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REPORT ON PECS COMPLIANCE TESTING

Performed for:
EES COKE BATTERY, LLC
PECS PUSHING STACK
ZUG ISLAND, RIVER ROUGE, MICHIGAN

Client Reference No: 4700817183
CleanAir Project No: 12632
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To the best of our knowledge, the data presented in this report are accurate, complete, error free, legible and representative of the actual emissions during the test program. Clean Air Engineering operates in conformance with the requirements of ASTM D7036-04 Standard Practice for Competence of Air Emission Testing Bodies.

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PROJECT OVERVIEW

INTRODUCTION

EES Coke Battery, LLC contracted Clean Air Engineering (CleanAir) to perform testing at the Zug Island Coke Battery located in River Rouge, Michigan for compliance purposes.

The objective of the test program was to provide testing to verify if DTE Energy's EES Zug Island Coke Battery PECS Pushing Stack is operating in compliance with their permit limits. During the testing, there were no variations in process conditions as the testing was performed at normal operating conditions throughout the program.

The PECS Pushing Stack has a baghouse as the air pollutant control equipment to control emissions during each oven push. Process conditions provided by DTE EES include the following:

- oven number
- push time
- amount of coke pushed
- coke volatile matter content
- fan amps
- baghouse pressure drop

All testing was conducted in accordance with the regulations set-forth by the United States Environmental Protection Agency (USEPA) and the Michigan Department of Environmental Quality (DEQ).

Key Project Participants

Individuals responsible for coordinating and conducting the test program were:

B. Harden – EES Coke Battery, LLC
J. Childers – CleanAir

Test Program Parameters

The testing was performed at the PECS Pushing Stack on December 16 through 18, 2014 and included the following emissions measurements:

- filterable particulate matter (FPM)
- condensable particulate matter (CPM)
- oxygen (O_2)
- carbon dioxide (CO_2)
- nitrogen oxide (NO_x)
- flue gas composition (e.g., O_2, CO_2, H_2O)
- flue gas temperature
- flue gas flow rate

TEST PROGRAM SYNOPSIS

Test Schedule

The on-site schedule followed during the test program is outlined in Table 1-1.

Table 1-1:
Schedule of Activities

Run Number	Location	Method	Analyte	Date	Start Time	End Time
1	PECS Pushing Stack	USEPA Method 5/202	FPM/CPM	12/16/14	10:54	15:44
2	PECS Pushing Stack	USEPA Method 5/202	FPM/CPM	12/17/14	09:32	14:28
3	PECS Pushing Stack	USEPA Method 5/202	FPM/CPM	12/18/14	09:17	14:19
1	PECS Pushing Stack	USEPA Methods 3A, 7E	O_2/CO_2, NO_x	12/16/14	10:46	15:50
2	PECS Pushing Stack	USEPA Methods 3A, 7E	O_2/CO_2, NO_x	12/17/14	09:23	14:40
3	PECS Pushing Stack	USEPA Methods 3A, 7E	O_2/CO_2, NO_x	12/18/14	09:07	14:27

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Results Summary

Table 1-2 summarizes the results of the test program. A more detailed presentation of the test conditions and results of analysis are shown on pages 2-1 and 2-2.

Table 1-2:
Summary of Test Results

Source Constituent	Sampling Method	Average Emission	Permit Limit[1]
PECS Pushing Stack			
PM_{10} (lb/ton Coke)	EPA M5	0.006	0.02
$PM_{2.5}$ (lb/ton Coke)	EPA M202	0.003	0.02
Total PM (lb/ton Coke)	EPA M5/202	0.009	0.02
Total PM (ton/yr)	EPA M5/202	4.2	9.7
PM_{10} (lb/hr)[2]	EPA M5	0.68	0.69
$PM_{2.5}$ (lb/hr)[2]	EPA M202	0.27	0.69
NO_x (lb/hr)[2]	EPA M7E	2.31	2.61

[1] Permit limits obtained from Michigan Permit to Install number MI-PTI-51-08C. 012815 095128

[2] The source does not emit continuously; lb/hr values are calculated as lb/operating hour of PECS exhaust fan.

