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

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

AP-42 Section 12.2
Reference
Report Sect. 4
Reference 202

#1 Boat Stack

EMISSION TESTING

FOR

U. S. STEEL
GARY, INDIANA

MARCH 19, 1980

BY

KEMRON ENVIRONMENTAL SERVICES
16550 HIGHLAND ROAD
BATON ROUGE, LOUISIANA 70808

80-15183-08

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Borg-Warner Corporation

Kemron Environmental Services

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EMISSION TESTING
FOR
UNITED STATES STEEL

Abstract

On February 1, 1980, KEMRON Environmental Services conducted emission tests for front half particulate and sulfate matter on the number one coke battery exhaust stack servicing United States Steel, Gary, Indiana.

The test results indicate an average grain loading of 0.02 GR/DSCF and an average emission rate of 29.9 LBS/HR for total particulate. The particulate minus sulfate grain loading is 0.0154 GR/DSCF and the emission rate is 22.9 LB/HR.

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TABLE

SUMMARY OF RESULTS

COKE BATTERY COMBUSTION STACK TESTS
BATTERY NUMBER ONE COKE OVEN GAS

RUN#	1	2	3
DATE	02/01/80	02/02/80	02/03/80
TIME (APPROX)	1545-1800	0800-0954	1500-1652
GAS TEMPERATURE (%F)	192	203	202
MOISTURE CONTENTS (% BY VOLUME)	2.97	2.61	3.07
GAS VOLUME			
ACFM	226362	208837	217600
DSCFM	177699	165010	170972
PARTICULATE CONCENTRATION			
FRONT CATCH			
CR/DSCF	0.0296	0.0164	0.0139
LB/HR	45.1	23.3	20.5
TOTAL CATCH - SULFATES			
GR/DACF	0.0253	0.0122	0.0087
LB/HR	38.6	17.4	12.8
$\%O_2$	18.7	18.3	18.0
$\%O_3$	4.5	4.9	4.7
% Isokinetic	90.6	101	98.3

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APPENDIX

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ΔH	-	Pressure differential across orifice, (" H_2O)
P_M	-	Pressure at meter ($\frac{\Delta H avg}{13.6} + P_B$), (" Hg)
P_s	-	Average static stack pressure, " Hg)
V_s	-	Velocity of stack gas, (fps)
ΔP	-	Velocity head, (" H_2O)
$V_{M\ STD}$	-	Volume through dry gas meter, corrected to standard conditions, (DSCF)
$V_{W\ STD}$	-	Volume of water collected, corrected to standard conditions, (DSCF)
V_{1c}	-	Volume of water collected, (ml)
B_{ws}	-	Moisture in stack gas fraction .
$1-B_{WS}$	-	Dry gas fraction in stack gas.
M_s	-	Average molecular weight of stack gas (wet), (lb/lb- mole)
Q_{SD}	-	Average stack gas dry volumetric flow rate, (DSCFH)
A	-	Area of stack, (ft.^{2})
θ	-	Total sampling time, (min.)
I	-	Isokinetic ratio, (%)
C_{SO_2}	-	Concentration of sulfur dioxide, dry basis corrected to standard condition, (lb/DSCF)
V_t	-	Volume of barium perchlorate titrant used for sample, (ml)
V_{tb}	-	Volume of barium perchlorate titrant used for blank, (ml)

GLOSSARY

P_B	-	Barometric Pressure, (" Hg.)
D_N	-	Diameter of Nozzle, (")
A_N	-	Area of Nozzle, (ft.^{2})
C_P	-	Calibration factor for pitot tube
Equivalent Diameter	-	Adjusted diameter for rectangular ducts
Upstream Disturbance	-	Location of sampling ports from nearest upstream disturbance (in terms of equivalent diameter)
Downstream Disturbance	-	Location of sampling ports from nearest downstream disturbance (in terms of equivalent diameter)
T_{STD}	-	Standard Temperature (528° R)
P_{STD}	-	Standard Pressure (29.92 " Hg)
$T_{s\ Avg}$	-	Average Stack Temperature, (° R)
K Factor	-	Correction factor for nomograph setting
V_M	-	Volume through meter at meter conditions, (SCF)
Y	-	Dry gas meter correction factor
T_i	-	Inlet temperature at dry gas meter, (° R)
T_o	-	Outlet temperature at dry gas meter, (° R)
T_m	-	Temperature of meter (average of T_i and T_o), (° R)

N	-	Normality of barium perchlorate titrant,
V_{solu}	-	Total volume of solution in which sulfur dioxide sample is contained, (ml)
V_a	-	Volume of sample aliquot titrated, (ml)
V_{SC}	-	Sample volume at standard conditions (dry basis), (ml)
V_f	-	Volume of flask and valve, (ml)
P_i	-	Initial absolute pressure of flask, (" Hg)
P_f	-	Final absolute pressure of flask, (" Hg)
T_{if}	-	Inital absolute temperature of flask, (° R)
T_{ff}	-	Final absolute temperature of flask, (° R)
M	-	Total milligrams NO_2 per sample
A_s	-	Absorbance of sample
F	-	Dilution factor
C_{H2SO4}	-	Concentration of sulfuric acid mist, (lb/DSCF)
K_c	-	Spectrophometer calibration factor

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EQUATIONS

Sample gas volume corrected to standard conditions (ft^3)

$$V_{M\ STD} = \frac{K_M\ Y\ V_M\ P_M}{T_M}$$

Volume of water vapor condensed corrected to standard conditions (ft^3)

$$V_{W\ STD} = K_W\ V_{1c}$$

Percent moisture of stack gas (%)

$$B_{WS} = \frac{V_{W\ STD}}{V_{W\ STD} + V_{M\ STD}}$$

Average molecular weight of stack gas (lb/lb mole)

$$M_S = 0.44\ (\%CO_2)(1-B_{WS}) + 0.32\ (\%O_2)(1-B_{WS}) + 0.28\ (\%N_2 + \%CO)(1-B_{WS}) + 18\ (B_{WS})$$

Average stack velocity (fps)

$$V_S = K_P\ C_P\ (\Delta P)^{1/2}_{Avg} \left[\frac{T_{S\ (Avg)}}{P_S\ M_S}\right]^{1/2}$$

Dry volumetric flow rate (DSCFH)

$$Q_{SD} = 3600\ (1-B_{WS})\ V_S\ A \left[\frac{T_{STD}}{T_S}\right]\left[\frac{P_S}{P_{STD}}\right]$$

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Isokinetic Ratio (%)

$$I = \frac{K_i \; V_{M\ STD} \; T_s}{P_s \; V_s \; A_N \; \theta \; (1-B_{WS})}$$

Sulfur dioxide concentration (lb/DSCF)

$$C_{SO_2} = K_s \frac{(V_t - V_{tb}) \; N \; (V_{solu}/V_a)}{V_{M\ STD}}$$

Sample volume for NO_2 (ml^3)

$$V_{SC} = K_M \; (V_f - 25 \text{ ml}) \left[\frac{P_f}{T_{ff}} - \frac{P_i}{T_{if}}\right]$$

Total milligrams NO_2 per sample (mg)

$$M = 2 \; K_C \; A_S \; F$$

Sample concentration for NO_2 (lb/DSCF)

$$C = K_N \frac{M}{V_{SC}}$$

Concentration of sulfuric acid mist (lb/DSCF)

$$C_{H_2SO_4} = K_H \; N \frac{(V_t - V_{tb})(V_{solu}/V_a)}{V_{M\ STD}}$$

Total Flow Of Stack Gas

$$Qa = As \times Vs \times 60$$

Particulate Concentration, Front Catch

$$GR/DSCF = \frac{(15.43)\ (Mn\ Front)}{Vmstd}$$

$$LB/HR = \#/DSCF * QSD$$

Particulate Concentration, Total Catch Minus Sulfates

$$GR/DSCF = \frac{(15.43)\ (Mn\ Total\text{-}S)}{Vmstd}$$

$$LB/HR = \#/DSCF * QSD$$

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CONSTANTS

K_P - Constant in velocity equation

$$85.49 \frac{ft.}{sec.} \left[\frac{(lb/lb\ mole)\ (\ "Hg)}{(°\ R)\ ("H_2O)} \right]^{\frac{1}{2}}$$

K_M - Constant in meter volume equation

$$17.64 \frac{°\ R}{"Hg}$$

K_W - Constant in water volume equation

$$0.04707 \frac{ft.^3}{ml}$$

K_i - Constant in isokinetic equation

$$0.09450 \frac{"Hg}{°\ R}$$

K_S - Constant in sulfur dioxide equation

$$7.061 \times 10^{-5} \frac{lb}{meg}$$

K_N - Constant in NO_2 equation

$$6.243 \times 10^{-5} \frac{lb/scf}{mg/ml}$$

K_H - Constant in sulfuric acid mist equation

$$1.081 \times 10^{-4} \frac{lb}{meg}$$

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PARAMETER SHEET
COKE BATTERY COMBUSTION STACK TESTS
BATTERY NUMBER ONE COKE OVEN GAS

Run #	1	2	3
Pb	30.05	30.43	30.43
Ps	29.99	30.36	30.37
Vlc	33.8	30.6	36.5
M Front	0.0995	0.0574	0.0490
M Minus Sulfate	0.0850	0.0427	0.0306
θ	96	96	96
% O_2	18.7	18.3	18
% CO_2	4.5	4.9	4.7
Δ H	1.117	0.9466	0.9627
Cp	0.81	0.81	0.81
Tm	532	528	521
$\overline{\Delta P}$	0.0667	0.0573	0.062
Ts	652	662	662
Vm	57.21	52.70	52.31
Dn	0.387	0.387	0.387
Vmstd	51.83	53.71	54.1
Vwstd	1.59	1.44	1.72
Bwo	2.97	2.61	3.07
Md	29.46	29.51	29.47
Ms	29.12	29.21	29.12
Vs	15.5	14.3	14.9
An	0.0008169	0.0008169	0.0008169

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PARTICULATE

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STACK SAMPLING DATA REDUCTION
FOR REFERNCE METHOD 5

UNITED STATES STEEL
GARY, INDIANA
#1 COKE BATTERY

OPERATORS	: TESSON - BROWNING
DATE OF THIS SAMPLE	: FEBRUARY 1, 1980
TODAY'S DATE	: FEBRUARY 20, 1980
RUN #	: 1
FILE NAME	: USTE30
AMBIENT TEMPERATURE (DEG F)	: 20
BAROMETRIC PRESS. (IN. HG.)	: 30.05

GAS ANALYSIS AT SAMPLING POINT
(DRY BASIS)

% CARBON DIOXIDE	: 4.5
% CARBON MONOXIDE	: 0
% OXYGEN	: 18.7
% NITROGEN	: 76.8
MOLECULAR WEIGHT (DRY)	: 29.46
% MOISTURE THIS RUN	: 2.97
% MOIST. @ SATURATION	: 100

# MLS OF H2O IN IMPINGERS	: 24
WT INCREASE OF SILICA GEL(G)	: 9.2
VOLUME OF GAS SAMPLE (DSCF)	: 51.83

FILTERABLE PARTICULATE

WEIGHT INCREASE OF FILTER(GRM)	: 0.0183
PROBE RESIDUE(GM)	: 0.0812
TOTAL MASS OF PROBE SAMPLE(GM)	: 1
BLANK RESIDUE(GM)	: 0
TOTAL MASS OF BLANK(GM)	: 1
PROBE CATCH	: 0.0812
FILTER CATCH	: 0.0183

PROBE LENGTH (IN)	: 146
NOZZLE DIAMETER (IN.)	: 0.387
DRY GAS METER CORRECTION FACTOR	: 1.001
PITOT TUBE CALIB. COEF.	: 0.81

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CLOCK TIME (H.M)	STATIC PRESS (IN H2O)	STACK TEMP (F)	VELOCITY HEAD (IN H2O)	ORIFICE PRES DROP (IN H2O)	DRY GAS VOLUME (F^3)	TEMP INLET (F)	TEMP OUTLET (F)	TEMP IMP (F)
				PORT # 1				
1545	-0.79	192	0.07	1.15	625.80	54	46	16
1547	-0.79	185	0.07	1.15	626.75	61	48	17
1549	-0.79	190	0.08	1.30	677.99	64	50	17
1551	-0.79	194	0.07	1.15	629.29	66	51	17
1553	-0.79	196	0.08	1.30	630.54	69	51	22
1555	-0.79	197	0.08	1.30	631.83	71	52	21
1557	-0.79	197	0.08	1.30	633.14	72	54	22
1559	-0.79	199	0.08	1.30	634.48	74	55	25
1601	-0.79	199	0.08	1.30	635.78	76	56	23
1603	-0.79	200	0.09	1.50	637.06	77	57	24
1605	-0.79	200	0.08	1.30	638.39	78	58	26
1607	-0.79	195	0.07	1.15	639.70	79	59	26
		FINAL DRY GAS VOLUME			640.97			
				PORT # 2				
1615	-0.79	180	0.04	0.66	640.97	66	63	23
1617	-0.79	186	0.05	0.82	641.91	72	63	22
1619	-0.79	189	0.04	0.66	642.99	72	63	23
1621	-0.79	185	0.05	0.82	643.89	75	63	20
1623	-0.79	191	0.06	0.99	644.93	77	63	19
1625	-0.79	193	0.07	1.15	646.03	78	64	19
1627	-0.79	193	0.07	1.15	647.22	80	64	20
1629	-0.79	193	0.07	1.15	648.47	81	65	18
1631	-0.79	194	0.07	1.15	649.71	82	65	18
1633	-0.79	196	0.06	0.99	650.99	83	66	17
1635	-0.79	193	0.07	1.15	652.14	83	67	17
1637	-0.79	152	0.05	0.82	653.33	83	67	16
		FINAL DRY GAS VOLUME			654.35			
				PORT # 3				
1642	-0.79	180	0.06	0.99	654.35	72	67	17
1644	-0.79	189	0.05	0.82	655.56	78	69	17
1646	-0.79	193	0.06	0.99	656.59	80	65	16
1648	-0.79	194	0.06	0.99	657.74	82	69	16
1650	-0.79	197	0.08	1.30	658.88	84	69	17
1652	-0.79	198	0.08	1.30	660.16	85	70	17
1654	-0.79	199	0.08	1.30	661.48	86	70	17
1656	-0.79	199	0.08	1.30	662.80	87	71	16

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1658	[illegible]	200	0.09	1.50	664.15	87	[illegible]	[illegible]
1700	[illegible]	201	0.09	1.50	665.50	89	71	16
1702	[illegible]	199	0.08	1.30	666.87	89	71	16
1704	[illegible]	168	0.07	1.15	668.18	89	72	16
		FINAL DRY GAS VOLUME			664.44			

PORT # 4

1738	-0.79	182	0.08	1.30	669.79	74	73	16
1740	-0.79	189	0.09	1.50	670.69	81	72	16
1742	-0.79	193	0.08	1.30	672.03	82	72	15
1744	-0.79	198	0.08	1.30	673.35	84	71	16
1746	-0.79	197	0.09	1.50	674.63	85	72	15
1748	-0.79	199	0.08	1.30	675.93	86	72	15
1750	-0.79	195	0.08	1.30	677.21	85	71	15
1752	-0.79	190	0.07	1.15	678.51	87	72	16
1754	-0.79	200	0.03	0.49	679.77	87	71	15
1756	-0.79	203	0.03	0.49	680.55	83	73	15
1758	-0.79	199	0.02	0.36	681.36	81	74	16
1800	-0.79	180	0.03	0.49	682.08	84	73	15
		FINAL DRY GAS VOLUME			682.95			

AVG ORIFICE DROP (IN H2O) : 1.1172
TEMP OF METER (DEGREES R) : 531.7
AVG. STATIC STK PRESS (IN H2O) :-0.79
AVG STACK PRESSURE (IN HG.) : 29.991
TOTAL SAMPLING TIME THIS SAMPLE : 96
AVG TEMP OF STK GAS (DEGREES R) : 652.3
AVG VELOCITY HEAD (IN H2O) : 0.0667
AVG VELOCITY (FPS) : 15.45
DIAMETER OF STACK (IN.) : 211.25
CROSS-SECT AREA OF STACK (SF) : 243.4
VOLUMETRIC FLOW OF STK (DSCF/HR): 10661960

CONC. OF FILT. PART. IN STK (GR/DSCF) : 0.0296
CONC. OF FILT. PART. IN STK (#/DSCF) : 4.23274E-06
#/HR OF FILT. PART (DRY BASIS) : 45.1293

ISOKINETIC VARIATION (%) : 90.57

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EMISSION TESTING
FOR
UNITED STATES STEEL

SULTS

SAMPLING METHOD : 1
RUN NUMBER :1
UNIT DESCRIPTION :#1 COKE BATTERY

PHYSICAL CONSTANTS
OF
STACK

DATE OF SAMPLING	FEBRUARY 1, 1980
TEMPERATURE OF STACK(F)	652.3
VELOCITY OF STACK GAS(FPS)	15.45
CROSS-SECTIONAL AREA OF STACK(SF)	243.4
VOLUMETRIC FLOW(DSCFH)	10661960
STATIC PRESSURE(INCHES OF H2O	-0.79
MOISTURE CONTENT(% VOLUME)	2.97
MOLECULAR WEIGHT OF STACK GAS(#/#-MOLE,DRY)	29.46
ISOKINETIC RATIO(%)	90.57
FILTERABLE PARICULATE EMISSION RATE(#/HOUR)	45.1293
FILTERABLE PARTICULATE CONCENTRATION(GR/DSCF)	0.0296

