times B_{wo}$ = 100×0.150 = 15.0

7. Dust Loading (gr/scf, dry)

$$C_s' = 0.0154 \frac{gr}{mg} \left(\frac{M_n}{V_{m(std)}} \right)$$

$$C_s' = 0.0154 \left(\frac{77.7}{48.81} \right) = 0.0245 \text{ gr/scf (dry)}$$

8. Dust Loading: lb/hr

$$\text{lb/hr.} = \frac{60}{7000} \left(\text{gas volume } [Q_s], \text{ scfm} \right) \text{(gr/scfd)}$$

$$\frac{60}{7000} (43{,}400)(0.0245) = 9.1$$

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9. Scrubber Efficiency: % Removal

Percent Removal =

$$\frac{\text{lb/push scrubber discharge water}}{\text{lb/push scrubber discharge water + lb/push stack emissions}} \times 100$$

$$= \frac{6.26}{0.445 + 6.26} - 100 = 93.4\%$$

10. Isokinetic Variation:

$$I = T_s \left(0.01667 \frac{min}{sec} \right) (100) \left[\left(0.00267 \frac{\text{in. Hg cu ft}}{\text{ml °R}} \right) V_{lc} + \frac{V_m}{T_m} \left(P_{bar} + \frac{\Delta H}{13.6} \right) \right] \text{ divided by } \theta \, V_s \, P_s \, A_n$$

$$I = \frac{(583)(1.667)\left[0.00267 \, (181) + \frac{48.59}{530} \left(30.00 + \frac{0.75}{13.6} \right) \right]}{(70.48)(78.09)(29.89)(0.000185)} = 103.4\%$$

Nomenclature

Symbols Used in Calculations

A = Cross-sectional area of stack, ft^2

A_n = Cross-sectional area of nozzle, ft^2

B_{wo} = Proportion by volume of water vapor in the gas stream, dimensionless

C_p = Pitot tube coefficient, dimensionless

C_s = Concentration of particulate matter in stack gas, lb/scf, dry basis

C'_s = Concentration of particulate matter in stack gas, gr/scf, dry basis

G_d = Specific gravity of gas in stack, dimensionless

ΔH = Average pressure drop across the orifice meter, inches H_2O

I = Percent of isokinetic sampling

M_n = Total amount of particulate matter collected, mg

P_{bar} = Barometric pressure, inches Hg

P_m = Absolute pressure at meter, inches Hg

P_s = Absolute pressure in stack, inches Hg

P_{std} = Absolute pressure at standard conditions, 29.92 inches Hg

ΔP = Velocity head measured by pitot tube, inches H_2O

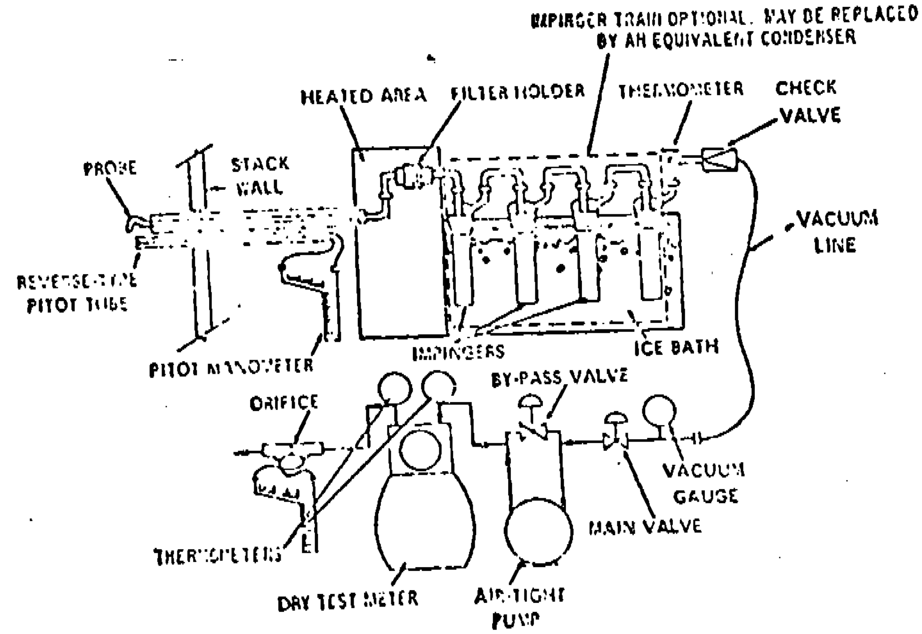
$\left(\sqrt{\Delta P}\right)_{avg}$ = Average of the square roots of the velocity heads measured in the stack, $(\text{inches } H_2O)^{1/2}$

