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Title: _____

Plant and Location: Carpenter town Coal and Coke Co., Boggs
Township, PA

SCC: ~~30300306~~ 30300401

Test Date: 10/17/73

By Whom: PADER

AP-42 Section	<u>12.2</u>
Reference	_____
Report Sect.	<u>4</u>
Reference	<u>133</u>

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AIR & ENERGY ANALYSIS SECTION

MAR 25 1977

EPA, R3

CARPENTERTOWN COAL AND COKE COMPANY
BOGGS TOWNSHIP, ARMSTRONG COUNTY

PROCESS DESCRIPTION

The Carpentertown Coal and Coke Company, located in Boggs Township, Armstrong County, operates 268 beehive coke ovens arranged in a double-block system. Stack Test No. 1873 A and B was performed in the stack of four coke ovens equipped with sole-heated flues ducted to a common stack.

The beehive coke ovens are charged as soon as possible after the previous charge has been drawn in order that residual heat stored in the oven structure will be sufficient to start the coking process. The discharge door is partially bricked and the coal is charged from a larry car through a trunnel head located at the top of each oven. The coal, in a cone-shaped pile in the oven, is then leveled by machine to a uniform depth over the entire bottom of the oven to assure the uniform coking of the coal. The discharge door is then bricked closed leaving approximately a one inch opening around the rim of the door.

The coking process begins as soon as the leveling of the coal bed has been accomplished. The oven rapidly reaches the kindling point of the combustible gases and with the presence of air, ignites and continues to burn slowly. The coking process continues for 48 to 72 hours.

At the end of the coking process, the brickwork closing the discharge door is torn out and a watering device inside the ovens is activated to quench the coke. The coke is drawn from each oven by a Covington coke-drawing machine into coke cars and is then loaded into railroed cars for transportation to Sharon Steel, Sharon, Ohio for consumption in the company's blast furnaces.

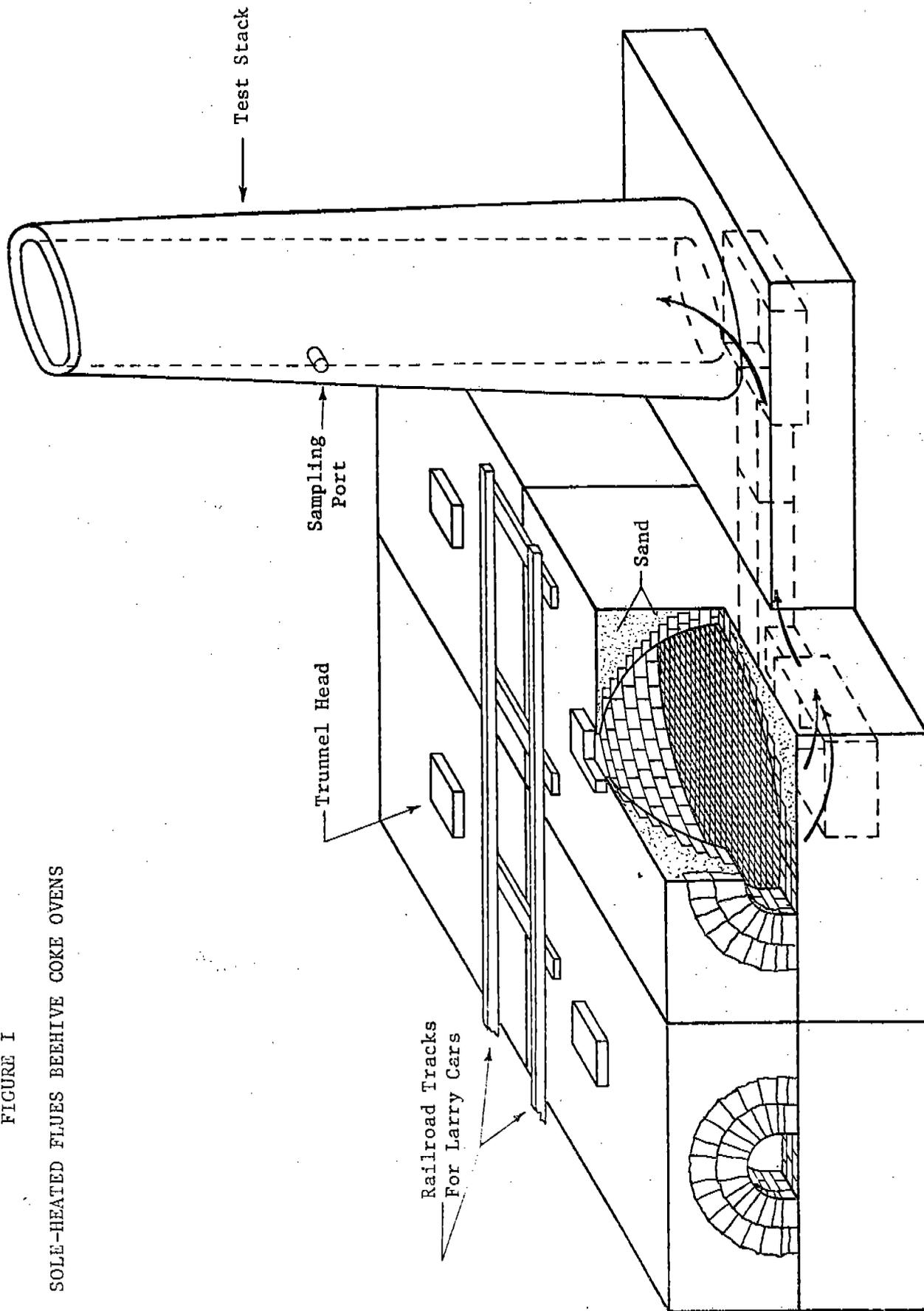
Combustion air for the ovens is principally supplied from the opening around the discharge door and through any cracks or holes in the structure of the ovens. The effluent is discharged from the ovens through checkerworks located at the floor of each oven and is then manifolded beneath the checkerwork to a common duct. The effluent is then discharged to the atmosphere through a three foot diameter stack having a discharge point of approximately 40 feet above grade.

