INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
Indianapolis

OFFICE MEMORANDUM

To: Rick Massoels Date: June 15, 2018

From: Jarrod C. Fisher JCF Thru: Dave Cline DAC

Subject: Indiana Harbor Coke Company L.P. a contractor of ArcelorMittal
Source ID: 089-00382 Permit Number: # T089-36826-00382
City: East Chicago County: Lake
Protocol Reviewer: HDV Field Observer: HDV
Test Company: AECOM

The Compliance Data Section has reviewed this report and found the sampling procedures used and results obtained to be acceptable to this office. A copy of the test report is filed in the Compliance Data Section. The following is a summary of the test results.

Unit Tested: Four (4) Coke Oven Charging/Pushing Units ES202, ES202B, ES203 and ES203D
Date of test: April 11, 2018
Test Purpose: Compliance
Type of Fuel: Coal
Pollution Control Equipment: Baghouse (Stack 204)
Permitted APCD Parameter Ranges: Pressure drop range of 1.0-8.0 inches H2O, fan amps
APCD Parameter During Testing: Pressure drop range of 4.8-7.0 inches of water, Minimum fan amps for Fan A was 66 amps, Minimum fan amps for Fan B was 50 amps

Pollutants:	PM, Opacity
Test methods:	1-5, 9
Maximum Permitted Operating Rate:	Four Batteries each @ 2013.7 tons coke per day 240 wet tons coke/hr
Average Operating Rate During Test:	Batteries A, B, C and D in operation Average of 17 ovens pushed per test run 280 wet tons coke/hr
PM Emission Limit:	0.04 lb/ton (326 IAC 6.8-9-3(3)(C))
PM Emission Rate:	0.0033 lb/ton
PM Emission Limit:	0.03 gr/dscf (326 IAC 6.8-1-2)
PM Emission Rate:	0.0007 gr/dscf
PM Emission Limit:	0.01 gr/dscf (40 CFR 63, Subpart CCCCC)
PM Emission Rate:	0.0007 gr/dscf
Opacity Limit:	20% (326 IAC 5)
Average Opacity:	0%
Highest 6-Minute Opacity:	0%

STATUS: **In Compliance**

cc: J. Fisher, IDEM

UNIT TESTED:	Pushing Baghouse Stack
SOURCE:	Indiana Harbor Coke
TESTING COMPANY:	AECOM
DATE OF TEST:	April 11, 2018
RUN NO.:	1

Area of Stack (enter diameter in inches), As

L =	0
W =	0
diameter (in) =	96
No. of Stacks =	1
Area Stack (ft^2) =	50.265

Molecular Weight of Stack Gas, Dry Basis, Md

%CO2 =	0	Method 3A?
%O2 =	20.9	no
Md (g/gmol) =	28.84	Equation 3-1

Volume of Dry Gas Collected @ STD. COND., Vm

Start Meter Volume (cf) =	161.94	
End Meter Volume (cf) =	234.913	
Vol. Int. Leak Checks (cf) =	0	
Vm (cf) =	72.973	
Vm (dscf) =	71.250	Equation 5-1

Volume of Water Vapor Collected @ STD. COND., Vw

Vlc (mL) =	16.6	
Vw (scf) =	0.78	Equation 5-2

Moisture Content of Stack Gas, Bws

		Equation 5-3	Sat. Moist.
Bws =	1.08%	1.08%	7.15%
1-Bws =	98.92%	98.92%	92.85%

Molecular Weight of Stack Gas, Ms

Ms (g/gmol) =	28.72	Equation 2-6

Absolute Pressure, Ps

Static (in H2O) =	0.15
Ps (in Hg) =	29.92

Stack Gas Velocity, Vs

Cp =	0.84	
Vs (fps) =	54.67	Equation 2-7

Stack Gas Flowrate, Qs

Qs (acfm) =	164878.06

Stack Gas Flowrate @ STD. COND., Dry Basis, Qstd

Qstd (dscfh) =	9167883.86	Equation 2-8
Qstd (dscfm) =	152798.06	

Velocity at the Nozzle, Vn

Dia. of Nozzle (in) =	0.21	Area of Nozzle, An	
Time of Run (min) =	96	An (ft^2) =	0.0002405
Vn (fps) =	55.49		