Q_s = Volumetric flow rate, dry basis, standard conditions, ft^3/min

R_m = Meter rate at meter conditions, ft^3/min

T_m = Absolute dry gas-meter temperature, ^oR

-18242 REV. 1063



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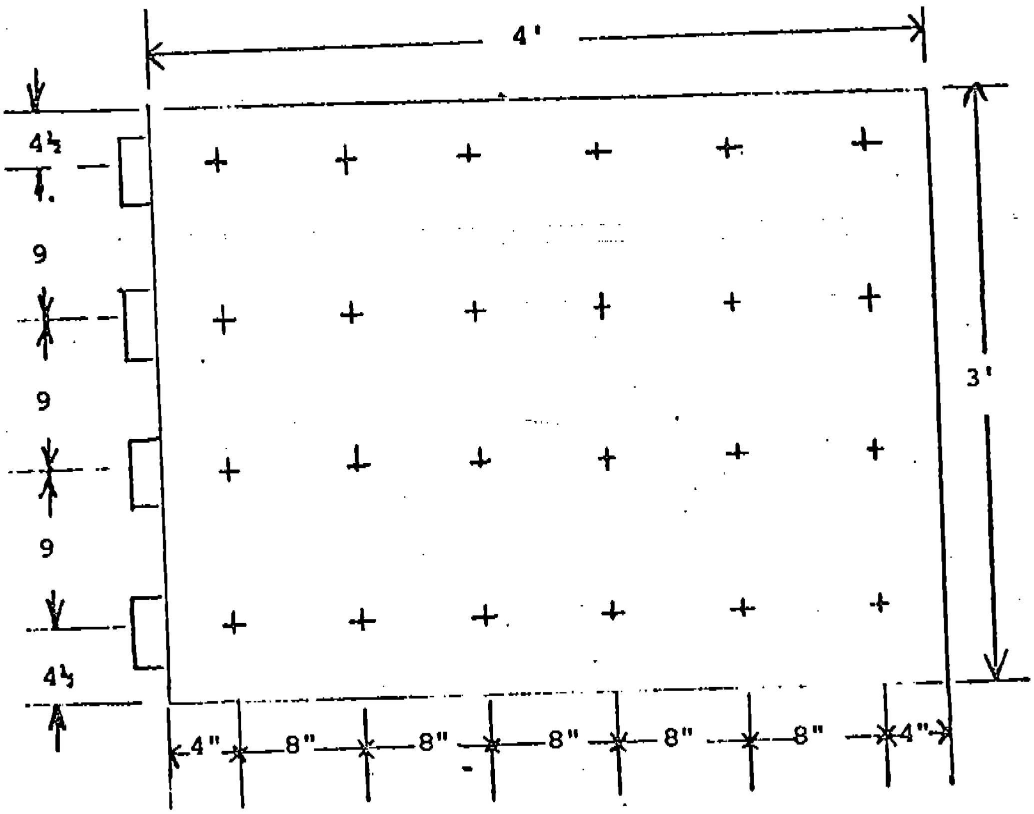
EPA PARTICULATE SAMPLING TRAIN

DRAWN BY DLT	CHK'D BY JWT	APPROVED BY JOH	UNITED STATES STEEL CORPORATION	FIGURE NO.
DRAWING No.		PROJECT No. 18-D-508 (003)	RESEARCH LABORATORY	1.
		DATE August 1979		

G-18292 REV. 1063



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DUST-SAMPLING POINTS, EMISSION-CONTROL-CAR STACK - FAIRFIELD

DRAWN BY	CHK'D BY	APPROVED BY		FIGURE NO.
JRN	JWT	JOH	UNITED STATES STEEL CORPORATION RESEARCH LABORATORY	
DRAWING No.		PROJECT NO. 18-D-508(003)		
		DATE		

PITOT TUBE CALIBRATIONS

PITOT TUBE NO: 1-5'

CALIBRATION DATE: 3-8-79

TEST STACK LOCATION: RESEARCH LAB. Rm. 282

FORMULA: ~~$\frac{\sqrt{\text{STANDARD}}}{\sqrt{\text{PITOT TUBE}}}$~~ x .99 = PITOT FACTOR

POINT NO. 1 = $\frac{\sqrt{.15}}{\sqrt{.20}} = \frac{.39}{.45}$ x .99 = .858

POINT NO. 2 = $\frac{\sqrt{.15}}{\sqrt{.22}} = \frac{.39}{.47}$ x .99 = .821

POINT NO. 3 = $\frac{\sqrt{.14}}{\sqrt{.21}} = \frac{.37}{.46}$ x .99 = .796

.825 PITOI FACT

EPA DRY-TEST-METER CALIBR ION

DATE OF CALIBRATION 3-5-79 BAROMETRIC PRESSURE 28.95" Hg

NAMES OF PERSONS PERFORMING CALIBRATION C.J. Kleist

CONSOLE Nº 3 CONSOLE SERIAL Nº 6-11-1150

WET TEST METER MANUFACTURER Precision Scientific Co.