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STACK SAMPLING DATA REDUCTION
FOR REFERNCE METHOD 5

UNITED STATES STEEL
GARY, INDIANA
#1 COKE BATTERY

OPERATORS	: TESSON - BROWNING
DATE OF THIS SAMPLE	: FEBRUARY 2, 1980
TODAY'S DATE	: FEBRUARY 20, 1980
RUN #	: 2
FILE NAME	: USTE31
AMBIENT TEMPERATURE (DEG F)	: 10
BAROMETRIC PRESS. (IN. HG.)	: 30.43

GAS ANALYSIS AT SAMPLING POINT
(DRY BASIS)

% CARBON DIOXIDE	: 4.9
% CARBON MONOXIDE	: 0
% OXYGEN	: 18.3
% NITROGEN	: 76.8
MOLECULAR WEIGHT (DRY)	: 29.51
% MOISTURE THIS RUN	: 2.61
% MOIST. @ SATURATION	: 100

# MLS OF H2O IN IMPINGERS	: 17
WT INCREASE OF SILICA GEL(G)	: 13
VOLUME OF GAS SAMPLE (DSCF)	: 53.71

FILTERABLE PARTICULATE

WEIGHT INCREASE OF FILTER(GRM)	: 0.0264
PROBE RESIDUE(GM)	: 0.031
TOTAL MASS OF PROBE SAMPLE(GM)	: 1
BLANK RESIDUE(GM)	: 0
TOTAL MASS OF BLANK(GM)	: 1
PROBE CATCH	: 0.031
FILTER CATCH	: 0.0264

PROBE LENGTH (IN)	: 146
NOZZLE DIAMETER (IN.)	: 0.387
DRY GAS METER CORRECTION FACTOR	: 1.001
PITOT TUBE CALIB. COEF.	: 0.81

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	STACK TEMP (F)	VELOCITY HEAD (IN H2O)	ORIFICE PRES DROP (IN H2O)	DRY GAS VOLUME (F^3)	TEMP INLET (F)	TEMP OUTLET (F)	TEMP IMP (F)
			PORT # 1				
.90	177	0.07	1.10	698.98	38	37	10
.90	198	0.07	1.10	700.24	48	37	24
.90	201	0.07	1.15	701.56	51	37	24
.90	202	0.07	1.15	702.64	55	38	25
.90	205	0.08	1.21	703.82	57	39	26
.90	206	0.07	1.15	705.04	59	40	26
.90	206	0.08	1.21	706.22	61	42	27
.90	207	0.08	1.31	707.45	64	43	20
.90	207	0.08	1.21	708.79	66	45	30
.90	210	0.07	1.19	709.93	69	46	28
-0.90	201	0.07	1.15	711.12	70	48	27
-0.90	194	0.05	0.82	712.24	72	50	26
	FINAL DRY GAS VOLUME			713.41			
			PORT # 2				
-0.90	196	0.05	0.82	713.41	55	56	8
-0.90	198	0.05	0.73	714.42	64	56	21
-0.90	201	0.05	0.82	719.39	68	55	21
-0.90	201	0.05	0.73	716.41	69	56	22
-0.90	204	0.05	0.82	717.48	72	56	22
-0.90	204	0.05	0.82	718.45	73	57	21
-0.90	205	0.06	0.99	719.43	76	58	21
-0.90	187	0.06	0.99	720.52	77	59	21
-0.90	195	0.07	1.08	721.63	80	60	23
-0.90	196	0.07	1.08	722.76	81	61	24
-0.90	192	0.06	0.90	723.91	82	62	26
-0.90	190	0.09	0.91	726.11	74	64	23
	FINAL DRY GAS VOLUME			726.11			
			PORT # 3				
-0.90	210	0.05	0.82	726.11	66	67	19
-0.90	209	0.05	0.82	727.15	76	65	28
-0.90	211	0.05	0.74	728.28	79	65	28
-0.90	214	0.05	0.74	729.15	80	66	28
-0.90	194	0.05	0.74	730.28	82	66	28
-0.90	198	0.05	0.82	731.13	84	67	29
-0.90	199	0.05	0.74	732.26	85	68	29
-0.90	198	0.04	0.66	733.14	85	69	30

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916	-0.90	199	0.04	0.66	734.08	86	70	33
918	-0.90	200	0.05	0.74	735.02	88	70	33
920	-0.90	200	0.03	0.49	736.01	86	71	32
922	-0.90	187	0.03	0.49	736.90	88	72	32
		FINAL DRY GAS VOLUME			737.67			

POFT # 4

930	-0.90	201	0.07	1.15	737.67	77	74	29
932	-0.90	203	0.08	1.22	738.99	81	74	37
934	-0.90	206	0.07	1.08	740.15	84	73	39
936	-0.90	207	0.07	1.08	741.35	85	72	40
938	-0.90	211	0.07	1.08	742.54	87	72	42
940	-0.90	213	0.07	1.15	743.71	88	72	42
942	-0.90	214	0.10	1.65	749.00	90	73	43
944	-0.90	215	0.07	1.15	746.38	91	74	45
948	-0.90	214	0.05	0.83	747.57	91	75	43
950	-0.90	215	0.05	0.83	748.65	91	75	46
952	-0.90	210	0.05	0.83	749.69	92	75	43
954	-0.90	173	0.03	0.49	750.76	90	76	43
		FINAL DRY GAS VOLUME			751.63			

AVG ORIFICE DROP (IN H2O) : 0.9466
TEMP OF METER (DEGREES R) : 527.8
AVG. STATIC STK PRESS (IN H2O) :-0.9
AVG STACK PRESSURE (IN HG.) : 30.363
TOTAL SAMPLING TIME THIS SAMPLE : 96
AVG TEMP OF STK GAS (DEGREES F) : 661.7
AVG VELOCITY HEAD (IN H2O) : 0.0573
AVG VELOCITY (FPS) : 14.32
DIAMETER OF STACK (IN.) : 211.25
CROSS-SECT AREA OF STACK (SF) : 243.4
VOLUMETPIC FLOW OF STK (DSCF/HR): 9900600

CONC. OF FILT. PART. IN STK (GR/DSCF) : 0.0164
CONC. OF FILT. PART. IN STK (#/DSCF) : 2.35641E-06
#/HR OF FILT. PART (DRY BASIS) : 23.3298

ISOKINETIC VARIATION (%) : 101.07

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Environmental Services Division
16550 Highland Road
Baton Rouge, Louisiana 70808

EMISSION TESTING
FOR
UNITED STATES STEEL

RESULTS

SAMPLING METHOD : 1
RUN NUMBER :2
UNIT DESCRIPTION :#1 COKE BATTERY

PHYSICAL CONSTANTS
OF
STACK

DATE OF SAMPLING	FEBRUARY 2, 1980
TEMPERATURE OF STACK(F)	661.7
VELOCITY OF STACK GAS(FPS)	14.32
CROSS-SECTIONAL AREA OF STACK(SF)	243.4
VOLUMETRIC FLOW(DSCFH)	9900600
STATIC PRESSURE(INCHES OF H2O	-0.9
MOISTURE CONTENT(% VOLUME)	2.61
MOLECULAR WEIGHT OF STACK GAS(#/#-MOLE,DRY)	29.51
ISOKINETIC RATIO(%)	101.07
FILTERABLE PARTICULATE EMISSION RATE(#/HOUR)	23.3298
FILTERABLE PARTICULATE CONCENTRATION(GR/DSCF)	0.0164

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STACK SAMPLING DATA REDUCTION
FOR REFERNCE METHOD 5

:ITED STATES STEEL
:SY, INDIANA
. COKE BATTERY

:PERATOFS	: TESSON - BROWNING
:TE OF THIS SAMPLE	: FEBRUARY 2, 1980
:DAY'S DATE	: FEBRUARY 20, 1980
:N #	: 3
:ILE NAME	: USTE32
:NBIENT TEMPERATURE (DEG F)	: 10
:APOMETRIC PRESS. (IN. HG.)	: 30.43

GAS ANALYSIS AT SAMPLING POINT
(DRY BASIS)

% CARBON DIOXIDE	: 4.7
% CARBON MONOXIDE	: 0
% OXYGEN	: 18
% NITROGEN	: 77.3
MOLECULAR WEIGHT (DRY)	: 29.47
% MOISTURE THIS RUN	: 3.07
% MOIST. @ SATURATION	: 100

# MLS OF H2O IN IMPINGERS	: 21
WT INCREASE OF SILICA GEL(G)	: 15
VOLUME OF GAS SAMPLE (DSCF)	: 54.1

FILTERABLE PARTICULATE

WEIGHT INCREASE OF FILTER(GRM)	: 0.0222
PROBE RESIDUE(GM)	: 0.0268
TOTAL MASS OF PROBE SAMPLE(GM)	: 1
BLANK RESIDUE(GM)	: 0
TOTAL MASS OF BLANK(GM)	: 1
PROBE CATCH	: 0.0268
FILTER CATCH	: 0.0222

PROBE LENGTH (IN)	: 146
NOZZLE DIAMETER (IN.)	: 0.387
DRY GAS METER CORRECTION FACTOR	: 1.001
PITOT TUBE CALIB. COEF.	: 0.81

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[illegible]	[illegible] (IN H2O)	STACK TEMP (F)	VELOCITY HEAD (IN H2O)	ORIFICE PRES DROP (IN H2O)	DRY GAS VOLUME (F^3)	TEMP INLET (F)	TEMP OUTLET (F)	TEMP IMP (F)
				PORT # 1				
[illegible]	-0.88	205	0.08	1.30	754.90	46	43	30
[illegible]	-0.88	212	0.08	1.30	756.14	51	44	33
[illegible]	-0.88	215	0.07	1.15	757.49	55	44	34
[illegible]	-0.88	202	0.08	1.30	758.60	56	45	34
[illegible]	-0.88	201	0.08	1.30	759.83	59	46	36
[illegible]	-0.88	203	0.07	1.15	761.09	61	46	36
[illegible]	-0.88	204	0.07	1.05	762.29	62	46	38
[illegible]	-0.88	204	0.03	0.49	763.44	61	45	38
[illegible]	-0.88	206	0.02	0.36	764.25	60	49	35
[illegible]	-0.88	207	0.02	0.36	764.99	61	50	33
[illegible]	-0.88	206	0.03	0.49	765.59	64	51	34
[illegible]	-0.88	190	0.02	0.36	766.40	64	52	33
		FINAL DRY GAS VOLUME			767.08			
				PORT # 2				
1530	-0.88	205	0.06	0.99	767.05	55	55	28
1532	-0.88	205	0.06	0.99	768.23	60	55	30
1534	-0.88	208	0.55	0.90	769.32	65	54	30
1536	-0.88	210	0.06	0.90	770.48	66	55	29
1538	-0.88	212	0.07	1.15	771.44	69	55	30
1540	-0.88	213	0.06	0.99	772.59	70	56	30
1542	-0.88	213	0.07	1.15	773.70	72	56	31
1544	-0.88	214	0.06	0.99	774.98	73	57	31
1546	-0.88	215	0.06	0.99	776.01	73	57	30
1548	-0.88	216	0.06	0.99	777.13	74	58	29
1550	-0.88	216	0.05	0.82	778.33	75	58	29
1552	-0.88	174	0.04	0.66	779.28	75	60	27
		FINAL DRY GAS VOLUME			780.19			
				PORT # 3				
1600	-0.88	198	0.04	0.66	780.19	58	56	23
1602	-0.88	203	0.04	0.57	781.12	63	59	28
1604	-0.88	206	0.05	0.74	781.99	65	59	29
1606	-0.88	208	0.05	0.82	782.94	69	59	30
1608	-0.88	209	0.05	0.82	783.97	69	60	31
1610	-0.88	211	0.06	0.99	785.00	71	59	33
1612	-0.88	212	0.06	0.99	786.10	71	59	33
1614	-0.88	198	0.06	0.90	787.21	72	60	34

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1616	-0.88	200	0.07	1.15	788.28	73	60	37
1618	-0.88	205	0.07	1.15	789.47	45	61	38
1620	-0.88	204	0.06	0.99	790.70	75	62	35
1622	-0.88	165	0.05	0.82	791.82	75		

FINAL DRY GAS VOLUME 792.86

PORT # 4

1630	-0.88	209	0.07	1.15	792.86	56	58	28
1632	-0.88	213	0.07	1.15	794.10	61	59	32
1634	-0.88	206	0.08	1.30	795.32	65	57	34
1636	-0.88	200	0.08	1.30	796.56	67	57	32
1638	-0.88	204	0.08	1.23	797.82	68	57	31
1640	-0.88	204	0.07	1.15	799.08	69	57	30
1642	-0.88	207	0.08	1.30	800.28	70	57	29
1644	-0.88	208	0.08	1.23	801.93	70	57	28
1646	-0.88	208	0.08	1.23	802.77	71	57	26
1648	-0.88	208	0.07	1.08	804.04	71	58	25
1650	-0.88	167	0.06	0.99	805.25	71	88	24
1652	-0.88	109	0.02	0.37	806.48	67	58	21

FINAL DRY GAS VOLUME 807.16

AVG ORIFICE DROP (IN H2O) : 0.9627
TEMP OF METER (DEGREES R) : 520.5
AVG. STATIC STK PRESS (IN H2O) :-0.88
AVG STACK PRESSURE (IN HG.) : 30.365
TOTAL SAMPLING TIME THIS SAMPLE : 96
AVG TEMP OF STK GAS (DEGREES R) : 662.4
AVG VELOCITY HEAD (IN H2O) : 0.062
AVG VELOCITY (FPS) : 14.93
DIAMETER OF STACK (IN.) : 211.25
CROSS-SECT AREA OF STACK (SF) : 243.4
VOLUMETRIC FLOW OF STK (DSCF/HR): 10258312

CONC. OF FILT. PART. IN STK (GR/DSCF) : 0.0139
CONC. OF FILT. PART. IN STK (#/DSCF) : 1.99682E-06
#/HR OF FILT. PART (DRY BASIS) : 20.484

ISOKINETIC VARIATION (%) : 98.26

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Environmental Services Division
16550 Highland Road
Baton Rouge, Louisiana 70808

EMISSION TESTING
FOR
UNITED STATES STEEL

RESULTS

SAMPLING METHOD : 1
RUN NUMBER :3
UNIT DESCRIPTION :#1 COKE BATTERY

PHYSICAL CONSTANTS
OF
STACK

DATE OF SAMPLING	FEBRUARY 2, 1980
TEMPERATURE OF STACK(R)	662.4
VELOCITY OF STACK GAS(FPS)	14.93
CROSS-SECTIONAL AREA OF STACK(SF)	243.4
VOLUMETRIC FLOW(DSCFH)	10258312
STATIC PRESSURE(INCHES OF H2O	-0.88
MOISTURE CONTENT(% VOLUME)	3.07
MOLECULAR WEIGHT OF STACK GAS(#/#-MOLE,DRY)	29.47
ISOKINETIC RATIO(%)	98.26
FILTERABLE PARICULATE EMISSION RATE(#/HOUR)	20.484
FILTERABLE PARTICULATE CONCENTRATION(GR/DSCF)	0.0139

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SULFATE

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16550 Highland Road
Baton Rouge, Louisiana 70808

STACK SAMPLING DATA REDUCTION
FOR REFERENCE METHOD 5

UNITED STATES STEEL
GARY, INDIANA
#1 COKE BATTERY

OPERATORS	: TESSON - BROWNING
DATE OF THIS SAMPLE	: FEBRUARY 1, 1980
TODAY'S DATE	: FEBRUARY 20, 1980
RUN #	: 1
FILE NAME	: USTE30
AMBIENT TEMPERATURE (DEG F)	: 20
BAROMETRIC PRESS. (IN. HG.)	: 30.05

GAS ANALYSIS AT SAMPLING POINT
(DRY BASIS)

% CARBON DIOXIDE	: 4.5
% CARBON MONOXIDE	: 0
% OXYGEN	: 18.7
% NITROGEN	: 76.8
MOLECULAR WEIGHT (DRY)	: 29.46
% MOISTURE THIS RUN	: 2.97
% MOIST. @ SATURATION	: 100

# MLS OF H2O IN IMPINGERS	: 24
WT INCREASE OF SILICA GEL(G)	: 9.2
VOLUME OF GAS SAMPLE (DSCF)	: 51.83

FILTERABLE PARTICULATE

WEIGHT INCREASE OF FILTER(GRM)	: 9.42100E-03
PROBE RESIDUE(GM)	: 5.09200E-03
TOTAL MASS OF PROBE SAMPLE(GM)	: 1
BLANK RESIDUE(GM)	: 0
TOTAL MASS OF BLANK(GM)	: 1
PROBE CATCH	: 5.09200E-03
FILTER CATCH	: 9.42100E-03