% Isokinetic, %I

%I =	101.50	PASS	
Intermediate (%I) =	101.57	PASS	Equation 5-8

Method 2				Method 4		
Point No.	Δp	√Δp	Stack Temp.	ΔH	Meter In	Meter Out
1	0.6	0.7746	105	1.28	85	
2	0.65	0.8062	112	1.38	85	
3	0.95	0.9747	112	1.99	85	
4	1.3	1.1402	112	2.7	86	
5	1.2	1.0954	112	2.5	86	
6	1.2	1.0954	110	2.5	87	
7	0.7	0.8367	107	1.5	88	
8	0.9	0.9487	106	1.9	88	
9	1.1	1.0488	106	2.35	89	
10	1.5	1.2247	103	3.2	90	
11	1.6	1.2649	102	3.44	90	
12	1.5	1.2247	100	3.2	91	
13	0.64	0.8	99	1.4	91	
14	0.73	0.8544	98	1.6	91	
15	0.82	0.9055	100	1.8	91	
16	0.9	0.9487	101	1.95	90	
17	0.95	0.9747	101	2.05	90	
18	0.75	0.866	99	1.6	90	
19	0.57	0.755	100	1.2	89	
20	0.5	0.7071	99	1.1	88	
21	0.6	0.7746	101	1.3	88	
22	0.7	0.8367	100	1.5	88	
23	0.75	0.866	101	1.6	88	
24	0.7	0.8367	100	1.5	87	
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
50						
AVG	0.909	0.940	103.583	1.94	88.375	

Delta H@=	1.906	
Pb (in Hg) =	29.91	
gamma =	1.01	
Post Test Cal	1.016	Pass

Particulate Emissions Test Results

Pollutant Mass Emission Rate, PMR

	Filterable	Condensible	Total
Mn (mg) =	4.2		
Mn (g) =			
Mn (g) =	0.0042	0	0.0042
PMR (lbs/hr) =	1.191	0.000	1.191

Concentration, gr/dscf

gr/dscf =	0.00091	0.00000	0.00091	Equation 5-6

Concentration, mg/dcsm

mg/dscm =	2.081	0.000	2.081

Pollutant Mass Emission Rate, Throughput Based

Production (lb/hr) =	
Production (ton/hr) =	268.875
Production (ton/hr) =	268.875

	Filterable	Condensible	Total
PMR (lbs/ton) =	0.004	0.000	0.004

Particulate Emissions Rate (F-factor based) O2 dry

F-factor	9780	
lb/MMBtu	#DIV/0!	Equation 19-1

Particulate Emissions Rate (F-factor based) CO2 dry

F-factor	1800	
lb/MMBtu	#DIV/0!	Equation 19-6

UNIT TESTED:	Pushing Baghouse Stack
SOURCE:	Indiana Harbor Coke
TESTING COMPANY:	AECOM
DATE OF TEST:	April 11, 2018
RUN NO.:	2

Area of Stack (enter diameter in inches), As

L =	0
W =	0
diameter (in) =	96
No. of Stacks =	1
Area Stack (ft^2) =	50.265

Molecular Weight of Stack Gas, Dry Basis, Md

%CO2 =	0
%O2 =	20.9
Md (g/gmol) =	28.84

Volume of Dry Gas Collected @ STD. COND., Vm

Start Meter Volume (cf) =	235.062	
End Meter Volume (cf) =	308.3	
Vol. Int. Leak Checks (cf) =	0	
Vm (cf) =	73.238	
Vm (dscf) =	72.921	Equation 5-1

Volume of Water Vapor Collected @ STD. COND., Vw

Vlc (mL) =	22	
Vw (scf) =	1.04	Equation 5-2

Moisture Content of Stack Gas, Bws

		Equation 5-3	Sat. Moist.
Bws =	1.40%	1.40%	4.75%
1-Bws =	98.60%	98.60%	95.25%

Molecular Weight of Stack Gas, Ms

Ms (g/gmol) =	28.68	Equation 2-6

Absolute Pressure, Ps

Static (in H2O) =	0.15
Ps (in Hg) =	29.92

Stack Gas Velocity, Vs

Cp =	0.84	
Vs (fps) =	54.48	Equation 2-7

Stack Gas Flowrate, Qs

Qs (acfm) =	164299.40

Stack Gas Flowrate @ STD. COND., Dry Basis, Qstd

Qstd (dscfh) =	9329363.42	Equation 2-8
Qstd (dscfm) =	155489.39	

Velocity at the Nozzle, Vn

		Area of Nozzle, An	
Dia. of Nozzle (in) =	0.21	An (ft^2) =	0.00024053
Time of Run (min) =	96		
Vn (fps) =	55.61		