A diagram of the coke ovens tested is shown in Figure I.

CARPENTERTOWN COAL AND COKE COMPANY
BOGGS TOWNSHIP, ARMSTRONG COUNTY

FIGURE I

SOLE-HEATED FLUES BEEHIVE COKE OVENS

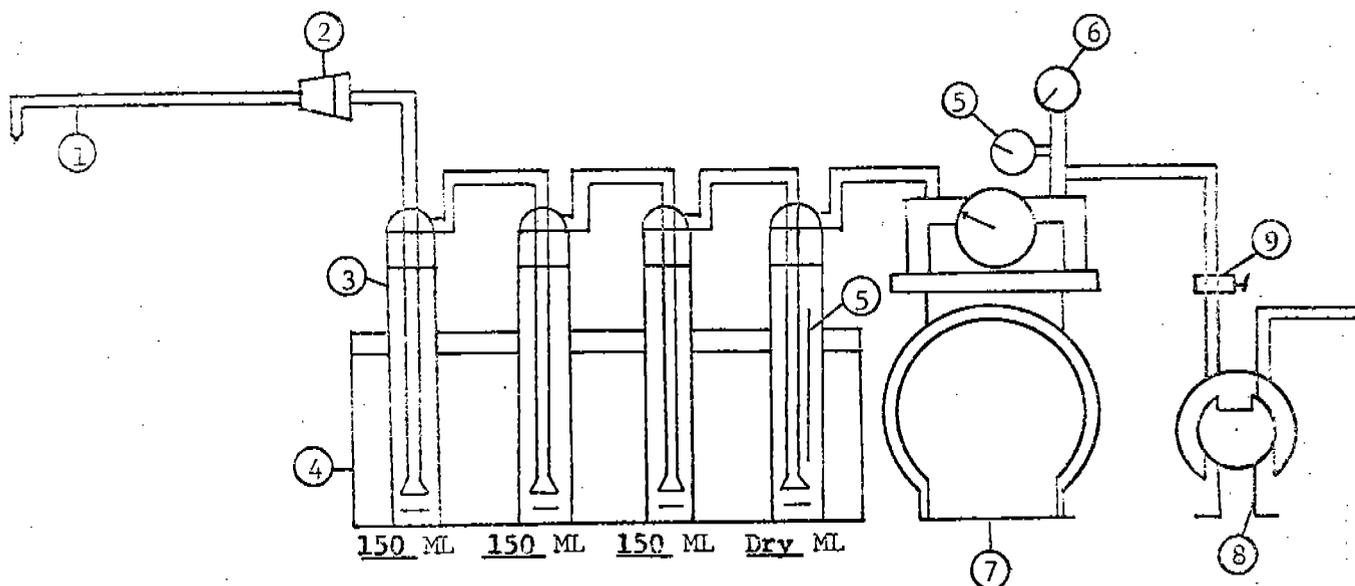


Coke Ovens

Test No. 1873A

SAMPLING APPARATUS

Date 10/17/73



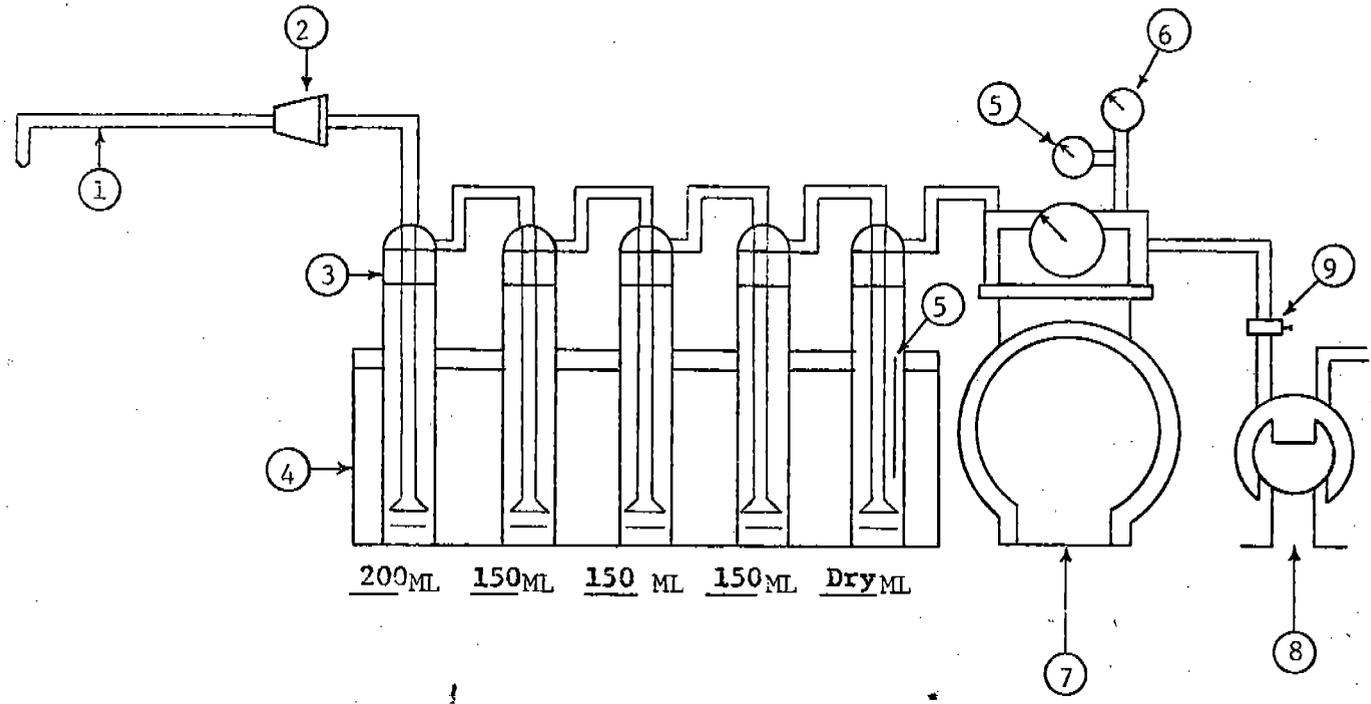
1. Sample Probe
2. Dry Filter 3" Dia. Glass Fiber Filter (In-Stack)
3. Impinger
4. Ice Bath Indicators
5. Temperature Indicators
6. Vacuum Gage
7. Dry Gas Meter
8. Vacuum Pump
9. Valves to Control Gas Flow Rate
10. Impinger Solution

Distilled Water

Test No. 1873B

SAMPLING APPARATUS

Date 10/17/73



1. Sample Probe
2. Dry Filter 4 inch Glass Fiber Filter
3. Impinger
4. Ice Bath Indicators
5. Temperature Indicators
6. Vacuum Gage
7. Dry Gas Meter
8. Vacuum Pump
9. Valves to Control Gas Flow Rate
10. Impinger Solution
5% NaOH

TEST NO. 1873 A & B

GAS VOLUME DATA

NAME OF FIRM

DATE

Carcentertown Coal and Coke Company, Boggs Township, Armstrong County

10/17/73

SAMPLE STATION

Sampling ports located in stack approximately 30 feet above grade.