PROBE LENGTH (IN)	: 146
NOZZLE DIAMETER (IN.)	: 0.387
DRY GAS METER CORRECTION FACTOR	: 1.001
PITOT TUBE CALIB. COEF.	: 0.81

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CLOCK TIME (H.M)	STATIC PRESS (IN H2O)	STACK TEMP (F)	VELOCITY HEAD (IN H2O)	ORIFICE PRES DROP (IN H2O)	DRY GAS VOLUME (F^3)	TEMP INLET (F)	TEMP OUTLET (F)	TEMP IMP (F)
				PORT # 1				
1545	-0.79	192	0.07	1.15	625.80	54	46	16
1547	-0.79	185	0.07	1.15	626.75	61	48	17
1549	-0.79	190	0.08	1.30	677.99	64	50	17
1551	-0.79	194	0.07	1.15	629.29	66	51	17
1553	-0.79	196	0.08	1.30	630.54	69	51	22
1555	-0.79	197	0.08	1.30	631.83	71	52	21
1557	-0.79	197	0.08	1.30	633.14	72	54	22
1559	-0.79	199	0.08	1.30	634.48	74	55	25
1601	-0.79	199	0.08	1.30	635.70	76	56	23
1603	-0.79	200	0.09	1.50	637.06	77	57	24
1605	-0.79	200	0.08	1.30	638.39	78	58	26
1607	-0.79	195	0.07	1.15	639.70	79	59	26
		FINAL DRY GAS VOLUME			640.97			
				PORT # 2				
1615	-0.79	180	0.04	0.66	640.97	66	63	23
1617	-0.79	186	0.05	0.82	641.91	72	63	22
1619	-0.79	189	0.04	0.66	642.99	72	63	23
1621	-0.79	185	0.05	0.82	643.89	75	63	20
1623	-0.79	191	0.06	0.99	644.93	77	63	19
1625	-0.79	193	0.07	1.15	646.03	78	64	19
1627	-0.79	193	0.07	1.15	647.22	80	64	20
1629	-0.79	193	0.07	1.15	648.47	81	65	18
1631	-0.79	194	0.07	1.15	649.71	82	65	18
1633	-0.79	196	0.06	0.99	650.99	83	66	17
1635	-0.79	193	0.07	1.15	652.14	83	67	17
1637	-0.79	152	0.05	0.82	653.33	83	67	16
		FINAL DRY GAS VOLUME			654.35			
				PORT # 3				
1642	-0.79	180	0.06	0.99	654.35	72	67	17
1644	-0.79	189	0.05	0.82	655.56	78	69	17
1646	-0.79	193	0.06	0.99	656.59	80	65	16
1648	-0.79	194	0.06	0.99	657.74	82	69	16
1650	-0.79	197	0.08	1.30	658.88	84	69	17
1652	-0.79	198	0.08	1.30	660.16	85	70	17
1654	-0.79	199	0.08	1.30	661.48	86	70	17
1656	-0.79	199	0.08	1.30	662.80	87	71	16

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	-0.79	200	0.09	1.50	664.15	87	71	16
	-0.79	201	0.09	1.50	665.50	89	71	16
	-0.79	199	0.08	1.30	666.87	89	71	16
	-0.79	168	0.07	1.15	668.18	89	72	16
		FINAL DRY GAS VOLUME			664.44			

PORT # 4

1738	-0.79	182	0.08	1.30	669.79	74	73	16
1740	-0.79	189	0.09	1.50	670.69	81	72	16
1742	-0.79	193	0.08	1.30	672.03	82	72	15
1744	-0.79	198	0.08	1.30	673.35	84	71	16
1746	-0.79	197	0.09	1.50	674.63	85	72	15
1748	-0.79	199	0.08	1.30	675.93	86	72	15
1750	-0.79	195	0.08	1.30	677.21	85	71	15
1752	-0.79	190	0.07	1.15	678.51	87	72	16
1754	-0.79	200	0.03	0.49	679.77	87	71	15
1756	-0.79	203	0.03	0.49	680.55	83	73	15
1758	-0.79	199	0.02	0.36	681.36	81	74	16
1800	-0.79	180	0.03	0.49	682.08	84	73	15
		FINAL DRY GAS VOLUME			682.95			

AVG ORIFICE DROP (IN H2O) : 1.1172
TEMP OF METER (DEGREES R) : 531.7
AVG. STATIC STK PRESS (IN H2O) :-0.79
AVG STACK PRESSURE (IN HG.) : 29.991
TOTAL SAMPLING TIME THIS SAMPLE : 96
AVG TEMP OF STK GAS (DEGREES R) : 652.3
AVG VELOCITY HEAD (IN H2O) : 0.0667
AVG VELOCITY (FPS) : 15.45
DIAMETER OF STACK (IN.) : 211.25
CROSS-SECT AREA OF STACK (SF) : 243.4
VOLUMETRIC FLOW OF STK (DSCF/HR): 10661960

CONC. OF FILT. PART. IN STK (GF/DSCF) : 4.30000E-03
CONC. OF FILT. PART. IN STK (#/DSCF) : 6.17385E-07
#/HR OF FILT. PART (DRY BASIS) : 6.5825

ISOKINETIC VARIATION (%) : 90.57

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Environmental Services Division
16550 Highland Road
Baton Rouge, Louisiana 70808

EMISSION TESTING
FOR
UNITED STATES STEEL

LTS

SAMPLING METHOD : 1
RUN NUMBER :1
UNIT DESCRIPTION :#1 COKE BATTERY

PHYSICAL CONSTANTS
OF
STACK

DATE OF SAMPLING	FEBRUARY 1, 1980
TEMPERATURE OF STACK(F)	652.3
VELOCITY OF STACK GAS(FPS)	15.45
CROSS-SECTIONAL AREA OF STACK(SF)	243.4
VOLUMETRIC FLOW(DSCFH)	10661960
STATIC PRESSURE(INCHES OF H2O	-0.79
MOISTURE CONTENT(% VOLUME)	2.97
MOLECULAR WEIGHT OF STACK GAS(#/#-MOLE,DRY)	29.46
ISOKINETIC RATIO(%)	90.57
FILTERABLE PARICULATE EMISSION RATE(#/HOUR)	6.5825
FILTERABLE PARTICULATE CONCENTRATION(GR/DSCF)	4.30000E-03

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Environmental Services Division
16550 Highland Road
Baton Rouge, Louisiana 70808

STACK SAMPLING DATA REDUCTION
FOR REFERNCE METHOD 5

UNITED STATES STEEL
GARY, INDIANA
#1 COKE BATTERY

OPERATORS	: TESSON - BROWNING
DATE OF THIS SAMPLE	: FEBRUARY 2, 1980
TODAY'S DATE	: FEBRUARY 20, 1980
RUN #	: 2
FILE NAME	: USTE31
AMBIENT TEMPERATURE (DEG F)	: 10
BAROMETRIC PRESS. (IN. HG.)	: 30.43

GAS ANALYSIS AT SAMPLING POINT
(DRY BASIS)

% CARBON DIOXIDE	: 4.9
% CARBON MONOXIDE	: 0
% OXYGEN	: 18.3
% NITROGEN	: 76.8
MOLECULAR WEIGHT (DRY)	: 29.51
% MOISTURE THIS RUN	: 2.61
% MOIST. @ SATURATION	: 100

# MLS OF H2O IN IMPINGERS	: 17
WT INCREASE OF SILICA GEL(G)	: 13
VOLUME OF GAS SAMPLE (DSCF)	: 53.71

FILTERABLE PARTICULATE

WEIGHT INCREASE OF FILTER(GRM)	: 0.010818
PROBE RESIDUE(GM)	: 3.90200E-03
TOTAL MASS OF PROBE SAMPLE(GM)	: 1
BLANK RESIDUE(GM)	: 0
TOTAL MASS OF BLANK(GM)	: 1
PROBE CATCH	: 3.90200E-03
FILTER CATCH	: 0.010818

PROBE LENGTH (IN)	: 146
NOZZLE DIAMETER (IN.)	: 0.387
DRY GAS METER CORRECTION FACTOR	: 1.001
PITOT TUBE CALIB. COEF.	: 0.81

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CLOCK TIME (H.M)	STATIC PRESS (IN H2O)	STACK TEMP (F)	VELOCITY HEAD (IN H2O)	ORIFICE PRES DROP (IN H2O)	DRY GAS VOLUME (F^3)	TEMP INLET (F)	TEMP OUTLET (F)	TEMP IMP (F)
				PORT # 1				
800	-0.90	177	0.07	1.10	698.98	38	37	10
802	-0.90	198	0.07	1.10	700.24	48	37	24
804	-0.90	201	0.07	1.15	701.56	51	37	24
806	-0.90	202	0.07	1.15	702.64	55	38	25
808	-0.90	205	0.08	1.21	703.82	57	39	26
810	-0.90	206	0.07	1.15	705.04	59	40	26
812	-0.90	206	0.08	1.21	706.22	61	42	27
814	-0.90	207	0.08	1.31	707.45	64	43	20
816	-0.90	207	0.08	1.21	708.79	66	45	30
818	-0.90	210	0.07	1.19	709.93	69	46	28
820	-0.90	201	0.07	1.15	711.12	70	48	27
822	-0.90	194	0.05	0.82	712.24	72	50	26
		FINAL DRY GAS VOLUME			713.41			
				PORT # 2				
830	-0.90	196	0.05	0.82	713.41	55	56	8
832	-0.90	198	0.05	0.73	714.42	64	56	21
834	-0.90	201	0.05	0.82	715.39	68	55	21
836	-0.90	201	0.05	0.73	716.41	69	56	22
838	-0.90	204	0.05	0.82	717.48	72	56	22
840	-0.90	204	0.05	0.82	718.45	73	57	21
842	-0.90	205	0.06	0.99	719.43	76	58	21
844	-0.90	187	0.06	0.99	720.52	77	59	21
846	-0.90	195	0.07	1.08	721.63	80	60	23
848	-0.90	196	0.07	1.08	722.76	81	61	24
850	-0.90	192	0.06	0.90	723.91	82	62	26
852	-0.90	190	0.09	0.91	726.11	74	64	23
		FINAL DRY GAS VOLUME			726.11			
				PORT # 3				
900	-0.90	210	0.05	0.82	726.11	66	67	19
902	-0.90	209	0.05	0.82	727.15	76	65	28
904	-0.90	211	0.05	0.74	728.28	79	65	28
906	-0.90	214	0.05	0.74	729.15	80	66	28
908	-0.90	194	0.05	0.74	730.28	82	66	28
910	-0.90	198	0.05	0.82	731.13	84	67	29
912	-0.90	199	0.05	0.74	732.26	85	68	29
914	-0.90	198	0.04	0.66	733.14	85	69	30

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916	-0.90	199	0.04	0.66	734.08	86	[illegible]	[illegible]
918	-0.90	200	0.05	0.74	735.02	88	70	[illegible]
920	-0.90	200	0.03	0.49	736.01	86	71	32
922	-0.90	187	0.03	0.49	736.90	88	72	32

FINAL DRY GAS VOLUME 737.67

PORT # 4

930	-0.90	201	0.07	1.15	737.67	77	74	29
932	-0.90	203	0.08	1.22	738.99	81	74	37
934	-0.90	206	0.07	1.08	740.15	84	73	39
936	-0.90	207	0.07	1.08	741.35	85	72	40
938	-0.90	211	0.07	1.08	742.54	87	72	42
940	-0.90	213	0.07	1.15	743.71	88	72	42
942	-0.90	214	0.10	1.65	749.00	90	73	43
944	-0.90	215	0.07	1.15	746.38	91	74	45
948	-0.90	214	0.05	0.83	747.57	91	75	43
950	-0.90	215	0.05	0.83	748.65	91	75	46
952	-0.90	210	0.05	0.83	749.69	92	75	43
954	-0.90	173	0.03	0.49	750.76	90	76	43

FINAL DRY GAS VOLUME 751.63

AVG ORIFICE DROP (IN H2O) : 0.9466
TEMP OF METER (DEGREES F) : 527.8
AVG. STATIC STK PRESS (IN H2O) :-0.9
AVG STACK PRESSURE (IN HG.) : 30.363
TOTAL SAMPLING TIME THIS SAMPLE : 96
AVG TEMP OF STK GAS (DEGREES F) : 661.7
AVG VELOCITY HEAD (IN H2O) : 0.0573
AVG VELOCITY (FPS) : 14.32
DIAMETER OF STACK (IN.) : 211.25
CROSS-SECT AREA OF STACK (SF) : 243.4
VOLUMETRIC FLOW OF STK (DSCF/HR): 9900600

CONC. OF FILT. PART. IN STK (GR/DSCF) : 4.20000E-03
CONC. OF FILT. PART. IN STK (#/DSCF) : 6.04292E-07
#/HR OF FILT. PART (DRY BASIS) : 5.9828

ISOKINETIC VARIATION (%) : 101.07

511090

Environmental Services Division
16550 Highland Road
Baton Rouge, Louisiana 70808

EMISSION TESTING
FOR
UNITED STATES STEEL

SAMPLING METHOD : 1
RUN NUMBER :2
UNIT DESCRIPTION :#1 COKE BATTERY

PHYSICAL CONSTANTS
OF
STACK

OF SAMPLING	FEBRUARY 2, 1980
PERATURE OF STACK(F)	661.7
CITY OF STACK GAS(FPS)	14.32
S-SECTIONAL AREA OF STACK(SF)	243.4
METRIC FLOW(DSCFH)	9900600
IC PRESSURE(INCHES OF H2O	-0.9
TURE CONTENT(% VOLUME)	2.61
ECULAR WEIGHT OF STACK GAS(#/#-MOLE,DRY)	29.51
KINETIC RATIO(%)	101.07
TERABLE PARTICULATE EMISSION RATE(#/HOUR)	5.9828
TERABLE PARTICULATE CONCENTRATION(GR/DSCF)	4.20000E-03

511091

KETRON
Environmental Services Division
16550 Highland Road
Baton Rouge, Louisiana 70808

STACK SAMPLING DATA REDUCTION
FOR REFERNCE METHOD 5

UNITED STATES STEEL
GARY, INDIANA
#1 COKE BATTERY

OPERATORS	: TESSON - BROWNING
DATE OF THIS SAMPLE	: FEBRUARY 2, 1980
TODAY'S DATE	: FEBRUARY 20, 1980
RUN #	: 3
FILE NAME	: USTE32
AMBIENT TEMPERATURE (DEG F)	: 10
BAROMETRIC PRESS. (IN. HG.)	: 30.43

GAS ANALYSIS AT SAMPLING POINT
(DRY BASIS)

% CARBON DIOXIDE	: 4.7
% CARBON MONOXIDE	: 0
% OXYGEN	: 18
% NITROGEN	: 77.3
MOLECULAR WEIGHT (DRY)	: 29.47
% MOISTURE THIS RUN	: 3.07
% MOIST. @ SATURATION	: 100

# MLS OF H2O IN IMPINGERS	: 21
WT INCREASE OF SILICA GEL(G)	: 15
VOLUME OF GAS SAMPLE (DSCF)	: 54.1

FILTERABLE PARTICULATE

WEIGHT INCREASE OF FILTER(GRM)	: 0.014097
PROBE RESIDUE(GM)	: 4.32500E-03
TOTAL MASS OF PROBE SAMPLE(GM)	: 1
BLANK RESIDUE(GM)	: 0
TOTAL MASS OF BLANK(GM)	: 1
PROBE CATCH	: 4.32500E-03
FILTER CATCH	: 0.014097

PROBE LENGTH (IN)	: 146
NOZZLE DIAMETER (IN.)	: 0.387
DRY GAS METER CORRECTION FACTOR	: 1.001
PITOT TUBE CALIB. COEF.	: 0.81

511092

Environmental Services Division
16550 Highland Road
Baton Rouge, Louisiana 70808

CLOCK TIME (H.M)	STATIC PRESS (IN H2O)	STACK TEMP (F)	VELOCITY HEAD (IN H2O)	ORIFICE PRES DROP (IN H2O)	DRY GAS VOLUME (F^3)	TEMP INLET (F)	TEMP OUTLET (F)	TEMP IMP (F)
				PORT # 1				
1500	-0.88	205	0.08	1.30	754.90	46	43	30
1502	-0.88	212	0.08	1.30	756.14	51	44	33
1504	-0.88	215	0.07	1.15	757.49	55	44	34
1506	-0.88	202	0.08	1.30	758.60	56	45	34
1508	-0.88	201	0.08	1.30	759.83	59	46	36
1510	-0.88	203	0.07	1.15	761.09	61	46	36
1512	-0.88	204	0.07	1.05	762.29	62	46	38
1514	-0.88	204	0.03	0.49	763.44	61	45	38
1516	-0.88	206	0.02	0.36	764.25	60	49	35
1518	-0.88	207	0.02	0.36	764.99	61	50	33
1520	-0.88	206	0.03	0.49	765.59	64	51	34
1522	-0.88	190	0.02	0.36	766.40	64	52	33
		FINAL DRY GAS VOLUME			767.08			
				PORT # 2				
1530	-0.88	205	0.06	0.99	767.05	55	55	28
1532	-0.88	205	0.06	0.99	768.23	60	55	30
1534	-0.88	208	0.55	0.90	769.32	65	54	30
1536	-0.88	210	0.06	0.90	770.48	66	55	29
1538	-0.88	212	0.07	1.15	771.44	69	55	30
1540	-0.88	213	0.06	0.99	772.59	70	56	30
1542	-0.88	213	0.07	1.15	773.70	72	56	31
1544	-0.88	214	0.06	0.99	774.98	73	57	31
1546	-0.88	215	0.06	0.99	776.01	73	57	30
1548	-0.88	216	0.06	0.99	777.13	74	58	29
1550	-0.88	216	0.05	0.82	778.33	75	58	29
1552	-0.88	174	0.04	0.66	779.28	75	60	27
		FINAL DRY GAS VOLUME			780.19			
				PORT # 3				
1600	-0.88	198	0.04	0.66	780.19	58	56	23
1602	-0.88	203	0.04	0.57	781.12	63	59	28
1604	-0.88	206	0.05	0.74	781.99	65	59	29
1606	-0.88	208	0.05	0.82	782.94	69	59	30
1608	-0.88	209	0.05	0.82	783.97	69	60	31
1610	-0.88	211	0.06	0.99	785.00	71	59	33
1612	-0.88	212	0.06	0.99	786.10	71	59	33
1614	-0.88	198	0.06	0.90	787.21	72	60	34