% Isokinetic, %I

%I =	102.08	PASS	
Intermediate (%I) =	102.15	PASS	Equation 5-8

Method 2				Method 4		
Point No.	Δp	√Δp	Stack Temp.	ΔH	Meter In	Meter Out
1	0.55	0.74162	96	1.2	83	
2	0.53	0.728011	95	1.1	82	
3	0.63	0.793725	94	1.4	81	
4	0.66	0.812404	94	1.4	81	
5	0.75	0.866025	93	1.6	80	
6	0.75	0.866025	91	1.6	80	
7	0.62	0.787401	91	1.3	79	
8	0.66	0.812404	91	1.4	79	
9	0.78	0.883176	91	1.7	79	
10	0.95	0.974679	89	2.05	80	
11	0.95	0.974679	88	2.05	79	
12	0.9	0.948683	88	1.95	79	
13	0.73	0.8544	87	1.6	75	
14	0.86	0.927362	87	1.9	75	
15	0.85	0.921954	86	1.8	75	
16	1.4	1.183216	86	3	75	
17	1.6	1.264911	87	3.5	75	
18	1.6	1.264911	89	3.5	75	
19	0.6	0.774597	90	1.3	76	
20	0.72	0.848528	91	1.55	76	
21	1.1	1.048809	91	2.4	76	
22	1.3	1.140175	90	2.8	76	
23	1.3	1.140175	89	2.8	76	
24	1.4	1.183216	89	3	76	
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
50						
AVG	0.925	0.948	90.125	2.00	77.83333333	

Delta H@=	1.906	
Pb (in Hg) =	29.91	
gamma =	1.01	
Post Test Cal	1.017512	Pass

Particulate Emissions Test Results

Pollutant Mass Emission Rate, PMR

	Filterable	Condensible	Total
Mn (mg) =	2.29		
Mn (g) =			
Mn (g) =	0.00229	0	0.00229
PMR (lbs/hr) =	0.646	0.000	0.646

Concentration, gr/dscf

gr/dscf =	0.00048	0.00000	0.00048	Equation 5-6

Concentration, mg/dcsm

mg/dscm =	1.109	0.000	1.109

Pollutant Mass Emission Rate, Throughput Based

Production (lb/hr) =	
Production (ton/hr) =	270.4375
Production (ton/hr) =	270.4375

	Filterable	Condensible	Total
PMR (lbs/ton) =	0.002	0.000	0.002

Particulate Emissions Rate (F-factor based) O2 dry

F-factor	9780	
lb/MMBtu	#DIV/0!	Equation 19-1

Particulate Emissions Rate (F-factor based) CO2 dry

F-factor	1800	
lb/MMBtu	#DIV/0!	Equation 19-6

UNIT TESTED:	Pushing Baghouse Stack
SOURCE:	Indiana Harbor Coke
TESTING COMPANY:	AECOM
DATE OF TEST:	April 11, 2018
RUN NO.:	3

Area of Stack (enter diameter in inches), As

L =	0
W =	0
diameter (in) =	96
No. of Stacks =	1
Area Stack (ft^2) =	50.265

Molecular Weight of Stack Gas, Dry Basis, Md

%CO2 =	0
%O2 =	20.9
Md (g/gmol) =	28.84

Volume of Dry Gas Collected @ STD. COND., Vm

Start Meter Volume (cf) =	308.443	
End Meter Volume (cf) =	378.706	
Vol. Int. Leak Checks (cf) =	0	
Vm (cf) =	70.263	
Vm (dscf) =	70.142	Equation 5-1

Volume of Water Vapor Collected @ STD. COND., Vw

Vlc (mL) =	25.9	
Vw (scf) =	1.22	Equation 5-2

Moisture Content of Stack Gas, Bws

		Equation 5-3	Sat. Moist.
Bws =	1.71%	1.71%	5.57%
1-Bws =	98.29%	98.29%	94.43%

Molecular Weight of Stack Gas, Ms

Ms (g/gmol) =	28.65	Equation 2-6

Absolute Pressure, Ps

Static (in H2O) =	0.15
Ps (in Hg) =	29.92

Stack Gas Velocity, Vs

Cp =	0.84	
Vs (fps) =	53.17	Equation 2-7

Stack Gas Flowrate, Qs

Qs (acfm) =	160342.54

Stack Gas Flowrate @ STD. COND., Dry Basis, Qstd

Qstd (dscfh) =	8991782.63	Equation 2-8
Qstd (dscfm) =	149863.04	

Velocity at the Nozzle, Vn

		Area of Nozzle, An	
Dia. of Nozzle (in) =	0.21	An (ft^2) =	0.00024053
Time of Run (min) =	96		
Vn (fps) =	54.16		