TIME	POINT	V. H.	T OF.	VEL FT/SEC	TIME	POINT	V. H.	T OF.	VEL FT/SEC
2:15 P.M.	E-1	0.01	765	10.2	2:30 P.M.	S-1	0.02	775	14.5
	2	0.02	775	14.5		2	0.02	780	14.5
	3	0.02	760	14.4		3	0.02	780	14.5
	4	0.02	765	14.4		4	0.02	780	14.5
	5	0.02	775	14.5		5	0.02	780	14.5
	6	0.02	790	14.5		6	0.02	780	14.5
	6	0.02	780	14.5		6	0.02	780	14.5
	5	0.02	785	14.5		5	0.02	780	14.5
	4	0.02	785	14.5		4	0.02	780	14.5
	3	0.02	790	14.5		3	0.02	805	14.6
	2	0.02	795	14.5		2	0.02	810	14.7
	1	0.01	765	10.2		1	0.02	775	14.5
	1	0.01	765	10.2		1	0.02	775	14.5
	2	0.02	785	14.5		2	0.02	860	14.6
	3	0.02	785	14.5		3	0.02	860	14.6
	4	0.02	780	14.5		4	0.02	860	14.6
	5	0.02	780	14.5		5	0.02	860	14.6
	6	0.02	780	14.5		6	0.02	860	14.6

P_{static} = Negligible

P_{barometric} = 29.27 In. Hg.

TRAVERSE VELOCITY 14.1 FT./SEC.

REFERENCE POINT VELOCITY _____ FT./SEC.

FLUE FACTOR (TRAVERSE/REF. PT.) _____

PITOT CORRECTION FACTOR 0.81

GAS DENSITY CORRECTION FACTOR _____

CORRECTED TRAVERSE VELOCITY -

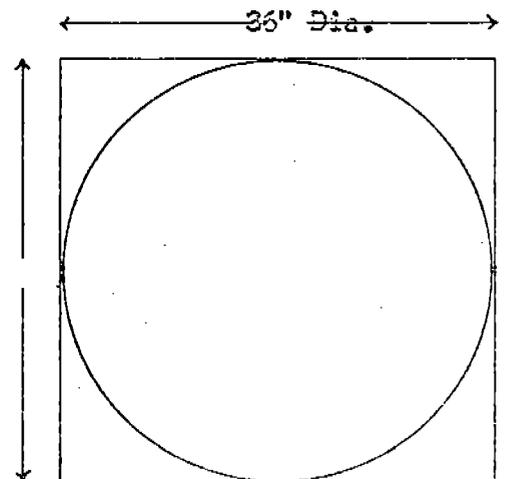
$14.1 \times 0.81 \times \dots = 11.4$ FT./SEC.

AREA OF FLUE 7.07 SQ. FT. AV. FLUE TEMP. 780 OF.

$\text{Vol. } 11.4 \text{ FT./SEC.} \times 7.07 \text{ SQ. FT.} \times 60 = 4,900$ CFM

$\text{Vol. } 4,900 \text{ CFM} \times 530/1,240 = 2,100$ SCFM

$\text{Vol.} = 2,100 \text{ SCFM} \times (100 - 12\% \text{ H}_2\text{O}) = 1,900 \text{ DSCFM}$



- Distance from port to sampling point
- | | | |
|------------|------------|--------------|
| 1. 1 5/8" | 3. 10 5/8" | 5. 30 11/16" |
| 2. 5 5/16" | 4. 25 3/8" | 6. 34 3/8" |

CALCULATION DATA SHEET

TEST NO. 1873A

PAGE 6 OF 12 PAGES

NAME OF FIRM

DATE

Carpentertown Coal and Coke Company, Boggs Township,
 Armstrong County

10/17/73

SAMPLE STATION

Sampling ports located in stack approximately 30 feet above grade.

COLLECTION TRAIN FOR

SAMPLE POINT

SAMPLE NOZZLE DIA.

E-1,2,3,4,5,6
 S-1,2,3,4,5,6
 CONDENSATE CC.