only filter

only condensable

Discussion of Test Program

Emission Calculation Explanation

Due to the intermittent operations of the facility, the approach to the emission calculations was appropriately adjusted. First, the facility data for the amount of coke pushed was provided in a daily summation (tons). This value was divided by 24 hours and then by 60 minutes, which provided ton coke pushed/minute. The overall sampling time of the test run was then multiplied by this value to arrive upon the amount of coke pushed during the test run. This value was used to calculate the lb/Ton Coke Pushed concentrations. Next, the particulate emission of lb/hr were calculated. The units of measure are actually lb/hr of clock time. This is done to compensate for the intermittent operations. The NOx lb/hr concentrations were similarly calculated.

Test Program Summary

The test program was completed over the span of three test days with each day completing one test run. Due to the intermittent nature of the process, it took roughly 5.5 hours to complete one test run. A push would occur approximately every 11-15 minutes and during each push roughly three minutes of sample was collected. The pushing schedule changes affected the total length of sample time for each run which varied from 66 to 72 minutes total.

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Method 5/202 testing was completed so that 12 total points were sampled. Each point was sampled for a minimum of five minutes and a maximum of six minutes. Sample was collected isokinetically so that a minimum of 60 minutes of sample was collected.

CEMS testing for O_2, CO_2 and NO_x were collected during the duration of the particulate testing. This provided more than 60 minutes of total sample. Also, during each push, the O_2/CO_2 values were observed for only about two minutes per push. However, the NOx values showed non-zero values for much longer.

Following an on-site discussion with Tom Gasloli of MDEQ, it was determined that ambient readings for all analytes would be eliminated. The O_2/CO_2 values would be displayed only when pushing gas was being measured and this was the same for the NO_x values. All CEMS run data is provided with the non-push readings omitted from the average results calculations.

USEPA Method 5/202 Testing

USEPA Method 5 results were considered filterable PM_{10} and $PM_{2.5}$ emissions since the process characteristics were very intermittent in nature. Per DEQ, most of the particulate matter was PM_{10} and $PM_{2.5}$ because the sample was collected after the baghouse. Therefore, the likelihood of overstating actual emissions was small. Tom Gasloli at DEQ agreed to substitute Method 5 in place of Method 201A, per discussions with Stephen Zervas of DTE Energy.

Filterable particulate matter was withdrawn isokinetically and collected on a quartz fiber filter maintained at a temperature of 248 ± 25°F. The FPM mass was determined gravimetrically by analyzing the gain in filter weight along with the mass gained during the acetone wash of the probe liner. Test runs were between 66 and 72 minutes in duration. The laboratory analysis was performed at CleanAir's analytical laboratory located in Palatine, Illinois. The laboratory report is in Appendix H.

The condensable particulate matter was collected in dry impingers after the FPM had been collected on the Method 5 filter. Total CPM was represented by the impinger fractions and the CPM filter. Immediately following a test run, Method 202 sample trains were purged with UHP nitrogen at a rate of 14 liters per minute for 60 minutes to remove any potential dissolved sulfur dioxide gases from the impinger.

Continuous Emissions Testing (USEPA Methods 3A and 7E)

O_2, CO_2 and NO_x were continuously measured from a heated probe, filter, and sample line assembly run from the stack location to the test trailer. The heat remained sufficient to prevent condensation of the sample in the sample lines. The sample was extracted and conditioned prior to being sent to a flow panel. The flow panel diverted a sufficient flow rate to the analyzer.

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Test runs were conducted at a three point traverse located at 15.75 in., 39.37 in and 78.74 in. The three points showed that the location met the requirements for single-point testing. However, during on-site talks between Tom Gasloli (MDEQ) and Josh Childers (CleanAir), it was agreed upon that due to the process, the CEMS sampling would continue to be performed at three points, not one. A total of three test runs were performed.