WET TEST METER SERIAL Nº ____

DRY TEST METER

FINAL VOLUME 0528.31

INITIAL VOLUME 0519.50

GAS METERED 8.81

METER-ORIFICE PRESSURE (IN H_2O)

5	+.70
10	+.69
15	+.70
20	+.69
25	+.73
30	+.69
AVG	+.70 = 0.05" Hg

$V_{std} = (8.81) \frac{(28.95 + .05)}{29.92} =$

= 8.54 SCFD

WET TEST METER

GAS METERED 9.34

	METER TEMP	METER PRESSURE
5	78	0
10	78	0
15	78	0
20	78	0
25	78	0
30	78	0
AVG	78	0

$V_{std} = 9.34 \frac{(530)}{(538)} \frac{(28.95 - .97)}{29.92} =$

= 8.60 SCFD

(CF = 1.007)

Plant FAIRFIELD WORKS
Run No. 1
Location No.2 BATTERY PUSHING CAR
Date [illegible] 26 [illegible]
Operator [illegible]
Sample Box No. [illegible]
Meter Box No. [illegible]
Static Press − 1.5 "H_2O
Leak Check 15 " "Hg ≤ .01 cfm

Particulate Sampling
EPA Procedures

Filter Wt 0.9501
Meter Start 1148.67
Time Start 0950
Time Finish 2245
.9018
.8[illegible]
.0317
[illegible] .0260

Silica Gel + 11
H_2O + 170 = 181 Total H_2O

Ambient Temp, °F [illegible]
Bar. Pressure, in. Hg [illegible]
Assumed Moisture, % [illegible]
Heater Box Setting, °F [illegible]
Probe Tip Dia., in. [illegible]
Probe Length 5'
Probe Heater Setting [illegible]
Avg. $\sqrt{\Delta P}$ ______ Avg ΔH ______

Traverse Point	Time, min.	Dry Gas Meter, CF	Pitot √ΔP, in. H_2O	Orfice ΔH, in. H_2O	Last Impinger Temp, °F	Gas Temp. at Meter, °F	Pump Vac. in Hg Guage	Box Temp °F	Stack Temp, °F	R m
A 1	2:42	1140.33	1.70	1.04	50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	1:14	1150.00	1.10	.56	50	70	4	[illegible]	120	.57
3	2:35	1151.48	.94	.39	50	70	2	[illegible]	120	.49
4	3:20	1153.21	.97	.41	50	70	2	[illegible]	120	.50
5	2:30	1154.44	.94	.39	60	80	2	230	120	.49
6	3:58	1157.33	1.41	.88	50	80	5	230	120	.73
B 1	3:15	1160.33	1.70	1.04	50	80	9	230	120	.8
2	3:02	1162.85	1.58	1.02	50	80	8	230	120	.82
3	4:34	1165.40	1.26	.72	50	80	5	230	120	.66
4	3:14	1167.15	1.26	.72	60	90	5	230	120	.66
5	3:11	1169.35	1.26	.72	60	90	5	230	120	.66
6	2:51	1171.25	1.22	.66	60	90	5	230	120	.63

Particulate Sampling
EPA Procedures

Plant	[illegible]	Filter Wt	
Run No.	[illegible]	Meter Start	
Location	[illegible]	Time Start	
Date	[illegible]	Time Finish	
Operator			
Sample Box No.			
Meter Box No.			
Static Press			
Leak Check	____ "Hg ____ cfm		

Ambient Temp, °F ______
Bar. Pressure, in. Hg ______
Assumed Moisture, % ______
Heater Box Setting, °F ______
Probe Tip Dia., in. ______
Probe Length ______
Probe Heater Setting ______
Avg. $\sqrt{\Delta P}$ ______ Avg ΔH ______