511093

KEMRON
Environmental Services Division
1633 Highland Road
Baton Rouge, Louisiana 70808

1616	-0.88	200	0.07	1.15	788.28	73	60	37
1618	-0.88	205	0.07	1.15	789.47	45	61	38
1620	-0.88	204	0.06	0.99	790.70	75	62	35
1622	-0.88	165	0.05	0.82	791.82	75		

FINAL DRY GAS VOLUME 792.86

PORT # 4

1630	-0.88	209	0.07	1.15	792.86	56	58	28
1632	-0.88	213	0.07	1.15	794.10	61	59	32
1634	-0.88	206	0.08	1.30	795.32	65	57	34
1636	-0.88	200	0.08	1.30	796.56	67	57	32
1638	-0.88	204	0.08	1.23	797.82	68	57	31
1640	-0.88	204	0.07	1.15	799.08	69	57	30
1642	-0.88	207	0.08	1.30	800.28	70	57	29
1644	-0.88	208	0.08	1.23	801.93	70	57	28
1646	-0.88	208	0.08	1.23	802.77	71	57	26
1648	-0.88	208	0.07	1.08	804.04	71	58	25
1650	-0.88	167	0.06	0.99	805.25	71	88	24
1652	-0.88	109	0.02	0.37	806.48	67	58	21

FINAL DRY GAS VOLUME 807.16

AVG ORIFICE DROP (IN H2O) : 0.9627
TEMP OF METER (DEGREES F) : 520.5
AVG. STATIC STK PRESS (IN H2O) :-0.88
AVG STACK PRESSURE (IN HG.) : 30.365
TOTAL SAMPLING TIME THIS SAMPLE : 96
AVG TEMP OF STK GAS (DEGREES R) : 662.4
AVG VELOCITY HEAD (IN H2O) : 0.062
AVG VELOCITY (FPS) : 14.93
DIAMETER OF STACK (IN.) : 211.25
CROSS-SECT AREA OF STACK (SF) : 243.4
VOLUMETRIC FLOW OF STK (DSCF/HR): 10258312

CONC. OF FILT. PART. IN STK (GR/DSCF) : 5.20000E-03
CONC. OF FILT. PART. IN STK (#/DSCF) : 7.50723E-07
#/HR OF FILT. PART (DRY BASIS) : 7.7011

ISOKINETIC VARIATION (%) : 98.26

511094

Environmental Services Division
16550 Highland Road
Baton Rouge, Louisiana 70808

EMISSION TESTING
FOR
UNITED STATES STEEL

RESULTS

SAMPLING METHOD : 1
RUN NUMBER :3
UNIT DESCRIPTION :#1 COKE BATTERY

PHYSICAL CONSTANTS
OF
STACK

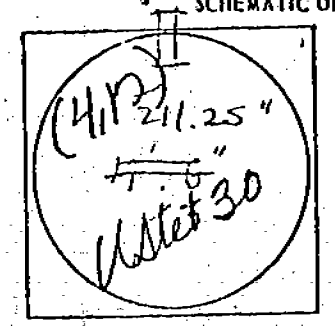
DATE OF SAMPLING	FEBRUARY 2, 1980
TEMPERATURE OF STACK(F)	662.4
VELOCITY OF STACK GAS(FPS)	14.93
CROSS-SECTIONAL AREA OF STACK(SF)	243.4
VOLUMETRIC FLOW(DSCFH)	10258312
STATIC PRESSURE(INCHES OF H2O	-0.88
MOISTURE CONTENT(% VOLUME)	3.07
MOLECULAR WEIGHT OF STACK GAS(#/#-MOLE,DRY)	29.47
ISOKINETIC RATIO(%)	98.26
FILTERABLE PARICULATE EMISSION RATE(#/HOUR)	7.7011
FILTERABLE PARTICULATE CONCENTRATION(GR/DSCF)	5.20000E-03

511095

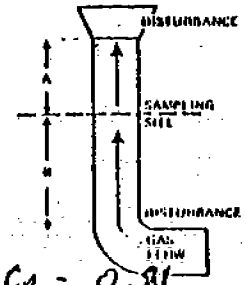
PARTICULATE FIELD DATA

Lot 4

SCHEMATIC OF STACK



CROSS SECTION



C_p = 0.81
γ = 1.001

PLANT: U.S. Steel
DATE: 2/1/80
LOCATION: Gary, Ind.
OPERATOR: TBSSON - BROWNING
STACK NO.: #1 Coke Batt.
RUN NO.: #1 - Particulate
SAMPLE BOX NO.: GST 1
METER BOX NO.: 481 W

AMBIENT TEMPERATURE: 30.0
BAROMETRIC PRESSURE: 30.05
ASSUMED MOISTURE, %: 2.5%
PROBE LENGTH, in.: 8' 50" 146"
NOZZLE DIAMETER, in.: .387
STACK DIAMETER, in.: 211.25 (654.75)
PROBE HEATER SETTING:
HEATER BOX SETTING:

METER $\Delta H_@$: 1.774
C FACTOR: 16.5 @ 200; 18.5 @ 125
PROCESS WEIGHT RATE:

WEIGHT OF PARTICULATE COLLECTED, mg		
SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	1545	-.79	192	.07	.264	1.15		625.745	54	46	249	16	7	
2	1547		185	.07	.264	1.15		626.25	61	48	299	17	7	
3	1549		190	.08	.282	1.3		627.99	64	50	299	17	7	
4	1551		194	.07	.264	1.15		629.29	66	51	300	17	7	
5	1553		196	.08	.282	1.3		630.54	69	51	302	22	26	
6	1555		197	.08	.282	1.3		631.83	71	52	302	21	6	
7	1557		197	.08	.282	1.3		633.14	72	54	301	22	6	
8	1559		199	.08	.282	1.3		634.48	74	55	300	25	6	
9	1601		199	.08	.282	1.3		635.78	76	56	301	23	6	
10	1603		200	.09	.3	1.5		637.06	77	57	302	24	6	
11	1605		200	.08	.282	1.3		638.39	78	58	301	26	6	
12	1607		195	.07	.264	1.15		639.70	79	59	302	26	6	
								640.97						
TOTAL														
AVERAGE			2344		3.33	15.2			84	637.				

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME, ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL	669.2	670.5		1328	666.1
INITIAL	661.3	653.2		1278	656.9
LIQUID COLLECTED	7.9	17.1		4.6	9.2
TOTAL					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

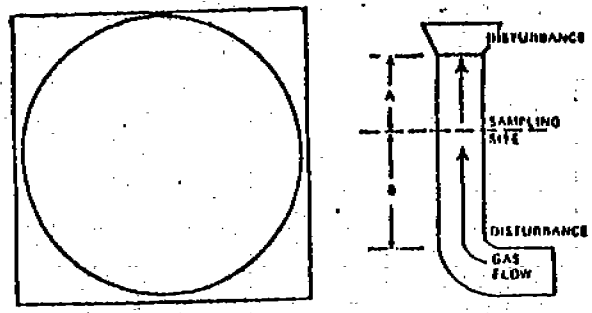
COMMENTS:

1 13 96
8 30
OK 96 Tab

60

PARTICULATE FIELD DATA

SCHEMATIC OF STACK



CROSS SECTION

PLANT U.S. Steel
DATE 2/1/80
LOCATION Gary, Ind.
OPERATOR Tesson, Browning
STACK NO. #1
RUN NO. #1 particulate
SAMPLE BOX NO. 1
METER BOX NO.

AMBIENT TEMPERATURE 20°
BAROMETRIC PRESSURE 30.05
ASSUMED MOISTURE, % 2.5
PROBE LENGTH, in. 8'50"
NOZZLE DIAMETER, in. .387
STACK DIAMETER, in. 211.25
PROBE HEATER SETTING
HEATER BOX SETTING

METER $\Delta H_@$ 1.774
C FACTOR 16.5 @ 200
18.5 @ 125
PROCESS WEIGHT RATE

WEIGHT OF PARTICULATE COLLECTED,

SAMPLE	FILTER	PROBE
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft^3	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER F	PUMP VACUUM in. Hg gauge	VEL
1	16.05	16.15	180	.04	.20	.66		690.97	66	63	301	23	4	
2	16.17		186	.05	.223	.82		691.91	72	63	302	22	4	
3	16.19		189	.04	.20	.66		692.99	72	63	301	23	4	
4	16.21		185	.05	.223	.82		693.89	75	63	300	20	4	
5	16.23		191	.06	.244	.99		694.93	77	63	278	19	4	
6	16.25		193	.07	.264	1.15		696.03	78	64	235	19	4	
7	16.27		193	.07	.264	1.15		697.22	80	64	232	20	5	
8	16.29		193	.07	.264	1.15		698.47	81	65	235	18	5	
9	16.31		194	.07	.264	1.15		699.71	82	65	290	18	5	
10	16.33		196	.06	.244	.99		650.99	83	66	238	17	4	
11	16.35		193	.07	.264	1.15		652.19	83	67	236	17	4	
12	16.37		152	.05	.223	.82		653.33	83	67	290	16	4	
								654.35						
TOTAL														
AVERAGE			2245		2.877	11.51			932	773				

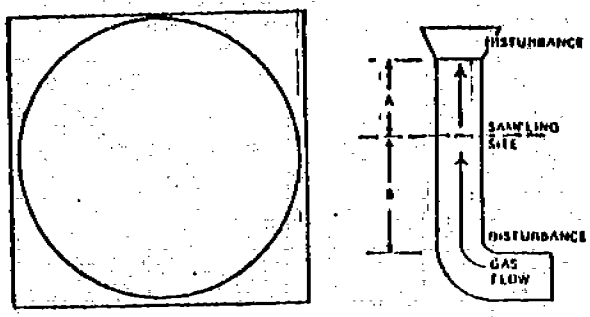
VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL					
INITIAL					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					

COMMENTS:

PARTICULATE FIELD DATA

SCHEMATIC OF STACK



CROSS SECTION

PLANT U.S. Steel
DATE 2/1/80
LOCATION Gary, Ind
OPERATOR Browning, Tesson
STACK NO. H 1,
RUN NO. #1 particulate
SAMPLE BOX NO. 1
METER BOX NO.

AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 30.05
ASSUMED MOISTURE, % 2.5
PROBE LENGTH, in. 8' 50"
NOZZLE DIAMETER, in. .387
STACK DIAMETER, in. 211.25
PROBE HEATER SETTING
HEATER BOX SETTING

C FACTOR 16.5 @ 2.00
18.5 @ 125
PROCESS WEIGHT RATE

WEIGHT OF PARTICULATE COLLECTED,		
SAMPLE	FILTER	PROBE W
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
	TOTAL	

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{IN}}$), °F	OUTLET ($T_{m_{OUT}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELO
1	1642		180	.06	.2449	.99		654.35	72	67	239	17	5	
2	1644		189	.05	.2236	.82		655.56	78	69	247	17	4	
3	1646		193	.06	.2449	.99		656.59	80	68	298	16	4	
4	1648		194	.06	.2449	.99		657.74	82	69	257	16	4	
5	1650		197	.08	.2828	1.3		658.88	84	69	253	17	4.5	
6	1652		198	.08		1.3		660.16	85	70	250	17	5	
7	1654		192	.08		1.3		661.48	86	70	249	17	5	
8	1656		199	.08		1.3		662.80	87	71	247	16	5	
9	1658		200	.09	.30	1.5		664.15	87	70	246	17	5	
10	1700		201	.09	.30	1.5		665.50	89	71	245	16	5	
11	1702		199	.08		1.3		666.87	89	71	297	16	5	
12	1704		168	.07	.2645	1.05		668.18	89	72	246	16	5	
								664.44						
TOTAL														
AVERAGE			2317		3.2368	14.44			1008	837				

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL					
INITIAL					

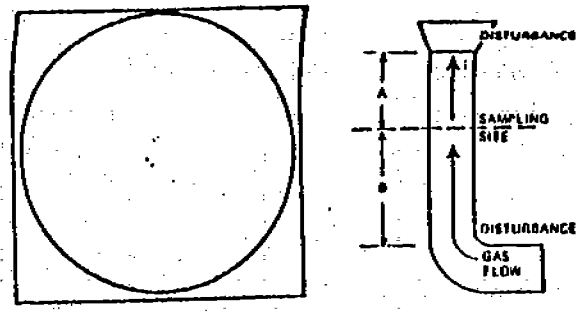
ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					

COMMENTS: 4 ports, 12 pts/port
2 mins./pt, - total sampl time =

1108

[illegible] PARTICULATE [illegible]

SCHEMATIC OF STACK



CROSS SECTION

PLANT W.S. Steel

DATE 2/1/80

LOCATION Gary, Ind

OPERATOR Fuller, Browning, Tessier

STACK NO. #1

RUN NO. #1 Particulate

SAMPLE BOX NO. 1

METER BOX NO.

BAROMETRIC PRESSURE

ASSUMED MOISTURE, % 2.5

PROBE LENGTH, in. 8' 50"

NOZZLE DIAMETER, in. .387

STACK DIAMETER, in. 211.25

PROBE HEATER SETTING

HEATER BOX SETTING

WEIGHT OF PARTICULATE COLLECTED

SAMPLE	FILTER	PROBE WAS
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{IN}}$), °F	OUTLET ($T_{m_{OUT}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	1738	-.79	182	.08	.282	1.3		669.79	74	73	295	16	5	
2	1740		189	.09	.3	1.5		670.69	81	72	298	16	5	
3	1742		193	.08	.282	1.3		672.03	82	72	297	15	5	
4	1744		198	.08	.282	1.3		673.35	84	71	297	16	5	
5	1746		197	.09	.3	1.5		674.63	85	72	295	15	5	
6	1748		199	.08	.282	1.3		675.83	86	72	291	15	5	
7	1750		195	.08	.282	1.3		677.21	85	71	295	15	5	
8	1752		190	.07	.264	1.15		678.51	87	72	291	16	5	
9	1754		200	.03	.173	.49		679.77	87	71	237	15	5	
10	1756		203	.03	.173	.49		680.55	83	73	291	15	3	
11	1758		199	.02	.141	.36		681.36	81	74	239	16	3	
12	1800		180	.03	.173	.49		682.08	84	73	242	15	4	
								682.95						
TOTAL														
AVERAGE			max 2326.2	.06	2.454	12.48			999	866				

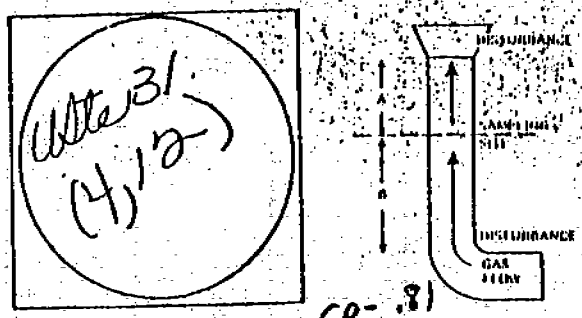
VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL					
INITIAL					
LIQUID COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					

COMMENTS:

PARTICULATE FIELD DATA

SCHEMATIC OF STACK



CROSS SECTION

Cp - .81
γ - 1.001

PLANT US STEEL
DATE 2/2/80
LOCATION GARY INDIANA
OPERATOR TESSON/BROWNING
STACK NO. 1
RUN NO. #2 PART/BLAST FURNACE
SAMPLE BOX NO. 4
METER BOX NO. 481

AMBIENT TEMPERATURE 810°
BAROMETRIC PRESSURE 30.43
ASSUMED MOISTURE, % 3.7
PROBE LENGTH, in.
NOZZLE DIAMETER, in. .387
STACK DIAMETER, in.
PROBE HEATER SETTING —
HEATER BOX SETTING —

METER ΔH@ 1.774
C FACTOR 16.5/200° 18.5/125
PROCESS WEIGHT RATE

WEIGHT OF PARTICULATE COLLECTED, mg		
SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT	5542	
WEIGHT GAIN		
TOTAL		

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s) ($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³ (698.981)	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{IN}}$), °F	OUTLET ($T_{m_{OUT}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	0800	-.90	177	.065	1.10			38	37	225	810	4.5	
2	0802		198	.065	1.10		700.24	48	37	235	24	4.5	
3	804		201	.07	1.15		701.56	51	37	235	24	4.5	
4	806		202	.07	1.15		702.64	55	38	238	25	4.5	
5	808		205	.075	1.21		703.82	57	39	234	26	4.5	
6	810		206	.070	1.15		705.04	59	40	240	26	4.5	
7	812		206	.075	1.21		706.22	61	42	244	27	4.9	
8	814		207	.080	1.31		707.45	64	43	246	30	4.9	
9	816		207	.079	1.21		708.79	66	45	247	30	4.9	
10	818		210	.070	1.15		709.925	69	46	243	28	4.5	
11	820		201	.07	1.15		711.12	70	48	242	27	4.2	
12	822		154	.05	0.82		712.24	72	50	243	26	4.0	
TOTAL													
AVERAGE			2374		7.96			710	502				

3.160°
13.71

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL	664.4	667.6		450.5	658.0
INITIAL	651.7	670.8		442.3	645.0
LIQUID COLLECTED	670.8	651.8	1.4	8.2	13.0
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1	9.15	4.7	18.5	0	
2		4.9	18.3	0	
3		4.5	18.7	0	
4					

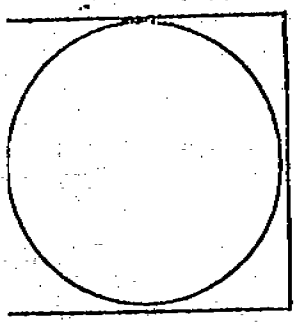
COMMENTS: 4 ports, 12 pts/port.
2 min's/pt.