0.4981 inch (No. 025357)

Particulate

TOTAL WGT. COLLECTED (GMS)

1.9236

177

SAMPLING POINT	TIME	GAS METER			IMP. T ^o F.	SAMPLING POINT	TIME	GAS METER			IMP. T ^o F.
		CU. FT.	VAC IN. HG	T ^o F				CU. FT.	VAC IN. HG	T ^o F	
E-6	3:55 PM	15.0	3.0	43	34		+ 15	60.5	7.5	44	38
	+ 5	17.2	3.0	44	40	S-5	5:50	60.5	7.5	44	38
	+ 10	19.4	3.0	44	40		+ 5	62.9	7.5	44	38
	+ 15	21.8	3.5	44	40		+ 10	65.4	8.0	44	38
E-5	4:10	21.8	3.5	44	40		+ 15	67.9	8.0	44	38
	+ 5	23.8	3.7	44	40	S-4	6:05	67.9	8.0	44	38
	+ 10	26.1	4.0	44	40		+ 5	70.4	8.0	44	38
	+ 15	28.2	4.1	44	40		+ 10	72.9	9.0	44	38
E-4	4:25	28.2	4.1	44	40		+ 15	75.6	9.2	43	38
	+ 5	30.0	4.7	44	40	S-3	6:20	75.6	10.0	43	38
	+ 10	32.5	4.8	44	41		+ 5	77.3	10.0	43	38
	+ 15	34.8	4.8	44	41		+ 10	81.7	10.0	43	38
E-3	4:40	34.8	4.8	44	41		+ 15	84.6	10.2	43	38
	+ 5	37.1	5.0	44	41	S-2	6:35	84.6	10.2	43	38
	+ 10	39.5	5.0	44	41		+ 5	87.2	10.0	43	38
	+ 15	41.7	5.1	44	41		+ 10	89.9	10.0	43	38
E-2	4:55	41.7	5.1	44	41		+ 15	92.7	10.0	43	38
	+ 5	43.9	5.1	44	41	S-1	6:50	92.7	10.0	43	38
	+ 10	46.2	5.6	44	41		+ 5	95.7	11.0	43	38
	+ 15	48.7	6.3	44	41		+ 10	98.9	11.5	44	38
E-1	5:10	48.7	4.2	44	41		+ 15	101.8	11.5	44	38
	+ 5	50.1	4.2	44	41	Total	180	86.8			
	+ 10	51.8	4.2	44	41		Avg.	6.7	44	39	
	+ 15	53.6	4.2	44	41						
S-6	5:35	53.6	5.0	44	38						
	+ 5	55.6	6.0	44	38						
	+ 10	58.0	7.5	44	38						

MOISTURE CALCULATIONS

DATE 10/17/73

1. PERCENT WATER VAPOR IN GASES	TEST NUMBERS			
	1873 A	1873 B		
A. Gas pressure at meter (Inches HG-ABS)	22.6	25.8		
B. Vapor pressure of water at impinger temp. (In. HG.)	0.2384	0.2119		
C. Vol. of metered gas (Cu. Ft.)	86.8	47.0		
D. Vol. of water vapor metered (BC/A, Cu. Ft.)	0.9	0.4		
E. Vol. of water vapor condensed (Cu. Ft.)	10.5	5.5		
F. Total vol. of water vapor in gas sample (D+E, Cu. Ft.)	11.4	5.9		
G. Total vol. of gas sample (C+E, Cu. Ft.)	97.3	52.5		
H. % water vapor in sampled gas (100 F/G)	11.7	11.2		
I. % water vapor (Average Value)	8.0	8.0		
2. ORSAT ANALYSIS - DRY BASIS				
A. CO ₂ (%)				
B. CO (%)				
C. O ₂ (%)				
D. N ₂ (%)				

LABORATORY RESULTS:

Test Number	1873 A	1873 B
Sampling Train Component	Part. wt. (gms.)	SO _x as SO ₂ Wt. (gms.)
3 inch Glass Fiber Filter #376	1.0622	-----
Probe and Tubing Washing	0.5147	-----
4 inch Glass Fiber Filter #439	-----	-----
Impinger #1	0.2493	1.0626
Impinger #2	0.0352	0.0265
Impinger #3	0.0622	0.0104
Impinger #4	None Detected	0.0003
Impinger #5	-----	None Detected
Total	1.9236	1.0996
Condensate Vol.	177 ml	105 ml

PROCESS DATA

DATE 10/17/73

TEST NUMBER 1873 A & B

NAME OF FIRM

Carpentertown Coal and Coke Company, Boggs Township, Armstrong County

DESCRIPTION OF EQUIPMENT TESTED AND OPERATION COVERED IN TEST

Four sole flue beehive coke ovens.,

SAMPLING STATION LOCATION

Sampling ports located in stack approximately 30 feet above grade.