Silica Gel + ____
H_2O + ____ = ______ Total H_2O

Traverse Point	Time, min.	Dry Gas Meter, CF	Pitot $\sqrt{\Delta P}$, in. H_2O	Orfice ΔH, in. H_2O	Last Impinger Temp, °F	Gas Temp. at Meter, °F	Pump Vac. in Hg Guage	Box Temp °F	Stack Temp, °F	R_m
1	3:17	1173.83	1.55	1.01	50	90	7	230	120	.81
2	3:45	1177.00	1.61	1.02	50	90	7	230	120	.84
3	4:07	1180.19	1.52	1.00	50	90	6	230	120	.79
4	2:30	1182.13	1.48	.98	60	90	6	230	120	.77
5	2:21	1183.75	1.38	.85	60	90	6	230	120	.72
6	2:22	1185.40	1.30	.76	60	90	5	230	120	.68
D 1	2:30	1186.96	1.22	.65	50	90	4	230	140	[illegible]
2	2:15	1188.49	1.30	.72	50	90	5	230	140	.67
3	2:44	1190.32	1.30	.72	50	90	5	230	140	.67
4	2:47	1192.07	1.18	.62	50	90	4	230	140	.60
5	2:15	1193.36	1.05	.47	60	100	3	230	120	.54
6	3:10	1195.26	1.14	.60	60	100	3	230	120	.5[illegible]
	[illegible]	49.59	1.31	.75					123	

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Plant [illegible]
Run No. 2
Location No 2 Battery [illegible]
Date 1-27-79
Operator [illegible]
Sample Box No. –
Meter Box No. 3
Static Press –1.5 "H2O
Leak Check 15 "Hg < .02 cfm

Particulate Sampling
EPA Procedures

Filter Wt 0.8397
Meter Start 1195.82
Time Start 0751
Time Finish ______

.8910
– .8397
.0513

ACET WT: .0538

Silica Gel + 14
H_2O + 150 = 164 Total H_2O

Ambient Temp, °F 83
Bar. Pressure, in. Hg 30.02
Assumed Moisture, % ______
Heater Box Setting, °F ______
Probe Tip Dia., in. ______
Probe Length 5'
Probe Heater Setting 210
Avg. $\sqrt{\Delta P}$ ______ Avg ΔH ______

Traverse Point	Time, min.	Dry Gas Meter, CF	Pitot $\sqrt{\Delta P}$, in. H_2O	Orfice ΔH, in. H_2O	Last Impinger Temp, °F	Gas Temp. at Meter, °F	Pump Vac. in Hg Guage	Box Temp °F	Stack Temp, °F	R n
A 1	3:04	1198.26	1.58	.99	50	80	6	230	120	.78
2	2:43	1200.23	1.48	.88	50	80	5	230	120	.73
3	3:12	1202.41	1.41	.80	60	90	5	230	120	.70
4	3:12	1204.63	1.45	.85	60	90	5	230	120	.72
5	3:24	1206.82	1.34	.72	70	90	4	230	120	.66
6	5:50	1210.55	1.30	.69	70	90	4	230	120	.64
B 1	3:13	1213.03	1.58	.99	60	90	6	230	120	[illegible]
2	2:40	1214.99	1.52	.94	60	90	5	230	120	.75
3	2:36	1216.83	1.45	.85	60	90	5	230	120	.72
4	2:43	1218.69	1.45	.80	60	90	5	230	140	.70
5	2:45	1220.54	1.41	.76	70	90	4	230	140	.68
6	3:11	1222.45	1.23	.60	70	90	4	230	140	.59

Particulate Sampling
EPA Procedures

Plant [illegible]
Run No. 2 CONT.
Location No.2 [illegible]
Date 5-27-79
Operator RPA-RLH-FTP-PAM
Sample Box No. 3
Meter Box No. 3
Static Press
Leak Check 15 "Hg ≤ .02 cfm

Filter Wt
Meter Start
Time Start
Time Finish 12:41

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Ambient Temp, °F
Bar. Pressure, in. Hg
Assumed Moisture, %
Heater Box Setting, °F 225
Probe Tip Dia., in. .184
Probe Length 5'
Probe Heater Setting 250
Avg. $\sqrt{\Delta P}$ ______ Avg ΔH ______

Silica Gel + ____
H_2O + ____ = ______ Total H_2O

Traverse Point	Time, min.	Dry Gas Meter, CF	Pitot $\sqrt{\Delta P}$, in. H_2O	Orfice ΔH, in. H_2O	Last Impinger Temp, °F	Gas Temp. at Meter, °F	Pump Vac. - in Hg Guage	Box Temp °F	Stack Temp, °F	Rm
C-1	2:41	1224.33	1.48	.85	60	90	5	230	140	.72
2	5:13	1227.78	1.41	.78	60	90	4	230	140	.69
3	3:40	1230.45	1.48	.88	60	90	5	230	120	.73
4	2.32	1232.17	1.38	.76	60	90	5	230	120	.68
5	2:37	1233.85	1.34	.72	60	90	4	230	120	.66
6	2.45	1235.64	1.34	.72	60	90	4	230	120	.66
D-1	2:53	1237.40	1.23	.62	50	90	4	230	120	
2	3.13	1239.37	1.23	.62	50	90	4	230	120	.60
3	3.12	1240.83	.89	.31	50	90	2	230	120	.44
4	2.33	1241.80	.74	.21	50	90	2	230	120	.37
5	2.32	1243.11	1.05	.43	50	90	3	230	120	.52
6	2.47	1244.07	.97	.38	50	90	3	230	120	.48
	75.21	46.25	1.22	.71					124	