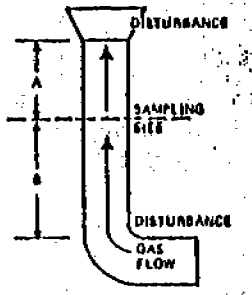
(16)

64

414

SCHEMATIC OF STACK





CROSS SECTION

PLANT: LCS STEEL
DATE: 2/2/90
LOCATION: GARY IND
OPERATOR: Tessa, Browning
STACK NO.: 1
RUN NO.: #2
SAMPLE BOX NO.: 4
METER BOX NO.: 401

PLANT TEMPERATURE: —
BAROMETRIC PRESSURE: 30.93
ASSUMED MOISTURE, %: —
PROBE LENGTH, in.: —
NOZZLE DIAMETER, in.: .387
STACK DIAMETER, in.: —
PROBE HEATER SETTING: —
HEATER BOX SETTING: —

METER: 1-4
C FACTOR: 16.5/200 18.5/125
PROCESS WEIGHT RATE: —

WEIGHT OF PARTICULATE COLLECTED, mg		
SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft^3	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	830		196	.05	8	.82		713.41	55	56	232	8	4.0	
2	832		198	.045		.73		714.42	64	56	242	21	3.0	
3	834		201	.050		.82		715.39	68	55	234	21	4.0	
4	836		201	.045		.73		716.41	69	56	244	22	8.0	
5	838		204	.05		.82		717.48	72	56	247	22	4.0	
6	840		204	.05		.82		718.45	73	57	236	21	4.0	
7	842		205	.06		.99		719.43	76	58	232	21	4.0	
8	844		187	.06		.99		720.52	77	59	223	21	4.0	
9	846		195	.065		1.08		721.63	80	60	244	23	4.0	
10	848		198	.065		1.08		722.76	81	61	253	24	4.0	
11	850		198	.055		0.90		723.91	82	62	257	26	4.0	
12	852		110	.052		[illegible]	.91	[illegible]	74	64	255	25	4.0	
								726.11						
TOTAL														
AVERAGE			227			7.41			871	700				

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

COMMENTS:

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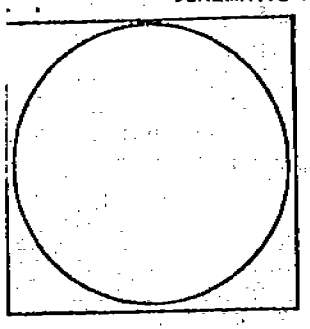
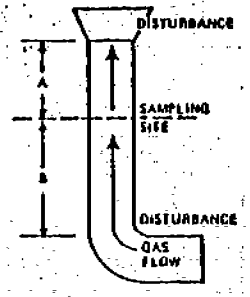
PARTICULATE FIELD DATA

SCHEMATIC OF STACK



CROSS SECTION



PLANT US STE

DATE 2/2/80

LOCATION GARY IND

OPERATOR TESSON/BROWNING

STACK NO. 1

RUN NO. #2

SAMPLE BOX NO. 4

METER BOX NO. 421

AMBIENT TEMPERATURE

BAROMETRIC PRESSURE 30.93

ASSUMED MOISTURE, %

PROBE LENGTH, in.

NOZZLE DIAMETER, in. .387

STACK DIAMETER, in.

PROBE HEATER SETTING

HEATER BOX SETTING

METER ΔH@ 1.7-4 3/4

C FACTOR 16.5/200 18.5/125

PROCESS WEIGHT RATE

WEIGHT OF PARTICULATE COLLECTED, mg		
SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s) ($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{IN}}$), °F	OUTLET ($T_{m_{OUT}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	900		210	.05	.82		726.11	66	67	243	19	4.0	
2	902		209	.05	.82		727.15	76	65	251	28	4.0	
3	904		211	.045	.74		728.28	79	65	257	28	3.0	
4	906		214	.045	.74		729.15	80	66	260	28	3.0	
5	908		199	.045	.74		730.28	82	66	262	28	3.0	
6	910		198	.05	.82		731.13	84	67	261	29	3.0	
7	912		199	.045	.74		732.26	85	68	262	29	3.0	
8	914		198	.040	.66		733.14	85	69	265	30	4.0	
9	916		199	.040	.66		734.08	86	70	270	33	5.0	
10	918		200	.045	.74		735.02	88	70	270	33	3.0	
11	920		200	.030	.49		736.01	86	71	273	32	3.00	
12	922		187	.03	.49		736.90	88	72	277	32	3.00	
TOTAL				2.475									
AVERAGE			209		8.46			985	816				

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

COMMENTS:

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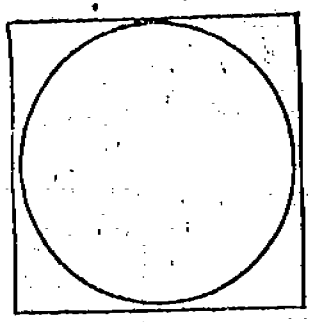
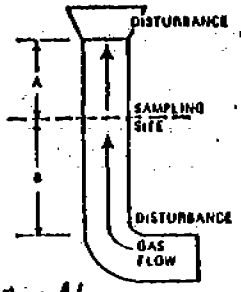
PARTICULATE FIELD DATA

PLANT U STC | INTEGRATOR | METER Δ$H_@$ 1.254 / 1.414

SCHEMATIC OF STACK



CROSS SECTION



C_p = .81
γ = 1.001

DATE 2/2/80
LOCATION GARY IND
OPERATOR JESSON / BRUNNING
STACK NO. 1
RUN NO. # 2
SAMPLE BOX NO. 4
METER BOX NO. 481 N

BAROMETRIC PRESSURE 30.43
ASSUMED MOISTURE, %
PROBE LENGTH, in.
NOZZLE DIAMETER, in.
STACK DIAMETER, in.
PROBE HEATER SETTING
HEATER BOX SETTING

C FACTOR
PROCESS WEIGHT RATE

WEIGHT OF PARTICULATE COLLECTED, mg		
SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s) ($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft^3	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{IN}}$), °F	OUTLET ($T_{m_{OUT}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	930		201	.07	1.15		737.67	77	77	252	29	4.0	
2	932		203	.075	1.22		738.99	81	74	253	37	4.0	
3	934		206	.065	1.08		740.15	84	73	250	39	4.0	
4	936		207	.065	1.08		741.27	85	72	266	40	4.0	
5	938		211	.065	1.08		742.84	87	72	259	42	4.0	
6	940		213	.07	1.15		743.71	88	72	258	42	4.00	
7	942		214	.10	1.65		749.00	90	73	260	43	5.0	
8	944	.05	215	.07	1.15		746.78	91	74	252	45	4.00	
9	946	.07	214	.05	.83		747.57	91	75	256	43	3.5	
10	950	.05	215	.05	.83		748.65	91	75	256	46	3.5	
11	952		210	.05	.83		749.69	92	75	256	43	3.5	
12	954		173	.03	.49		750.76	90	76	259	43	3.0	
							751.628						
TOTAL				2.99									
AVERAGE			210.2		12.54			107.7	73.5				

CONDENSATE	VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
	FINAL					
	INITIAL					
	LIQUID COLLECTED					
	TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

COMMENTS:

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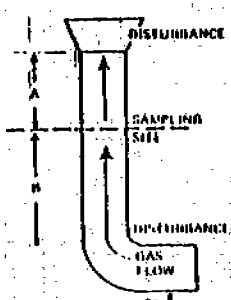
PARTICULATE FIELD DATA

SCHEMATIC OF STACK

Wt B2 (4,12)



CROSS SECTION

cp-.81
γ-1.001

PLANT US STEEL
DATE 2/2/80
LOCATION GARY IND.
OPERATOR TESSON/BROWNING
STACK NO. 1
RUN NO. #3 BHT/BLAST GAS
SAMPLE BOX NO. 6
METER BOX NO. 481

AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 30.93
ASSUMED MOISTURE, %
PROBE LENGTH, in.
NOZZLE DIAMETER, in. .387
STACK DIAMETER, in.
PROBE HEATER SETTING —
HEATER BOX SETTING —

METER NO. 1,219
C FACTOR 16.5/200 18.5/125
PROCESS WEIGHT RATE

WEIGHT OF PARTICULATE COLLECTED, mg

SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT	.5574	
WEIGHT GAIN		
TOTAL		

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	3.00	-.88	205	.08	.282	1.3		754.895	46	43	230	30	7	
2	1502		212	.08	.282	1.3		756.14	51	44	243	33	7	
3	1504		215	.07	.264	1.15		757.49	55	44	248	34	7	
4	1506		202	.08	.282	1.3		758.60	56	45	255	34	7	
5	1508		201	.08	.282	1.3		759.83	59	46	266	36	7	
6	1510		203	.07	.264	1.15		761.09	61	46	266	36	7	
7	1512		204	.065	.254	1.05		762.29	62	46	270	38	6	
8	1514		204	.03	.173	.49		763.44	61	45	275	38	4	
9	1516		206	.02	.141	.36		764.25	60	49	277	35	4	
10	1518		207	.02	.141	.36		764.99	61	50	295	33	4	
11	1520		206	.03	.173	.49		765.59	64	51	254	34	4	
12	1522		190	.02	.141	.36		766.80	68	52	274	33	4	
TOTAL														
AVERAGE			2455		2.679	10.61			700	561				

	VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL		665.9	678.9		429.5	650.6
INITIAL		648.8	659.1		425.9	635.6
LIQUID COLLECTED		17.1	19.8		3.6	15.0

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1		4.7	12.0		
2					
3					
4					

COMMENTS: 4 PORTS 12 PTS/PORT
2 MIN/PTS

0165

68

PARTICULATE FIELD DATA

PLANT U 76 AMBIENT TEMPERATURE BAROMETRIC PRESSURE 1,224

DATE 2/2/80

LOCATION

OPERATOR TFS

STACK NO. 1

RUN NO. #3 PART/BLAST GAS

SAMPLE BOX NO. 6

METER BOX NO. 491

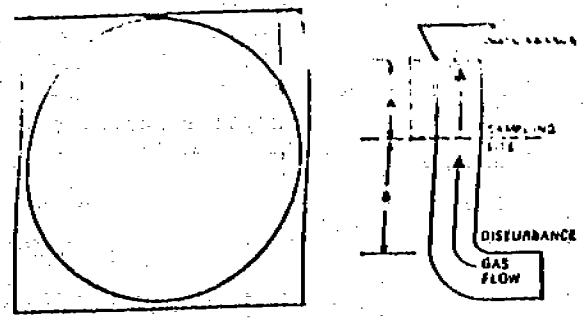
NOZZLE DIAMETER

STACK DIAMETER, in.

PROBE HEATER SETTING —

HEATER BOX SETTING —

SCHEMATIC OF STACK



CROSS SECTION

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{IN}}$), °F	OUTLET ($T_{m_{OUT}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	15 20		205	.06	.244	.99		767.08	56	55	220	28	6	
2	15 22		205	.06	.244	.99		768.23	61	55	220	30	6	
3	15 24		208	.055	.741	.90		769.32	65	54	235	30	6	
4	36		210	.055	.741	.90		770.48	66	56	241	29	6	
5	38		212	.07	.264	1.15		771.44	69	55	243	30	7	
6	40		213	.06	.244	.99		772.59	70	56	245	30	6	
7	42		213	.07	.264	1.15		773.70	72	56	240	31	7	
8	44		214	.06	.244	.99		774.88	73	57	248	31	6	
9	46		215	.06	.244	.99		775.01	73	57	250	30	6	
10	48		216	.05	.244	.99		777.125	74	58	250	29	6	
11	50		216	.04	.223	1	.82	778.215	75	58	251	29	5	
12	52		214	.04	.20	.66		779.28	75	60	252	27	4	
TOTAL														
AVERAGE			2501		3.897	11.52			829	676				

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

COMMENTS:

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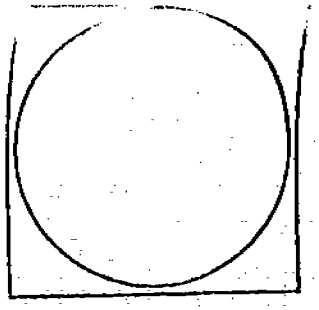
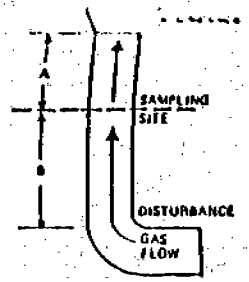


CROSS SECTION



LOCATION

OPERATOR TESS BROWN

STACK NO. 1

RUN NO. #3 PART/BLAST GAS

SAMPLE BOX NO. 6

METER BOX NO. 481

PROBE LENGTH, in.

NOZZLE DIAMETER, in. .387

STACK DIAMETER, in.

PROBE HEATER SETTING —

HEATER BOX SETTING —

SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{IN}}$), °F	OUTLET ($T_{m_{OUT}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	1:00		198	.040	.20	.66		780.19	58	56	267	23	6	
2	02		203	.055	.187	.57		781.12	63	59	274	28	5	
3	04		206	.045	.212	.74		781.99	65	59	277	29	5.5	
4	06		208	.05	.223	.82		782.94	69	59	279	30	6	
5	08		209	.05	.223	.82		783.97	69	60	275	31	6	
6	10		211	.06	.244	.99		785.00	71	59	275	33	6.5	
7	12		212	.06	.244	.99		786.10	71	59	280	33	6.5	
8	14		198	.055	.234	.90		787.21	72	60	280	34	5.5	
9	16		200	.07	.264	1.15		788.28	73	61	279	35	7	
10	18		205	.07	.264	1.15		789.47	75	60	280	37	7.5	
11	20		204	.06	.244	.99		790.70	75	61	279	38	7	
12	22		145	.05	.223	.82		791.82	75	62	280	35	5.5	
								792.86						
TOTAL														
AVERAGE			2419		(.762)	10.61			636	715				

	VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
STATE	FINAL					
	INITIAL					
	LIQUID COLLECTED					
	TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

COMMENTS:

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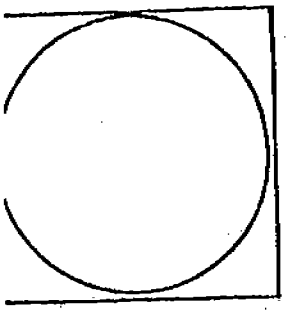
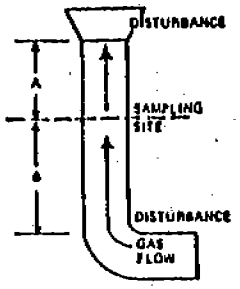
PARTICULATE FIELD DATA

419

SCHEMATIC OF STACK





CROSS SECTION

PLANT DS TTL

DATE 2/2/80

LOCATION GARY IND.

OPERATOR JESS BROWN

STACK NO. 1

RUN NO. #3 PART/BLAST FURN

SAMPLE BOX NO. 6

METER BOX NO. 481

AMBIENT TEMPERATURE

BAROMETRIC PRESSURE 30.03

ASSUMED MOISTURE, %

PROBE LENGTH, in.

NOZZLE DIAMETER, in. .387

STACK DIAMETER, in.