LENGTH OF PROCESS CYCLE _____ TIME CYCLE BEGINS _____ ENDS _____

TIME OF TEST: BEGINS 1873 A 3:55 P.M. 1873 B 7:25 P.M. ENDS 1873 A 7:05 P.M. 1873 B 8:30 P.M. CYCLE COVERAGE _____

* RAW MATERIAL CHARGED DURING THIS TIME:

MATERIAL	Bituminous Coal	WT(LBS.)	54,000
MATERIAL	_____	WT(LBS.)	_____
MATERIAL	_____	WT(LBS.)	_____
MATERIAL	_____	WT(LBS.)	_____
MATERIAL	_____	WT(LBS.)	_____
SOLID FUEL CHARGED	_____	WT(LBS.)	_____
TOTAL POUNDS	Bituminous Coal	WT(LBS.)	54,000

COLLECTION EQUIPMENT TYPE

None

PLANT OFFICIAL AND TITLE

James McCauley, Vice-President

ADDITIONAL COMMENTS

Of the four beehive coke ovens ducted to the common test stack, three of the ovens were in operation during the test.

* The three ovens were charged at approximately 9:30 A.M. on 10/17/73 and were pulled at approximately 10:00 A.M. on 10/19/73 for a total coking period of 48.5 hours.

TEST NO. 1873 A & B

SUMMARY

DATE 10/17/73

NAME OF FIRM

Carpentertown Coal and Coke Company, Boggs Township, Armstrong County

Description of Equipment Tested and Operation Covered in Test

Four sole flue beehive coke ovens.

Test Number	1873 A	1873 B
Sampling Station Location	E-1,2,3,4,5,6 S-1,2,3,4,5,6	E-3
Average Gas Velocity (Ft./Sec.)	11.5	11.5
Area of Flue at Sampling Station	7.07	7.07
Flue Gas Volume (SCFM) (Dry)	1,900	1,900
Sample Nozzle Diameter (In.)	0.484	0.369
Sampling Rate at Meter (CFM)	0.48 Avg.	0.72 Avg.
Total Sampling Time (Minutes)	180	65
Meter Vacuum-Average (In. HG)	6.7	3.5
Meter Temperature - Average (°F)	44	45
Volume of Gas Sampled, Meter Conditions (CF)	86.8	47.0
Water Vapor Condensate (CC)	177	105
Water Vapor Volume Meter Conditions (CF)	10.5	5.5
Moisture in Gases (%)	11.7	11.2
Total Sampled Volume, Meter Conditions (CF) (Dry)	85.9	46.6
Corrected Sample Volume (SCF) (Dry)	68.3	42.2
Type Material Collected	Particulate	SO ₂
Total Weight Collected (GMS)	1,9236	1,0998
Concentration Grains/SCF (Dry)	0.43	0.40
Calculated Loss (Lbs./Hr.)	7.0	6.5 SO _x as SO ₂
Concentration (PPM)	---	352
Percent Isokinetic Sampling	107	

Test Number	1873 A	REGULATORY STANDARD	1873 B
Type of Material			
	Total Particulate		Sulfur Oxides
Allowable Loss (Lb./Hr.)	0.04 gr./DSCF		500 PPM

COLLECTOR EFFICIENCY

Total Material to Collector (Lbs./Hr.)	
Total Loss to Atmosphere (Lbs./Hr.)	
Total Material Collected	

COMMENTS

Test Conducted By	Approved By
St. Louis, Downey, Sloteman, DiRienzo	L. Blaine Dellaven, P. E.
	Test Computed and Checked By

CARPENTERTOWN COAL AND COKE COMPANY
BOGGS TOWNSHIP, ARMSTRONG COUNTY

DISCUSSION

Stack Test No. 1873A was conducted using standard procedures for the isokinetic collection of a particulate sample. A twelve point velocity traverse was performed to determine the velocity profile and the isokinetic sampling rates. A twelve point sampling program was performed with a sampling period of fifteen minutes per point. Total sampling time was 180 minutes.

The test data indicates an actual particulate grain loading of 0.43 grains per dry standard cubic foot. The allowable concentration as determined according to the Department of Environmental Resources' Rules and Regulations, Chapter 123 § 123.13 is 0.04 grains per dry standard cubic foot.

Stack Test No. 1873B was conducted using standard procedures for the collection of a gas sample. Sampling was conducted at a single point for a period of 65 minutes.

The test data indicates a sulfur oxides concentration of 352 parts per million expressed as sulfur dioxide. The allowable concentration as determined according to the Department of Environmental Resources' Rules and Regulations, Chapter 123 § 123.21 is 500 parts per million sulfur oxides expressed as sulfur dioxide.

The concentrations reported for Stack Test No. 1873A and B are representative of the emissions from process discharging into the test stack and the operating conditions of this process during the test.