Particulate Sampling
EPA Procedures

Plant: FAIRFIELD WORKS
Run No.: 3
Location: No.2 BATTERY PUSHING CAR
Date: 6-28-79
Operator: RPA-RLH-FTP-PAM
Sample Box No.: 3
Meter Box No.: 3
Static Press: −1.5
Leak Check: 15" "Hg <.02 cfm

Filter Wt: 0.8402
Meter Start: 1244.57
Time Start: 0820
Time Finish: 1745

.8863
−.8402
.0461

Acet Wt = .0231

Silica Gel + 13
H_2O + 150 = 163 Total H_2O

Ambient Temp, °F: 75
Bar. Pressure, in. Hg: 29.78
Assumed Moisture, %: 15
Heater Box Setting, °F: 225
Probe Tip Dia., in.: .194
Probe Length: 5'
Probe Heater Setting: 250
Avg. $\sqrt{\Delta P}$: ______ Avg ΔH: ______

Traverse Point	Time, min.	Dry Gas Meter, CF	Pitot $\sqrt{\Delta P}$, in. H_2O	Orfice ΔH, in. H_2O	Last Impinger Temp, °F	Gas Temp. at Meter, °F	Pump Vac. in Hg Guage	Box Temp °F	Stack Temp, °F	R m
A-1	4.00	1247.72	1.67	1.02	50	70	5	230	120	.82
2	2.39	1249.75	1.67	1.02	50	70	5	230	120	.82
3	2.50	1251.71	1.45	.82	60	70	5	230	120	.71
4	2.50	1253.67	1.45	.82	70	90	4	230	120	.71
5	2.07	1255.33	1.48	.97	70	90	5	230	130	.77
6	2.16	1256.93	1.41	.88	70	90	5	230	130	.73
B-1	1.53	1258.39	1.70	1.04	70	100	5	230	130	[illegible]
2	3.20	1260.90	1.52	.99	70	100	5	230	130	.78
3	2.34	1262.85	1.48	.97	70	100	5	230	130	.77
4	2.55	1265.12	1.70	1.02	70	100	5	230	120	.84
5	2.27	1267.82	1.41	.88	70	100	4	230	130	.73
6	4.35	1270.16	1.41	.88	70	100	4	250	150	.73

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SHEET (2)

Particulate Sampling
EPA Procedures

Plant FAIRFIELD WORKS

Run No. 3 CONT.

Location No. 2 BATTERY PUSHING CAR

Date 6-26-79

Operator ______

Sample Box No. ______

Meter Box No. ______

Static Press ______

Leak Check ______ "Hg ______ cfm

Filter Wt ______

Meter Start ______

Time Start ______

Time Finish ______

Ambient Temp, °F ______

Bar. Pressure, in. Hg ______

Assumed Moisture, % ______

Heater Box Setting, °F ______

Probe Tip Dia., in. ______

Probe Length ______

Probe Heater Setting ______

Avg. $\sqrt{\Delta P}$ ______ Avg ΔH ______

Silica Gel + ______

H_2O + ______ = ______ Total H_2O

Traverse Point	Time, min.	Dry Gas Meter, CF	Pitot √ΔP, in. H_2O	Orfice ΔH, in. H_2O	Last Impinger Temp, °F	Gas Temp. at Meter, °F	Pump Vac. in Hg Guage	Box Temp °F	Stack Temp, °F	R_m
C-1	2:45	1272.25	1.45	.94	60	100	4	230	120	.75
2	2:40	1274.12	1.48	.88	60	100	4	230	120	.73
3	2:33	1275.76	1.48	.88	60	100	4	230	120	.73
4	2:35	1277.19	1.05	.43	60	100	2	230	120	.52
5	3.57	1279.80	1.41	.80	60	100	3	230	120	.70
6	2:17	1281.25	1.22	.62	60	100	3	230	120	.60
D-1	2:29	1282.63	1.14	.53	60	100	2	230	120	.6
2	2:41	1284.20	1.14	.53	60	100	2	230	120	.56
3	2:32	1285.49	1.05	.43	60	100	2	230	120	.52
4	2:38	1287.07	1.22	.62	60	100	3	230	120	.60
5	3:02	1288.81	1.18	.58	60	100	2	230	120	.58
6	3:37	1290.95	1.18	.58	60	100	2	230	120	.58
	(64.2)	(46.34)	(1.37)	(.91)					(123)	