PROBE HEATER SETTING —

HEATER BOX SETTING —

PITOT TUBE COEFFICIENT

C FACTOR 16.5/200/1826/125

PROCESS WEIGHT RATE

WEIGHT OF PARTICULATE COLLECTED, mg		
SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft^3	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{IN}}$), °F	OUTLET ($T_{m_{OUT}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1	16 32		209	.07	.264	1.15		792.859	56	58	230	28	7	
2	16 32		213	.07	.264	1.15		794.100	61	59	296	32	7	
3	39		206	.08	.282	1.30		795.315	65	57	287	34	8	
4	26		200	.08	.282	1.3		796.56	67	57	231	32	8	
5	36		204	.075	.273	1.23		797.82	68	57	220	31	7	
6	40		204	.07	.264	1.15		799.075	69	57	233	30	7	
7	42		207	.08	.282	1.30		800.276	70	57	232	29	7.5	
8	44		208	.075	.273	1.23		801.525	70	57	232	28	7.0	
9	46		208	.075	.273	1.23		802.77	71	57	233	26	7.0	
10	46		208	.065	.009	1.08		804.04	71	58	226	25	8	
11	36		162	.06	.244	0.99		805.25	71	58	225	124	0	
12	32		109	.02	.1414	.37		806.40	67	58	230	21	3	
								2.276						
TOTAL														
AVERAGE			2343		2.8464	13.48		52.266	66.0	670				

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL					
INITIAL					
LIQUID COLLECTED					
TOTAL VOLUME COLLECTED					

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

COMMENTS:

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(312) 766-2012

71

stack # 1

moisture

Isokinetic Field Calculations

.387

Ts (°R)	665	Vm (FT^3)	21.39	δ (DGMCF)	1.001	CO_2	DECIMAL FRACTION
Tm (°R)	511.08	Vw (FT^3)	12.0	Cp (PITOT)	.84	O_2	
ΔPs ("H_2O)	12.0	Pb ("Hg)	30.04	θ (MIN)	30	CO	
ΔHm ("H_2O)	1.72	$(\Delta P)^{1/2}$		An (FT^2)		N_2	

$Vw_{std} (.04707)(12.0) = .56$

$An = \left(\frac{dn}{2*12}\right)^2 \pi = \left(\frac{.387}{24}\right)^2 \pi = .0008168$

Pm = ΔH/13.6 + Pb = (1.72)/13.6 + Pb = 30.166

Ps = ΔPs/13.6 + Pb = (12.0)/13.6 + Pb = 30.922

Vm_{std} = (17.64) (δ) (Vm) (Pm)/Tm = (17.64) (1.001) (21.39) (30.166) / (511.08) = 22.25

$\%H_2O = Vw_{std} / (Vm_{std} + Vw_{std}) = [(.56)/(22.29 + (.56)] *100 = 2.45$

DGF = 1 − $\%H_2O$/100 = 1−(2.45)/100 = _____

Mw = (44) (CO_2) (DGF) + (28) (CO) (DGF) + (28) (N_2) (DGF) + (18) ($\%H_2O$/100) = _____

(44) ( ) ( ) + (32) ( ) ( ) + (28) ( ) ( ) + (28) ( ) ( )
+ (18) ($\%H_2O$/100) = _____

$Vs = (85.49) (Cp) (\Delta P)^{1/2} \left[\frac{Ts}{Mw\ Ps}\right]^{1/2} = (85.49) (\quad)(\quad) \left[\frac{(\quad)}{(\quad)\cdot(\quad)}\right]^{1/2} =$ _____

$\%I = \frac{(0.0945) (Vm_{std}) (Ts)}{(Ps) (Vs) (An) (\theta) (DGF)} = \frac{(0.0945) (\quad)(\quad)}{(\quad)(\quad)(\quad)(\quad)(\quad)} =$ _____

- cp = 0.81
- Ts = 205
- Tm = 51.08
- Pm = 30.166
- Ps = 30.922
- Rwc = .364
- ΔP = .069
- Bws = 2.45

511108

PITOT TUBE CALIBRATION

Pitot Tube Number Probe Extension CPst .99

Date 1-29-80 Calibrated By Kirk Meyer

	Standard Type Pitot P in H_2O	"S" Type Pitot P in H_2O A	B	Cps
1.	1.4	2.0	2.0	.828
2.	.56	.78	.78	.839
3.	.87	1.2	1.25	.834
4.	1.1	1.6	1.6	.821
5.	1.2	1.75	1.72	.823
6.	.29	.43	.45	.804
7.	.39	.56	.57	.823
8.	.45	.70	.67 ~~.65~~	.802
9.	.10	.16	.16	.783
10.	.19	.29	.29	.801
11.	.05	.08	.08	.783

$$CP_s = CP_{st} \left(\Delta P_{st} / \Delta P_{"s"}\right)^{1/2}$$

$$CP = \frac{\Sigma CPi}{N} = .81$$

511109

51

Isokinetic Field Calculations

Ts (°R) 655.545	Vm _____	δ 1.001	CO_2 _____
Tm (°R) 511.09	Vw _____	Cp _____	O_2 _____
Ps ("Hg) _____	Pb _____	θ _____	CO _____
Pm ("Hg) _____ 29.945	$(\Delta P)^{\frac{1}{2}}$ _____	An _____	N_2 _____

$Vm_{std} = (17.64)(\delta)(Vm)(Pm)/Tm = (17.64)(\quad)(\quad)(\quad)/(\quad) =$ _____ 22.159

$Vw_{std} = (0.04707)(Vw) = (0.04707)(\quad) =$ .564

$\%H_2O = Vw_{std} / Vm_{std} + Vw_{std} = (\quad) / (\quad) + (\quad) =$ _____ 2.482

$DGF = 1 - \%H_2O = 1 - (\quad) =$ _____ .975

$Mw = [(44)(CO_2)(DGF) + (32)(O_2)(DGF) + (28)(CO)(DGF) + (28)(N_2)(DGF) + (18)(\%H_2O)] =$
$[(44)(\quad)(\quad) + (32)(\quad)(\quad) + (28)(\quad)(\quad) + (28)(\quad)(\quad) +$
$(18)(\quad)] =$ _____

$$Vs = (85.49)(Cp)(\Delta P)^{\frac{1}{2}}\left[\frac{Ts}{Mw\ Ps}\right]^{\frac{1}{2}} = (85.49)(\quad)(\quad)^{\frac{1}{2}}\left[\frac{(\quad)}{(\quad)(\quad)}\right]^{\frac{1}{2}} = \text{_____}$$

$$\%I = \frac{(0.0945)(Vm_{std})(Ts)}{(Ps)(Vs)(An)(\theta)(DGF)} = \frac{(0.0945)(\quad)(\quad)}{(\quad)(\quad)(\quad)(\quad)(\quad)} = \text{_____}$$

.508
.148

22.723

Isokinetic Field Calculations Particulate #1 run

(R)	652.3 (192°F)	Vm	57.15	δ	1.001	CO_2	
(R)	531.80 (71.80°F)	Vw	(33.8)	Cp	0.81	O_2	
("Hg)	29.991	Pb	30.05"	θ	96 min	CO	
("Hg)	30.131 $\frac{\Delta H}{13.6} + P_b$	$(\Delta P)^{\frac{1}{2}}$	.258	An	.0008168 6714	N_2	

$V_{m_{std}}$ = (17.64)(δ)(Vm)(Ps)/Ts = (17.64)(1.001)(57.15)(30.131)/(531.80) = 57.176

$V_{w_{std}}$ = (0.04707)(Vw) = (0.04707)(33.8) = 1.59096

$\%H_2O$ = Vw_{std} / Vm_{std} + Vw_{std} = (1.590) / (57.176) + (1.590) = .0270 % x100 = 2.7

DGF = 1 - $\%H_2O$ = 1 - (.027) = .973

Mw = [(44)(CO_2)(DGF) + (32)(O_2)(DGF) + (28)(CO)(DGF) + (28)(N_2)(DGF) + (18)($\%H_2O$)] =
[(44)( )( ) + (32)( )( ) + (28)( )( ) + (28)( )( ) +
(18)( )] = 28

$$Vs = (85.49)(Cp)(\Delta P)^{\frac{1}{2}}\left[\frac{Ts}{Mw\ Ps}\right]^{\frac{1}{2}} = (85.49)(0.81)(.258)\left[\frac{(652.3)}{(28)(29.99)}\right]^{\frac{1}{2}} = 15.769298 \text{ @ } 28$$

14.96 @ 31

$$\left(17.8657\right)\left[\frac{652.3}{837.2}\right]^{\frac{1}{2}} = 16.340 \text{ @ } 26$$

$$ZI = \frac{(0.0945)(Vm_{std})(Ts)}{(Ps)(Vs)(An)(\Theta)(DGF)} = \frac{(0.0945)(57.176)(652.3)}{(29.99)(15.769)(.0008168)(96)(.973)} = \frac{3524.46}{36.08} = 97$$

An =

= 9768 @ 28

511111

RK #1 / 2UN1 STATIC -.79

Isokinetic Field Calculations

NOZZLE .387
ΔH 1.774

Ts (°R)	652.3	Vm	57.15	δ	1.001	CO_2	
Tm (°R)	531.8	Vw	33.8	Cp	.81	O_2	
Ps ("Hg)	29.99	Pb	30.05	θ	96 min	CO	
Pm ("Hg)	30.10	$(\Delta P)^{\frac{1}{2}}$	.2577	An	.000816	N_2	28

$Vm_{std} = (17.64)(\delta)(Vm)(Pm)/Tm = (17.64)(1.001)(57.15)(30.10)/(531.8) = 57.117$

$Vw_{std} = (0.04707)(Vw) = (0.04707)(33.8) = 1.59$

$\%H_2O = Vw_{std} / Vm_{std} + Vw_{std} = (1.59) / (57.117) + (1.59) = 2.7$

$DGF = 1 - \%H_2O = 1 - (.027) = .973$

$Mw = [(44)(CO_2)(DGF) + (32)(O_2)(DGF) + (28)(CO)(DGF) + (28)(N_2)(DGF) + (18)(\%H_2O)] =$
$[(44)(\quad)(\quad) + (32)(\quad)(\quad) + (28)(\quad)(\quad) + (28)(\quad)(\quad) +$
$(18)(\quad)] = 28.0$ "26"

$Vs = (85.49)(Cp)(\Delta P)^{\frac{1}{2}}\left[\frac{Ts}{Mw\ Ps}\right]^{\frac{1}{2}} = (85.49)(.81)(.2577)\left[\frac{(652.3)}{(28)(29.99)}\right]^{\frac{1}{2}} = 15.728$ "26" "32" "16.329" "14.71"

$\%I = \frac{(0.0945)(Vm_{std})(Ts)}{(Ps)(Vs)(An)(\Theta)(DGF)} = \frac{(0.0945)(57.117)(652.3)}{(29.99)(15.728)(.000816)(96)(.973)} = 97.93$ "16.329" "14.71" "94.32" "104.70"

511112

STACK MOISTURE %

Isokinetic Field Calculations

DH 1.774

Ts (°R)	665 (659)	Vm	52.65	δ	1.001	CO_2	4.7
Tm (°R)	520 (529)	Vw	30.6	Cp	.84 .81	O_2	18.5
Ps ("Hg)	29.98 (30.36)	Pb	30.43	θ	90	CO	—
Pm ("Hg)	30.19 (30.47)	$(\Delta P)^{\frac{1}{2}}$	.2376	An	.000816	N_2	0.768

$Vm_{std} = (17.64)(\delta)(Vm)(Pm)/Tm = (17.64)(1.001)(52.65)(30.19)/(520) = 21.928$ (53.68)

$Vw_{std} = (0.04707)(Vw) = (0.04707)(30.6) = 1.44$ .387

$\%H_2O = Vw_{std} / Vm_{std} + Vw_{std} = (1.44) / (21.928) + (1.44) = 6.2$

$DGF = 1 - \%H_2O = 1 - (\quad) = .974$ 55.12

$Mw = [(44)(CO_2)(DGF) + (32)(O_2)(DGF) + (28)(CO)(DGF) + (28)(N_2)(DGF) + (18)(\%H_2O)] =$
$[(44)(.047)(.974) + (32)(.185)(.974) + (28)(.768)(.974) + (28)(\quad)(\quad) +$
$(18)(.062)] =$ 2.014 + 5.76 + 20.94 + 0.468

29.182

$Vs = (85.49)(Cp)(\Delta P)^{\frac{1}{2}}\left[\frac{Ts}{Mw\ Ps}\right]^{\frac{1}{2}} = (85.49)(.81)(.2376)\left[\frac{(659)}{(29.18)(30.36)}\right]^{\frac{1}{2}} = 14.9$

58.707

$\%I = \frac{(0.0945)(Vm_{std})(Ts)}{(Ps)(Vs)(An)(\theta)(DGF)} = \frac{(0.0945)(53.68)(659)}{(30.36)(14.9)(.000816)(96)(.974)} = 101.7$

79

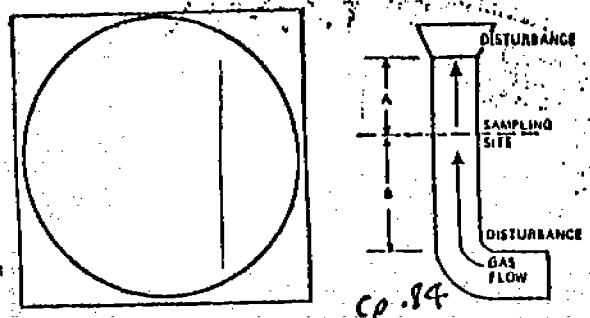
3520.826 / 35.952

839.72

511113

PARTICULATE FIELD DATA

SCHEMATIC OF STACK



CROSS SECTION

Cp .84
PFM 1.001

PLANT US STEEL
DATE 1/29/80
LOCATION GARY INDIANA
OPERATOR BROWN.101/TOSS.O/JOHN
STACK NO. #1
RUN NO. MOISTURE
SAMPLE BOX NO. #1
METER BOX NO. 481 N

AMBIENT TEMPERATURE 12
BAROMETRIC PRESSURE 30.04
ASSUMED MOISTURE, %
PROBE LENGTH, in. 120"
NOZZLE DIAMETER, in.
STACK DIAMETER, in. 211.25
PROBE HEATER SETTING —
HEATER BOX SETTING —

METER $\Delta H_@$ 1.573
C FACTOR
PROCESS WEIGHT RATE

WEIGHT OF PARTICULATE COLLECTED, mg		
SAMPLE	FILTER	PROBE WASH
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min (1/min)	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s) ($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (Vm), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{IN}}$), °F	OUTLET ($T_{m_{OUT}}$), °F	SAMPLE BOX TEMPERATURE °F	TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY fps
1		-.85	200	[illegible]	2.1	-.556	575.165	41	46	252	6		
2			200	.08	2.0	1.414		52	44	241	6		
3			208	.08	"	1.414	581.61	57	43	249			
4			210	.055	"			61	44	248			
5			212	.05	"			64	46	251			
6			200	.055	"			67	48	255	6		
			199				596.55						
			205	.06	1.768	1.291		51.08					
					1.72		21.39						
7			199	.05									
8			198	.06									
9			195	.06									
10			194	.05									
11													
12			195.55										
TOTAL													
AVERAGE			204.8		1.72		21.385	51.08					

VOLUME OF LIQUID WATER COLLECTED	IMPINGER VOLUME, ml 1	2	3	4	SILICA GEL WEIGHT, g
FINAL	771.3	753.1	427.8		650.9
INITIAL	692.0	755.0	426.4		647.7
LIQUID COLLECTED	9.3	-1.9	1.4		3.2
TOTAL VOLUME COLLECTED					12.0

ORSAT MEASUREMENT	TIME	CO_2	O_2	CO	N_2
1					
2					
3					
4					

COMMENTS: static -.85

.36

0164

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EPA - O.K
3 PT
or CALIB (AS MARKED)

PITOT TUBE CALIBRATION

Pitot Tube Number Probe Extension CPst .99

Date 1-29-80 Calibrated By Kirk Meyer

	Standard Type Pitot P in H_2O		"S" Type Pitot P in H_2O A	B	Cps
	1.4		2.0	2.0	.828
	.56		.78	.78	.839
3.	.87		1.2	1.25	.834
4.	1.1		1.6	1.6	.821
5.	1.2		1.75	1.72	.823
6.	.29		.43	.45	.804
7.	.39		.56	.57	.823
8.	.45		.70	.67 ~~.65~~	.802
9.	.10	*	.16	.16	.783
10.	.19	*	.29	.29	.801
11.	.05	*	.08	.08	.783