End of Section 1 – Project Overview

RESULTS

Table 2-1:
PECS Pushing Stack – FPM/CPM

Run No.		1	2	3	Average
Date (2014)		Dec 16	Dec 17	Dec 18	
Start Time (approx.)		10:54	09:32	09:17	
Stop Time (approx.)		15:44	14:28	14:19	
Process Conditions					
R_P	Production rate (ton/hr)	107	106	107	**107**
P_1	Oven number	19	63	34	**39**
P_2	Push time (minutes)	443	442	443	**443**
P_3	Amount of coke pushed (tons)	791	781	791	**788**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	19.1	19.3	19.4	**19.3**
CO_2	Carbon dioxide (dry volume %)	1.6	1.3	0.6	**1.2**
T_s	Sample temperature (°F)	122	112	110	**115**
B_w	Actual water vapor in gas (% by volume)	1.2	2.0	1.8	**1.7**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	167,000	166,000	167,000	**167,000**
Q_s	Volumetric flow rate, standard (scfm)	150,000	152,000	155,000	**152,000**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	148,000	149,000	152,000	**150,000**
PM10 Results					
C_{sd}	Particulate Concentration (lb/dscf)	3.01E-07	2.59E-07	3.78E-07	**3.12E-07**
C_{sd}	Particulate Concentration (gr/dscf)	2.11E-03	1.81E-03	2.65E-03	**2.19E-03**
$E_{lb/hr}$	Particulate Rate (lb/hr)*	0.662	0.563	0.823	**0.683**
$E_{T/yr}$	Particulate Rate (ton/yr)	2.90	2.46	3.60	**2.99**
E_{Rp}	Particulate Rate - Production-based (lb/ton)	6.18E-03	5.31E-03	7.68E-03	**6.39E-03**
PM2.5 Results					
C_{sd}	Particulate Concentration (lb/dscf)	1.04E-07	1.76E-07	9.30E-08	**1.24E-07**
C_{sd}	Particulate Concentration (gr/dscf)	7.28E-04	1.23E-03	6.51E-04	**8.70E-04**
$E_{lb/hr}$	Particulate Rate (lb/hr)*	0.229	0.383	0.202	**0.271**
$E_{T/yr}$	Particulate Rate (ton/yr)	1.00	1.68	0.886	**1.19**
E_{Rp}	Particulate Rate - Production-based (lb/ton)	2.14E-03	3.61E-03	1.89E-03	**2.55E-03**
Total Particulate Matter Results					
C_{sd}	Particulate Concentration (lb/dscf)	4.05E-07	4.34E-07	4.71E-07	**4.37E-07**
C_{sd}	Particulate Concentration (gr/dscf)	2.83E-03	3.04E-03	3.30E-03	**3.06E-03**
$E_{lb/hr}$	Particulate Rate (lb/hr)*	0.891	0.946	1.03	**0.954**
$E_{T/yr}$	Particulate Rate (ton/yr)	3.90	4.14	4.49	**4.18**
E_{Rp}	Particulate Rate - Production-based (lb/ton)	8.32E-03	8.92E-03	9.57E-03	**8.94E-03**

Average includes 3 runs.

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RESULTS

Table 2-2:
PECS Pushing Stack – SO_2, NO_x, CO, VOC

Run No.	1	2	3	Average
Date (2014)	Dec 16	Dec 17	Dec 18	
Start Time	10:46	9:23	9:07	
End Time	15:50	14:40	14:27	
Elapsed Time	5:04	5:16	5:20	
Gas Parameters[1]				
Oxygen (O2) - PECS Pushing Stack (%dv)	19.1	19.3	19.4	**19.3**
Carbon Dioxide (CO2) - PECS Pushing Stack (%dv)	1.6	1.27	0.61	**1.16**
H2O - PECS Pushing Stack (%)	1.2	2.0	1.8	**1.7**
Actual Gas Flow Rate - PECS Pushing Stack (acfm)	167,356	165,509	167,404	**166,756**
Standard Gas Flow Rate - PECS Pushing Stack (scfm)	149,574	152,225	154,905	**152,234**
Dry Standard Gas Flow Rate - PECS Pushing Stack (dscfm)	147,718	149,163	152,165	**149,682**
Nitrogen Oxides (NOX) - PECS Pushing Stack				
Concentration (ppmdv)	2.79	4.79	2.76	**3.45**
Mass Rate (lb/hr)	2.96	0.971	3.01	**2.31**

[1] Flow and moisture data obtained from USEPA Method 5/202 testing.

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End of Section 2 – Results