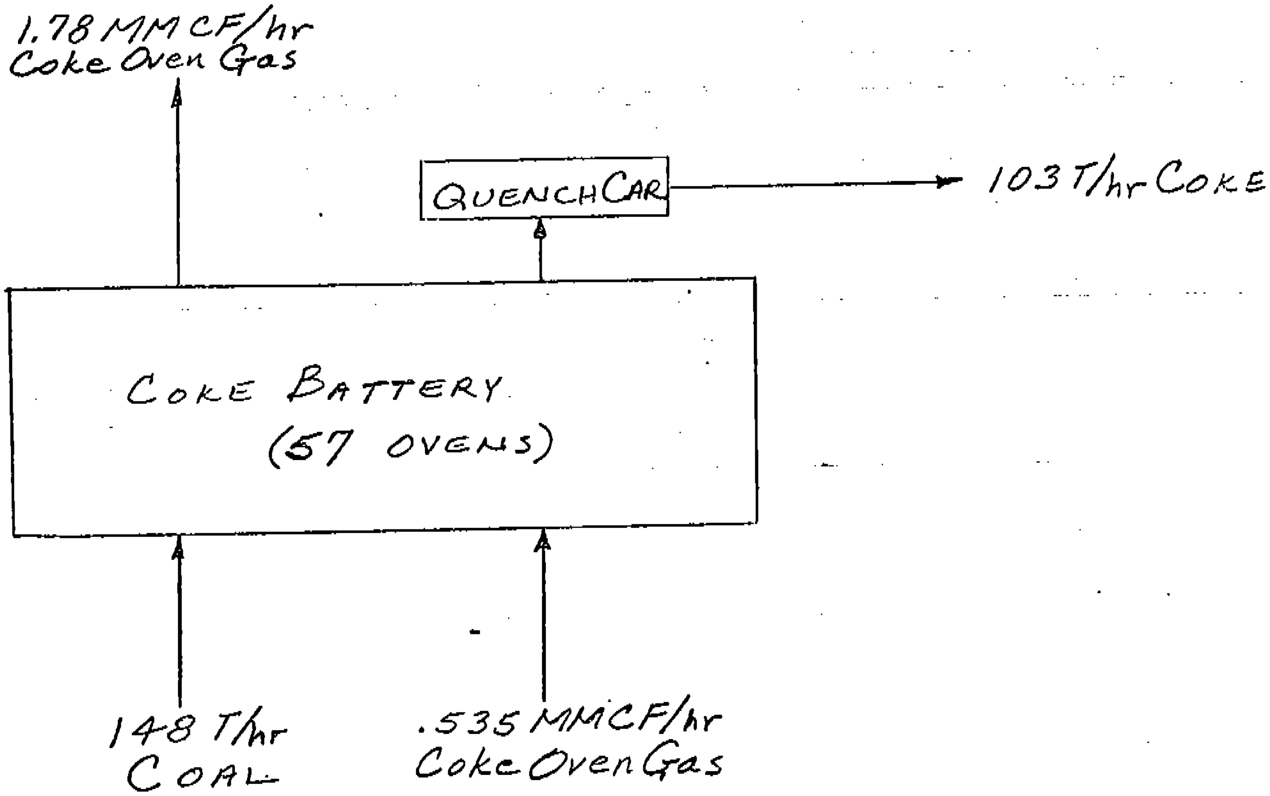
GENERAL BATTERY DESCRIPTION

The No. 2 Coke Battery is a six meter Firma Carl Still battery, and consists of 57 ovens. Its brickwork and heating are identical to U. S. Steel's Gary Works Batteries 2 and 3. The ovens are 6.2 meters (20.3 feet) high, 14.6 meters (47.8 feet) long, and 46 centimeters (18 inches) wide. The oven taper is 8.9 centimeters (3-1/2 inches) from pusher side to coke side. The annual designed coke capacity of this 57-oven battery is 816,000 metric tons (900,000 short tons). Full preheat operation schedule will be 106 ovens per day.

The heating system is the unique Still design which is distinguished by several features. First, is the multistage burning of the fuel gas. Unlike other systems, the mixing and burning of the fuel gas with the combustion air takes place at six different levels in the heating flues to provide more even heating over the height of the wall. Second, the waste heat canals are located under the battery pad. There are six precast concrete archways running the length of the battery. Each collects the waste gas from one-sixth of the battery.