$CP_s = CP_{st} \ (\Delta P_{st} / \Delta P_{"s"})^{1/2}$

511115

PITOT TUBE CALIBRATION

Pitot Tube Number Probe Extension CPst 0.99

Date 1-30-79 Calibrated By Kirk Meyer

Standard Type Pitot P in H_2O	"S" Type Pitot P in H_2O A	B	Cps
1.1	1.6	1.65	.815
.78	1.2	1.25	.790
.96	1.42	1.4	.817
.46	.66	.65	.830
.69	.98	.99	.829
.53	.75	.73	.838
.33	.53	.51	.789
.24 *	.34	.34	.832
.14 *	.19	.19	.850
.08	.12	.13	.792
.87	1.3	1.3	.810

$$CP_s = CP_{st} \left(\Delta P_{st} / \Delta P_{"s"}\right)^{1/2}$$

$$CP = \frac{\Sigma CPi}{N} = .82$$

511116

Date: 9-20-79

Box No. 481N

Barometric Pressure, Pb = 29.73 in. Hg

Orifice Manomer Setting ΔH In. H_2O	Gas Volume Wet Test Meter Vw, ft^3 (Int)	Gas Volume Dry Gas Meter Vd, ft^3 (Final)	WET TEST Wet Test Meter °F TW	DRY GAS METER Inlet tdi °F (Int)	Inlet tdi °F (Final)	Outlet tdo °F (Int)	Outlet tdo °F (Final)	Average Td, °F	Time O; Min.	Y	ΔH@
0.5	5	586.83 / 581.36	70.5	127	130	115	120	123	11.92	1.003	1.463
0.8	5	580.27 / 574.835	70.5	124	128	110	115	119.25	10.35	1.003	1.77[illegible]
1.0	5	541.97 / 536.95	70.5	70	90	77	73	77.5	8.83	1.007	1.741
1.5	7	550.175 / 542.98	70.5	89	108	78	84	89.75	10.60	1.004	1.877
2.0	10	541.815 / 551.22	70.5	107	123	87	97	103.50	13.42	.998	1.918
3.0	10	573.75 / 562.885	70.5	121	135	100	110	116.50	10.93	.993	1.867
									Average	1.001	1.774

CALCULATIONS

H	ΔH / 13.6	Y: vw Pb (td + 460) / vd [Pb + (ΔH ÷ 13.6)]	ΔH@: 0.0317 ΔH / Pb(td + 460) [(tw + 460) θ / vw]²
5	0.0368		
8	0.0588		
0	0.0737		
5	0.110		
0	0.147		
0	0.221		

Ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01

[illegible] differential [illegible] 0.75 [illegible] at 70°F and 29.92 in. of mercury. To H20 Tolerance = ± 0.15

81

Date: 9-18-79

Box No. 479N

Barometric Pressure, Pb = 30.05 in. Hg

Orifice Manomer Setting ΔH In. H_2O	Gas Volume Wet Test Meter Vw, ft3 (Int)	Gas Volume Dry Gas Meter Vd, ft3 (Final)	WET TEST Wet Test Meter °F TW	DRY GAS METER Inlet tdi °F (Int)	Inlet tdi °F (Final)	Outlet tdo °F °F (Int)	Outlet tdo °F. (Final)	Average Td, °F	Time θ, Min.	Y	ΔH@
0.5	5	175.795 / 170.56	71.5	100	100	94	95	97.25	13.17	1.000	1.855
0.8	5	169.515 / 164.245	71.0	101	103	94	95	98.5	10.60	.996	1.915
1.0	5	132.355 / 127.175	70.0	86	84	93	85	87	9.45	.994	1.935
1.5	5	138.63 / 133.40	70.5	92	99	87	88	91.5	7.83	.990	1.980
2.0	10	150.23 / 139.68	70.5	95	105	88	91	94.75	13.70	.986	2.009
3.0	10	163.185 / 152.292	71.0	102	109	92	94	99.5	11.32	.982	2.044
									Average	.991	1.956

CALCULATIONS

	$\frac{\Delta H}{13.6}$	Y $\frac{vw\ Pb\ (td + 460)}{vd\ [Pb + (\Delta H \div 13.6)](tw+460)}$	ΔH@ $\frac{0.0317\ \Delta H}{Pb(td + 460)} \left[\frac{(tw + 460)\ \theta}{vw}\right]^2$
6	0.0368		
0	0.0580		
0	0.0737		
5	0.110		
0	0.147		
0	0.221		

Y = Ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01

ΔH@ = Orifice differential at flow of 0.75 cfm of air at 70°F and 29.92 In. of mercury, In H2O Tolerance = ± 0.15

Date: 2-25-80 Box No. 479N

Barometric Pressure, Pb = 30.31 in. Hg

Orifice Manomer Setting ΔH In. H_2O	Gas Volume Wet Test Meter Vw, ft^3 (Int)	Gas Volume Dry Gas Meter Vd, ft^3 (Final)	WET TEST: Wet Test Meter °F TW	DRY GAS METER: Inlet tdi °F (Int)	Inlet tdi °F (Final)	Outlet tdo °F (Int)	Outlet tdo °F (Final)	Average Td, °F	Time of Min.	Y	ΔH@
0.5	5	866.18 / 871.29	67.5	87	82	90	84	85.75	14.33	1.011	2.19
0.0	5	900.28 / 905.42	68.5	95	89	87	94	91.25	10.41	1.012	1.837
1.0	5	853.91 / 859.03	67	84	79	91	81	83.75	9.316	1.004	1.4544
1.5	5	840.55 / 845.72	67	95	85	92	87	89.75	7.65	1.003	1.4623
2.0	10	886.77 / 891.94	68.5	96	86	97	87	91.5	6.7	1.004	1.9022
3.0	10	906.47 / 911.67	68.5	97	87	101	87	93	5.56	.9988	1.959
									Average	1.0054	1.9341

CALCULATIONS

	$\frac{\Delta H}{13.6}$	Y: $\frac{vw\ Pb\ (td + 460)}{vd\ [Pb + (\Delta H \div 13.6)]}$	ΔH@: $\frac{0.0317\ \Delta H}{Pb(td + 460)} \left[\frac{(tw + 460)\ \theta}{vw}\right]^2$
5	0.0368		
1	0.0500		
0	0.0737		
5	0.110		
0	0.147		
0	0.221		

Ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01

Date: 9-19-79 Box No. 482N

Barometric Pressure, Pb = 30.01 in. Hg

Orifice Manomer Setting ΔH In. H_2O	Gas Volume Wet Test Meter Vw, ft^3 (Int)	Gas Volume Dry Gas Meter Vd, ft^3 (Final)	WET TEST Wet Test Meter °F TW	DRY GAS METER Inlet tdi °F (Int)	Inlet tdi °F (Final)	Outlet tdo °F °F (Int)	Outlet tdo °F. (Final)	Average Td, °F	Time θ, Min.	Y	ΔH@
0.5	5	319.015 / 313.885	70.5	88	91	84	85	87	14.37	1.001	2.245
0.8	5	306.665 / 301.58	70	81	88	79	79	81.75	10.87	1.003	2.071
1.0	5	259.325 / 254.280	67.5	73	80	69	70	73	9.83	.999	2.131
1.5	5	288.155 / 282.995	67	87	93	79	80	84.75	8.27	.998	2.210
2.0	10	299.55 / 289.195	67	87	97	79	81	86	14.58	.995	2.284
3.0	10	270.585 / 260.35	67.5	81	94	73	76	81	11.85	.995	2.289
									Average	.999	2.205

ALCULATIONS

	ΔH / 13.6	Y: $\frac{vw\ Pb\ (td + 460)}{vd\ [Pb + (\Delta H \div 13.6)]}$	ΔH@: $\frac{0.0317\ \Delta H}{Pb(td + 460)} \left[\frac{(tw + 460)\ \theta}{vw}\right]^2$
	0.0360		
	0.0500		
	0.0737		
	0.110		
	0.147		
	0.221		

Ratio of accuracy of wet test meter to dry test meter. Tolerance = + 0.01

Orifice pressure differential that gives 0.75 cfm of air at 70°F and 29.92 in. of mercury. In H20 Tolerance = + 0.15

Date: 2.28.00 Box No. 4621

Barometric Pressure, Pb = 30.12 in. Hg

Orifice Manomer Setting ΔH In. H_2O	Gas Volume Wet Test Meter Vw, ft^3 (Int)	Gas Volume Dry Gas Meter Vd ft^3 (Final)	WET TEST Wet Test Meter °F TW	DRY GAS METER Inlet tdi °F (Int)	Inlet tdi °F (Final)	Outlet tdo °F (Int)	Outlet tdo °F (Final)	Average Td, °F	Time θ, Min.	Y	ΔH@
0.5	5	782.97 / 777.86	68	78	86	93	82	84.75	13.5	1.0082	1.97
0.8	5	789.161 / 784.00	69	83	94	86	97	90	11.00	1.00454	2.07
1.0	5	796.432 / 791.23	70	98	87	87	99	92.75	9.75	1.0022	2.03
1.5	5	402.635 / 797.46	70.5	87	99	87	102	93.75	8.00	1.0048	2.05
2.0	10	409.91 / 804.70	70.5	87	100	103	88	94.5	6.833	.9982	1.9
3.0	10	417.22 / 812.0	71	87	104	89	104	97		1.0233	2.11
									Average	1.0068	2.0

CALCULATIONS

	ΔH / 13.6	Y = vw Pb (td + 460) / vd [Pb + (ΔH ÷ 13.6)](tw+460)	ΔH@ = 0.0317 ΔH / Pb(td + 460) · [(tw +460) θ / vw]²
	0.0360		
	0.0500		
	0.0737		
	0.110		
	0.147		
	0.221		

Ratio of accuracy of wet test meter to dry test meter. Tolerance = ± 0.01

Orifice pressure differential that gives 0.75 cfm of air at 70°F and 29.92 in. of mercury. In H20 Tolerance = ± 0.1

TABLE

GRAVIMETRIC ANALYSIS BREAKDOWN - FRONT CATCH
(ALL WEIGHTS ARE NET, CORRECTED FOR BLANKS)
BATTERY NUMBER ONE COKE OVEN GAS

TEST	FILTER	PROBE WASH	TOTAL FRONT
1	0.0183	0.0812	0.0995
2	0.0264	0.0310	0.0574
3	0.0222	0.0268	0.0490

Kemron Environmental Services

TABLE

GRAVIMETRIC ANALYSIS BREAKDOWN - TOTAL CATCH
(ALL WEIGHTS ARE NET, CORRECTED FOR BLANK)
BATTERY NUMBER ONE COKE OVEN GAS

TEST	TOTAL FRONT	- SULFATES	= TOTAL CATCH MINUS SULFATES
GAS STACK RUN # Coke Oven Gas			
1	0.0995	0 01451	0.0850
2	0.0574	0.01472	0.0427
3	0.04900	0.01842	0.0306

Smoke Evaluation Form
U.S. Steel Corp.
Gary Works

Facility: #1 Battery
Stack Test
Run #1
C.O.G.

Date: 2/1/80
U.S.S.C. Observer: Murphy
Inspecting Agency:

Observation Point: West of Stack

Distance from stack: 2 stacks
Stack Height:
Color of Emission:
Reading Conditions: Good
Observation Begun 3:10 Ended
Background:
Sky Condition: Sunny
Temperature: 15 Wind: N @ 10
Humidity:
Regulatory Personnel:

Comments:

Signature: R.K. Murphy

Color	0	15	30	45		0	15	30	45	Color
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	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	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	

SMOKE EVALUATION FORM
U.S. STEEL CORP.
GARY WORKS

FACILITY: #1 STACK
TEST
RUN #1

DATE: 2/1/80

U.S.S.C. OBSERVER: M. RAMY

INSPECTING AGENCY:

OBSERVATION POINT: (1) EAST OF STACK

DISTANCE FROM STACK: 250 YD

STACK HEIGHT:

COLOR OF EMISSION:

READING CONDITIONS: GOOD

OBSERVATION BEGAN 3:10 ENDED 3:10

BACKGROUND: SKY

SKY CONDITION: SUNNY

TEMPERATURE: 15 WIND: N @10

HUMIDITY:

REGULATORY PERSONNEL:

COMMENTS:

SIGNATURE: R. Y. Mull

COLOR	0	15	30	45		0	15	30	45	COLOR
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	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	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	

SMOKE EVALUATION FORM. SHEET 1

U. S. STEEL CORP.
GARY WORKS

90

FACILITY: #1 COKE BATTERY UNDERFIRE STACK

DATE: 2-2-80

U.S.S.C. OBSERVER: J. Pen

INSPECTING AGENCY:

C.O.G

OBSERVATION POINT: WEST OF STACK

DISTANCE FROM STACK: 150 yds

STACK HEIGHT:

COLOR OF EMISSION:

BACKGROUND: SKY

OBSERVATION BEGAN 10 35 ENDED 11 35

READING CONDITIONS: FAIR

SKY CONDITION: GRAY

TEMPERATURE: 19 WIND: N @ 3

HUMIDITY: 77%

REGULATORY PERSONNEL:

COMMENTS:

SIGNATURE: Jesse E. Pen

COLOR		0	15	30	45		0	15	30	45	COLOR
	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	
45	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	
45	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	
55	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	
55	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	0	0	0	
11:13	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	

511120

SMOKE EVALUATION FORM.
U.S. STEEL CORP.
GARY WORKS

SHEET

FACILITY: #1 COKE BATTERY UNDERFIRE STACK

DATE: 2-2-8

U.S.S.C. OBSERVER: J. Pen

INSPECTING AGENCY:

OBSERVATION POINT: WEST OF STACK

DISTANCE FROM STACK: 150 YDS

STACK HEIGHT:

COLOR OF EMISSION:

BACKGROUND: SKY

OBSERVATION BEGAN 11:35 ENDED 12:35

READING CONDITIONS: FAIR

SKY CONDITION: LIGHT GREY

TEMPERATURE: 15 WIND: N @ 3

HUMIDITY:

REGULATORY PERSONNEL:

COMMENTS:

SIGNATURE: Jean E. Pen

COLOR		0	15	30	45		0	15	30	45	CO
	0	0	0	0	0	30	0	5	5	5	W
	1	0	0	0	0	31	5	5	10	5	S
	2	0	0	0	0	32	5	5	5	5	
	3	0	0	0	0	33	5	5	5	5	
	4	0	0	0	0	34	5	5	10	10	
	5	0	0	0	0	35	10	10	10	10	
	6	0	0	0	0	36	10	10	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	0	1	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	10	10	10	10	W
	16	0	0	0	0	46	10	10	10	10	S
	17	0	0	0	0	47	10	0	0	0	
	18	0	0	0	0	48	0	0	0	0	
	19	0	0	0	0	49	0	0	0	0	
WHITE	20	20	20	20	20	50	0	0	0	0	
	21	20	20	20	20	51	0	0	0	0	
	22	20	20	20	20	52	0	0	0	0	
	23	20	20	20	20	53	0	0	0	0	
	24	20	20	20	20	54	10	10	10	10	W
	25	20	10	10	5	55	10	10	10	10	
	26	0	0	0	0	56	10	10	10	10	
	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	

511127

SMOKE EVALUATION FORM
U.S. STEEL CORP.
GARY WORKS

SHEET #1

FACILITY: #1 COKE BATTERY UNDERFIRE STACK

DATE: 2-2-80

U.S.S.C. OBSERVER: J. Pen

INSPECTING AGENCY:

C.O.G.

OBSERVATION POINT: WEST OF STACK

DISTANCE FROM STACK: 160 YDS

STACK HEIGHT:

COLOR OF EMISSION:

BACKGROUND: SKY

OBSERVATION BEGAN 3:00 ENDED 4:00

READING CONDITIONS: GOOD

SKY CONDITION: CLEAR

TEMPERATURE: 20 WIND: S.W @ 5/15

HUMIDITY:

REGULATORY PERSONNEL:

COMMENTS:

SIGNATURE: James E. Pen

COLOR		0	15	30	45		0	15	30	45	COL
	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	
15	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	
15	9	0	0	0	0	39	0	0	0	0	
	10	0	0	0	0	40	0	0	0	0	
WHITE	11	10	10	10	10	41	0	0	0	0	
	12	10	10	10	10	42	0	0	0	0	
	13	10	10	10	10	43	0	0	0	0	
15	14	10	10	10	10	44	0	5	5	5	
	15	10	10	10	10	45	5	5	5	5	
	16	10	5	5	5	46	5	5	5	5	
	17	5	5	5	5	47	5	5	5	5	
	18	5	5	5	5	48	5	5	5	5	
15	19	5	5	5	5	49	5	5	5	5	
	20	5	5	5	5	50	5	5	5	5	
	21	5	5	5	5	51	5	5	5	5	
	22	5	5	5	5	52	5	5	5	5	
	23	5	5	5	5	53	5	5	5	5	
45	24	5	5	5	5	54	5	5	5	5	
	25	5	5	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	
30	29	5	5	0	0	59	5	5	5	5	

511128

SMOKE EVALUATION FORM
U.S. STEEL CORP.
GARY WORKS

SHEET #2

FACILITY: #1 COKE BATTERY UNDERFIRE STACK

DATE: 2-2-8

U.S.S.C. OBSERVER: [illegible]

INSPECTING AGENCY:

OBSERVATION POINT: WEST OF STACK

DISTANCE FROM STACK: 150 yds

STACK HEIGHT:

COLOR OF EMISSION:

BACKGROUND: SKY

OBSERVATION BEGAN 400 ENDED 500

READING CONDITIONS: GOOD

SKY CONDITION: CLEAR

TEMPERATURE: 20 WIND: SW @ 5/10

HUMIDITY:

REGULATORY PERSONNEL:

COMMENTS:

SIGNATURE: [illegible]