% Isokinetic, %I

%I =	101.88	PASS	
Intermediate (%I) =	101.95	PASS	Equation 5-8

Method 2				Method 4		
Point No.	Δp	√Δp	Stack Temp.	ΔH	Meter In	Meter Out
1	0.58	0.761577	92	1.2	75	
2	0.68	0.824621	92	1.45	75	
3	0.97	0.984886	93	2.1	75	
4	0.65	0.806226	95	1.4	75	
5	1.3	1.140175	95	2.8	75	
6	1.3	1.140175	95	2.8	75	
7	0.71	0.842615	94	1.5	78	
8	0.87	0.932738	97	1.9	75	
9	1.1	1.048809	99	2.3	76	
10	0.9	0.948683	99	1.9	76	
11	1.6	1.264911	97	3.4	76	
12	1.7	1.30384	97	3.6	77	
13	0.63	0.793725	94	1.3	77	
14	0.7	0.83666	97	1.5	77	
15	0.82	0.905539	98	1.7	77	
16	0.92	0.959166	99	2	77	
17	0.92	0.959166	99	2	77	
18	0.75	0.866025	98	1.6	77	
19	0.5	0.707107	93	1.1	76	
20	0.5	0.707107	92	1.1	76	
21	0.6	0.774597	93	1.3	77	
22	0.7	0.83666	93	1.5	77	
23	0.75	0.866025	93	1.6	77	
24	0.75	0.866025	93	1.6	77	
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
50						
AVG	0.871	0.920	95.292	1.86	76.25	

Delta H@=	1.906	
Pb (in Hg) =	29.91	
gamma =	1.01	
Post Test Cal	1.022	Pass

Particulate Emissions Test Results

Pollutant Mass Emission Rate, PMR

	Filterable	Condensible	Total
Mn (mg) =	3.36		
Mn (g) =			
Mn (g) =	0.00336	0	0.00336
PMR (lbs/hr) =	0.950	0.000	0.950

Concentration, gr/dscf

gr/dscf =	0.00074	0.00000	0.00074	Equation 5-6

Concentration, mg/dscm

mg/dscm =	1.691	0.000	1.691

Pollutant Mass Emission Rate, Throughput Based

Production (lb/hr) =	
Production (ton/hr) =	299.4375
Production (ton/hr) =	299.4375

	Filterable	Condensible	Total
PMR (lbs/ton) =	0.003	0.000	0.003

Particulate Emissions Rate (F-factor based) O2 dry

F-factor	9780	
lb/MMBtu	#DIV/0!	Equation 19-1

Particulate Emissions Rate (F-factor based) CO2 dry

F-factor	1800	
lb/MMBtu	#DIV/0!	Equation 19-6

UNIT TESTED:	Pushing Baghouse Stack
SOURCE:	Indiana Harbor Coke
TESTING COMPANY:	AECOM
DATE OF TEST:	April 11, 2018
METHODS:	5/202

Average Stack Temperature, Ts (F)		96.33
Average Stack Gas Velocity, Vs, fps		54.10
Average Stack Gas Flowrate, Qs, acfm		163173.33
Average Stack Gas Flowrate @ STD. COND., Dry Basis, Qstd (dscfm)		152716.83
Average Stack Gas Flowrate @ STD. COND., Dry Basis, Qstd (dscfh)		9163009.97
Average % Isokinetic, %I	Pass	101.82
Average % Isokinetic measured from intermediate values, %I	Pass	101.89
Average Post Test Cal (2-run)	Pass	1.017
Average Post Test Cal (3-run)	Pass	1.019

PM Only	
Average Pollutant Mass Emission Rate, PMR, lbs/hr	0.93
Average Concentration, gr/dscf	0.00071
Average Concentration, mg/dscm	1.627
Average PM Emission Rate, lbs/MMBtu (O2 dry basis)	#DIV/0!
Average PM Emission Rate, lbs/MMBtu (CO2 dry basis)	#DIV/0!
Average Pollutant Mass Emission Rate, PMR, lbs/ton	0.0033

PM10 (Condensable)	
Average Pollutant Mass Emission Rate, PMR, lbs/hr	0.00
Average Concentration, gr/dscf	0.000
Average Concentration, mg/dscm	0.000
Average Pollutant Mass Emission Rate, PMR, lbs/ton	0.000

PM10 (Filterable + Condensable)	
Average Pollutant Mass Emission Rate, PMR, lbs/hr	0.93
Average Concentration, gr/dscf	0.001
Average Concentration, mg/dscm	1.627
Average Pollutant Mass Emission Rate, PMR, lbs/ton	0.003

Average Production Rate, lb/hr	559,166.67
Average Production Rate, ton/hr	279.58
Opacity (highest 6-min average)	
Average Opacity	