The oven doors are of latest U. S. Steel Research and Engineering design. The battery equipment consists of two one-spot pushers, two door machines, two hot larry cars and a single spot quench car connected to a car capable of collecting and cleaning the pushing emissions. All battery machinery is powered by 250 volt DC. The battery top has four charging holes per oven and a collector main on both the coke side and the pusher side. Two back pressure control butterflies are used to control collector main back pressure.

COKE BATTERY Nº 2



DESIGN CAPACITY

MAX. CAPACITY = 200 T/hr COAL

	6-26	6-27	6-28
COG Btu Value	497	488	489
COG Consumption Rate	12,800 M^3/Hr	8,970 M^3/Hr	11,640 M^3/Hr
*Flow interrupted 1 min. every 20 min. for reversing			
Collector Main Pressure	14 MMWC	14 MMWC	14 MMWC

Both coke and pusher side lids were closed on all pushes.

COKE PRODUCTION AND COAL CHARGED DURING TESTS

Coal Charged = 33 Tons/Oven

Coke Produced = 23 Tons/Oven

6-26-79 9:54 a.m. - 11:27 a.m. 4:25 p.m. - 10:45 p.m. = 7:53

(23 T)(24 Push)/7.88 hr ≐ 70.1 T/hr Coke

$$(70.1)\frac{(33)}{(23)} = 100.6 \text{ T/hr Coal}$$

6-27-79 7:55 a.m. - 5:40 p.m. = 9:45

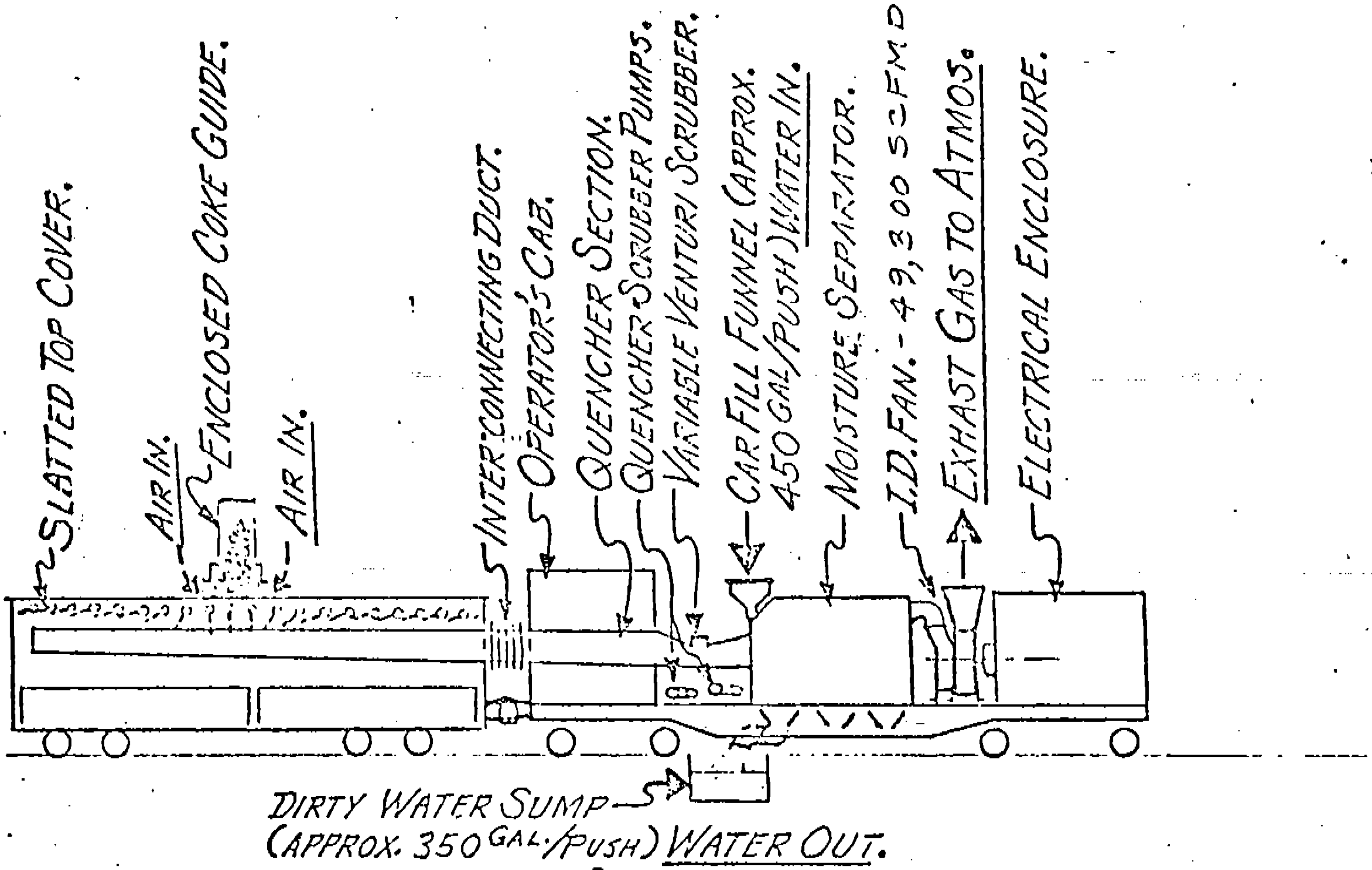
(23 T)(24)/9.75 = 56.6 T/hr Coke
81.2 T/hr Coal