COLOR		0	15	30	45		0	15	30	45	CO
	0	5	5	5	5	30	5	5	0	0	
	1	5	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	
65	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	
1:	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	
WHITE	12	0	0	5	5	42	0	0	0	0	
	13	5	5	5	5	43	0	0	0	0	
15	14	5	5	5	5	44	0	0	0	0	
	15	5	5	5	5	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	5	5	5	5	
	21	0	0	0	0	51	5	5	5	5	
	22	0	0	0	0	52	5	5	5	5	
WHITE	23	5	5	5	5	53	5	5	5	5	
3	24	5	5	5	5	54	5	5	5	5	
	25	5	5	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	

GARY COKE AND CHEMICALS DIVISION

DAILY COAL AND COKE
QUALITY REPORT

DATE SAMPLED: 2-1-8[illegible]
DATE REPORT ISSUED: 2-2-[illegible]

INCOMING COALS	3-DOCK TURN			11-7 TURN			DAILY AVERAGE		
	Alpheus	Corbin		Alpheus	Corbin		Alpheus	Corbin	
% Moisture	4.87	5.92		9.32	7.36		7.10	6.64	
% Ash	5.03	5.80		5.81	6.72		5.42	6.26	
% Volatile Matter	17.29	34.83		18.11	33.85		17.70	34.34	
% Sulfur							0.65	0.88	

BLENDED COAL	7P	7P	9P	5-11 Avg.	11P LA	11P LA	1A 3A	11-7 Avg.			DAILY AVG.
Bulk Density	46.6	48.9	44.7	46.7	45.1	44.1	46.6	45.3			46.0
% Moisture				7.50				7.33			7.42
% Ash				5.74				5.78			5.76
% Volatile Matter				28.05				27.48			27.77
% Sulfur											0.78
Oxidation Index											97.4
Pulverization % +1"											
" % +1/2"				0.4				0.3			0.4
" % +1/4"				5.8				5.7			5.8
" % -1/8"				75.5				76.2			75.9
" % -100 Mesh				11.9				13.9			12.9
% -200 Mesh				7.2				7.7			7.5

PULVERIZERS	X-1	X-3	X-5	Az 2	Az 1	Ab 5	Ab 3	Ab 1
Pulverization % +1"								
" % +1/2"								
" % +1/4"								
" % -1/8"								
" % -100 Mesh								

Coal as received	
Alpheus	Corbin
0.5	3.6
3.0	23.9
9.9	58.5
77.0	17.9
18.5	1.3

BLAST FURNACE COKE

SCREENING STATION	+3"	+2½"	+2"	+1½"	+1"	+3/4"	-3/4"	Stab.	Hard.	Moist	Ash	V.M.
2	7.8	14.9	30.7	60.2	91.0	94.1	5.9	64	72	15.5	8.00	0.40
3	5.0	12.7	26.2	47.7	86.7	92.3	7.7	60	73	7.1	8.76	0.37
5-6	2.8	9.7	28.0	59.2	88.5	97.5	2.5	53	70	9.0	8.11	0.43
5	4.6	13.0	36.0	62.6	94.3	96.5	3.5	5[illegible]	71	9.2	7.98	0.53
5	5.7	13.8	29.9	57.2	98.1	97.0	3.0	50	70	22.[illegible]	7.55	0.[illegible]
Avg.												

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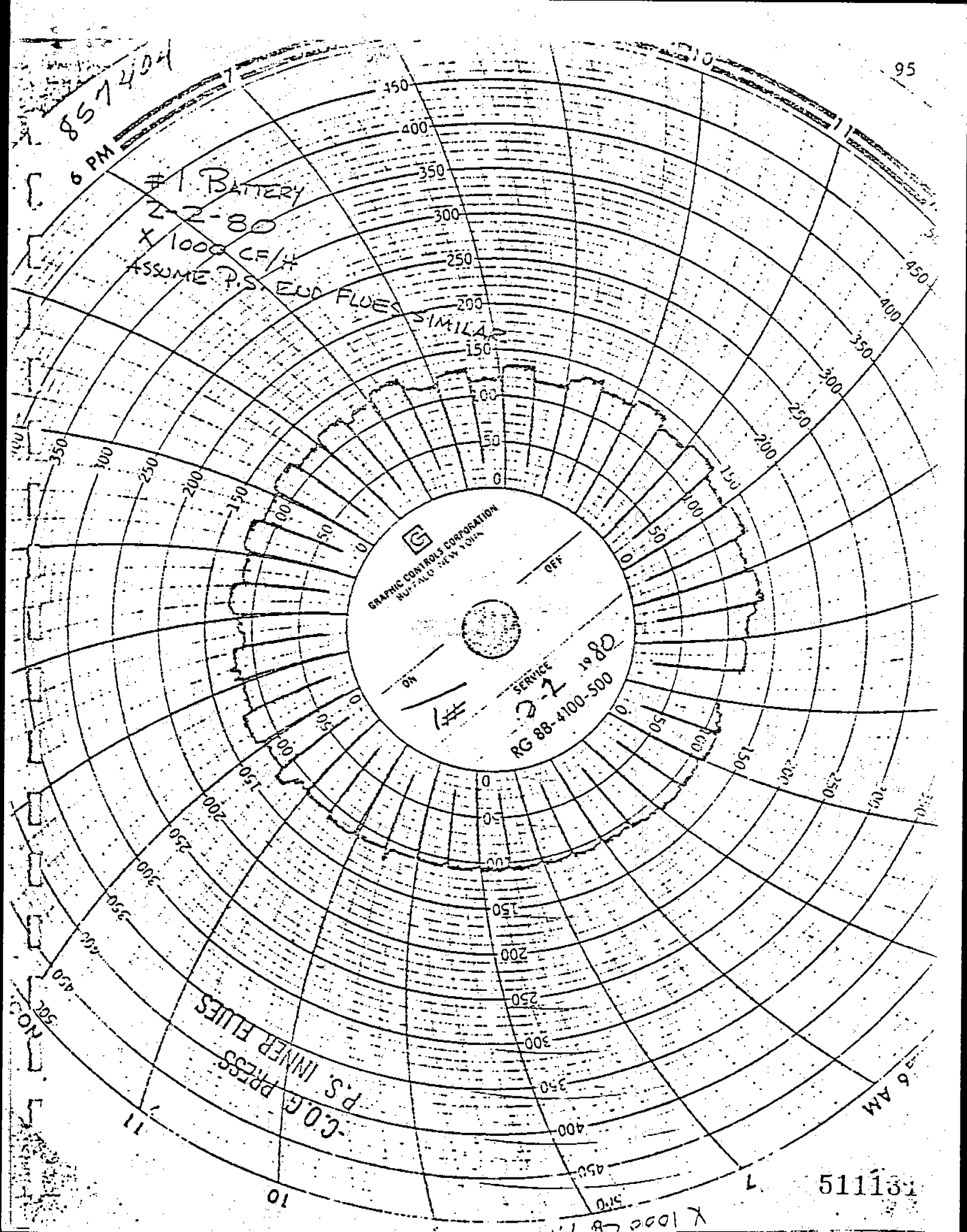
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#1 BATTERY
2-2-80
X 1000 CF/H
ASSUME P.S. EVP FLUES SIMILAR
GRAPHIC CONTROLS CORPORATION
BUFFALO NEW YORK
ON
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P.S. INNER FLUES
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X 1000 CF/H
C.O. & C.S. FLOW
INNER FLUE
#1 BATTERY
2-2-80
X1000 CF/H
ASSUME C.S. ELO FLUES SIMILAR
GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
ON
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SERVICE
RG 88-4100-500
2-2-80
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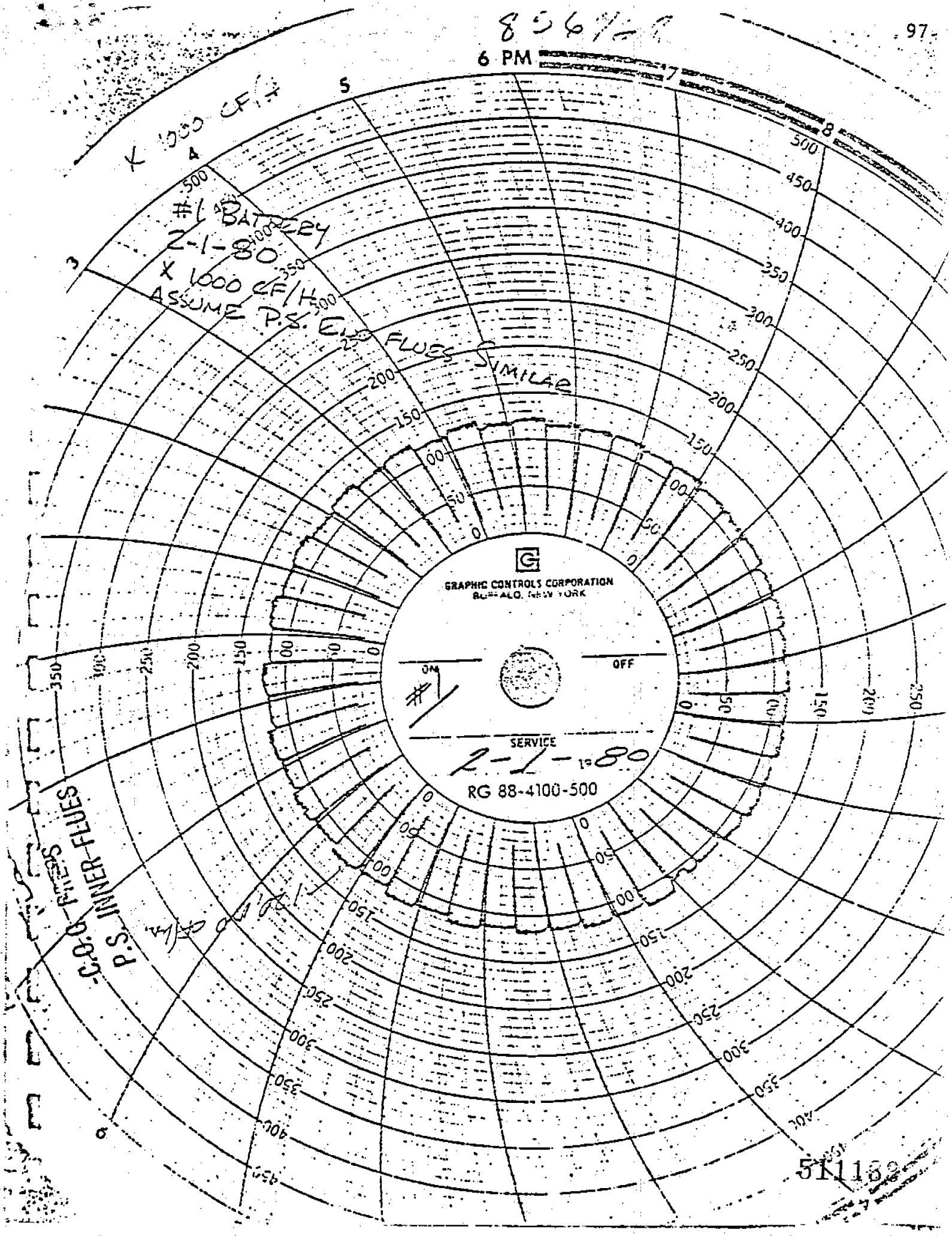
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GRAPHIC CONTROLS CORPORATION
BUFFALO, NEW YORK
ON
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2-1-80
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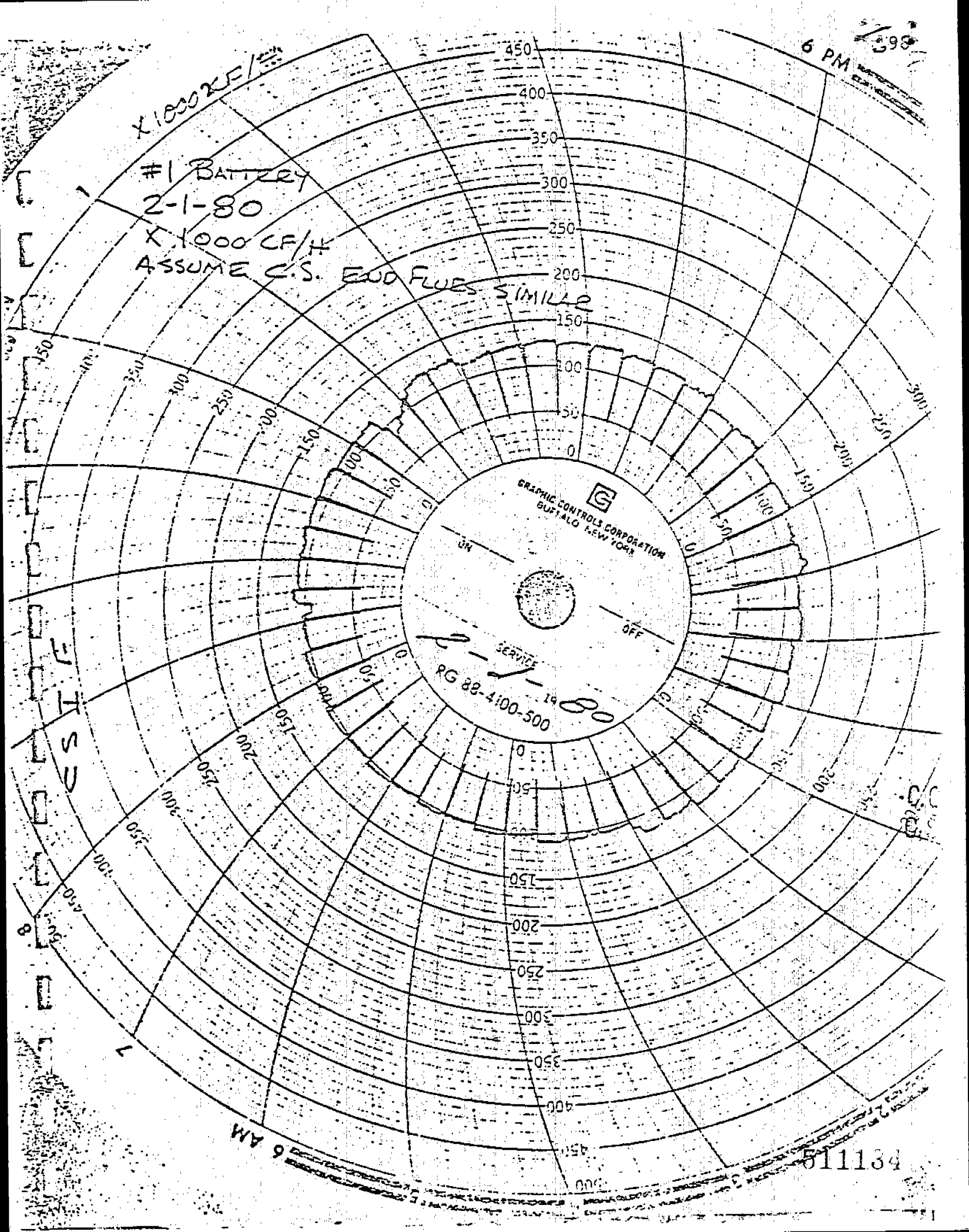
#1 BATTERY
2-1-80
X 1000 CF/H
ASSUME P.S. & C.O. FLUES SIMILAR
P.S. INNER FLUES
C.O. FLUES
511182


X 1000 CF/H
#1 BATTERY
2-1-80
X 1000 CF/H
ASSUME C.S. EQUO FLUES SIMILAR
6 PM
6 AM
GRAPHIC CONTROLS CORPORATION
BUFFALO NEW YORK
ON
OFF
SERVICE
RG 88-4100-500
2-1-80
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EMISSION TESTING

FOR

U. S.. STEEL

Equipment

Sampling Train: NAPP 21/Lear-Siegler PM100

Orsat Analyzer: Burrell Industro Gas Analyzer Model

The stack sampling system consists of two major units - the control unit and the sampling train unit, electrically and pneumatically connected by an umbilical cord. The sampling train unit can be broken down into three sub-units; (1) the probe with a heated pyrex liner, (2) the hot box assembly thermostatically controlled to maintained 250° F during the sampling, and (3) the cold box assembly to hold four 500 ml glass impingers in an ice bath.

The control unit contains gauges and meters to measure all parameters necessary for sampling calculations. A dry gas meter (recently calibrated to EPA specifications) is used to measure the volume of sample removed from the stack. A thermometer or thermocouple on the inlet and exit sides of the meter are

used to determine the meter temperature. A magnehelic gauge or inclined manometer is available on the control box for measuring velocity heads in inches of water from 0.0 - 10.0 inches. An inclined manometer is also available for lower velocity heads in the range of 0.0 - 0.5 inches of water. The amount of heat to the probe liner is controlled by an adjustment on the control box. The vacuum at the inlet to the dry gas meter is monitored by another gauge in inches of mercury. The stack temperature is monitored by an digital temperature indicator (0 - 2000° F) on the control box connected to the thermocouple on the probe by two chromel-alumel wires in the umbilical cord. The orifice pressure differential is indicated by another magnehelic or manometer (0 - 10 of H_2O).

The particulate-laden flue gas is vacuumed into the nozzle (stainless steel 316) at isokinetic conditions. It then passes through the heated pyrex liner (heated to prevent condensation of water vapor) into the hot box assembly. The hot box, maintained at 250 ° F, contains a 4" Type A glass fiber filter where the particulate is removed from the gas. The gas, after passing through the filter and into the cold box, is bubbled through a series

Kemron Corporation