6-28-79 8:24 a.m. - 5:40 p.m. = 9:16

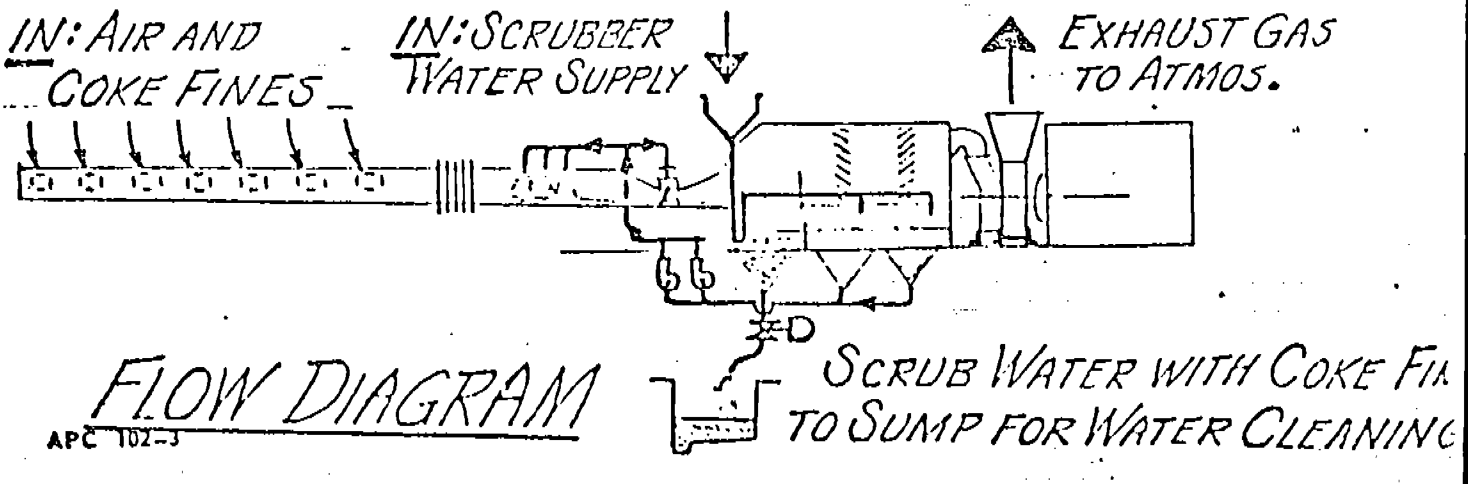
(23 T)(24)/9.27 = 59.5 T/hr Coke
85.4 T/hr Coal

COKE AND COAL ANALYSIS, JUNE 25 - 28, 1979

Coal Screen	6-26		6-27	6-28
Size	#2		#2	#2
2"	-	-	-	
1.05"	-	-	-	
0.525"	-	-	-	
3 Mesh	2.0%		4.0%	3.0%
6 Mesh	12.0%		15.0%	13.0%
10 Mesh	32.0%		36.0%	35.0%
20 Mesh	62.0%		64.0%	58.0%
Coal Analysis				
H_2O	4.44		3.78	4.78
Ash	7.66		7.42	8.05
Sulfur	0.82		0.84	0.83
Volatile	27.03		26.49	27.16
Bulk Density	45.5		45.63	45.37
Coke Analysis	#2		#2	#2
H_2O	12.00		7.97	9.00
V.M.	0.80		0.70	0.78
Ash	9.85		9.48	9.67
Sulfur	0.73		0.71	0.73
Stability	NA		53.0	54.3
Hardness	NA		69.7	70.3



COKE QUENCH CAR AND GAS CLEANING CAR GENERAL ARRGT.



FLOW DIAGRAM

APC 102-3