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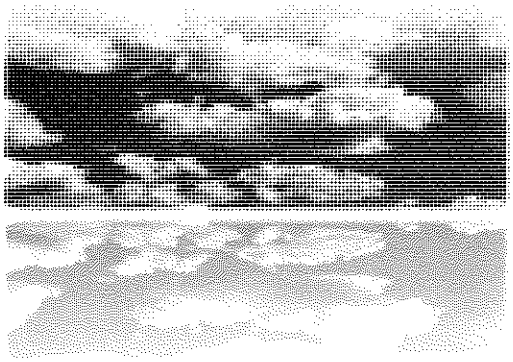


REPORT ON RELATIVE ACCURACY TESTING

Zug Island EES Coke Battery, L.L.C.

Underfire Combustion Stack

EES Coke Battery, L.L.C.
1400 Zug Island Road
River Rouge, Michigan 48218
Client Reference No. 4701101296

CleanAir Project No. 13297-2
STAC Certificate No. 2007.002.0113.1217
Revision 0, Final Report
December 21, 2017

1. PROJECT OVERVIEW

Test Program Summary

EES Coke Battery, L.L.C. (EES) contracted CleanAir Engineering (CleanAir) to successfully complete RATA testing on the Underfire Combustion Stack at the Zug Island EES Coke Battery, LLC located in River Rouge, Michigan. The test program included the following objectives:

- Performed relative accuracy testing to demonstrate compliance with applicable limits outlined in Permit to Install 51-08C and 40 CFR 60, Appendix B Performance Specifications.
- Performed gaseous emissions and moisture measurements while USTI (a vendor for EES) conducted flue gas velocity and temperature measurements.
- Conducted all sampling measurements in accordance with the regulations set-forth by the USEPA and the Michigan Department of Environmental Quality, Air Quality Division (MDEQ-AQD). The methods used and their respective sources are outlined in Section 4 of the test report.

A summary of the test program results is presented below in the following two tables. Table 1-1 displays results from the initial RATA (RATA #1) which occurred on October 31 – November 01, 2017. Table 1-2 displays results from the additional RATA (RATA #2) performed on November 02, 2017. Section 2 Results provides a more detailed account of the test conditions and data analysis.

Test program information, including the test parameters, on-site schedule and a project discussion, begin on page 2.

Table 1-1:
Summary of Results – RATA #1

Source Constituent	Reference Method	Relative Accuracy[1]	Applicable Specification	Specification Limit[2]
Combustion Stack				
CO_2 (% wv)	EPA 3A, 4	0.14	PS3	1.0% of Abs. Diff.
SO_2 (lb/hr)	EPA 6C, 2	16.4%	PS6	20% of RM
NOx (lb/hr)	EPA 7E, 2	12.8%	PS6	20% of RM
CO (lb/hr)	EPA 10, 2	10.4%	PS6	20% of RM
Flow (kscfh)[3]	EPA 2	1.2%	PS6	20% of RM

[1] Relative Accuracy is expressed in terms of comparison to the reference method (% RM) or absolute difference (Abs.Diff). The specific expression used depends on the specification limit cited.

[2] Specification limits obtained from 40 CFR 60, Appendix B, Performance Specifications.

[3] Flow data obtained from USTI.

Table 1-2:
Summary of Results –RATA #2

Source Constituent	Reference Method	Relative Accuracy[1]	Applicable Specification	Specification Limit[2]
Combustion Stack				
CO_2 (% wv)	EPA 3A, 4	0.05	PS3	1.0% of Abs. Diff.
SO_2 (lb/hr)	EPA 6C, 2	16.3%	PS6	20% of RM
NOx (lb/hr)	EPA 7E, 2	11.2%	PS6	20% of RM
CO (lb/hr)	EPA 10, 2	8.9%	PS6	20% of RM
Flow (kscfh)[3]	EPA 2	2.5%	PS6	20% of RM

[1] Relative Accuracy is expressed in terms of comparison to the reference method (% RM) or absolute difference (Abs.Diff). The specific expression used depends on the specification limit cited.

[2] Specification limits obtained from 40 CFR 60, Appendix B, Performance Specifications.

[3] Flow data obtained from USTI.

Test Program Details

Parameters

The test program included the following emissions measurements:

- oxygen (O_2)
- carbon dioxide (CO_2)
- sulfur dioxide (SO_2)
- nitrogen oxide (NO_x)
- carbon monoxide (CO)
- flue gas composition (e.g., O_2, CO_2, H_2O)
- flue gas temperature
- flue gas flow rate

Schedule

Testing was performed from October 31, 2017 thru November 02, 2017. The on-site schedule followed during the test program is outlined in the following table.

Table 1-3:
Test Schedule – RATA #1

Run Number	Location	Method	Analyte	Date	Start Time	End Time
1	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	10/31/17	13:40	14:01
2	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	10/31/17	14:24	14:45
3	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	10/31/17	15:09	15:30
4	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	10/31/17	17:04	17:25
5	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	10/31/17	17:54	18:15
6	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	10/31/17	18:45	19:06
7	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	10/31/17	20:04	20:25
8	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	10/31/17	20:50	21:11
9	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	10/31/17	21:44	22:05
10	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	10/31/17	22:31	22:52
11	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	11/01/17	12:45	13:06
12	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	11/01/17	13:44	14:05
1	Combustion Stack	USEPA Method 4	Moisture	10/31/17	13:40	15:29
2	Combustion Stack	USEPA Method 4	Moisture	10/31/17	17:04	19:04
3	Combustion Stack	USEPA Method 4	Moisture	10/31/17	20:20	22:04
4	Combustion Stack	USEPA Method 4	Moisture	10/31/17	22:32	23:07
5	Combustion Stack	USEPA Method 4	Moisture	11/01/17	12:44	13:14
6	Combustion Stack	USEPA Method 4	Moisture	11/01/17	13:44	14:14
1	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	10/31/17	13:40	14:01
2	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	10/31/17	14:26	14:47
3	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	10/31/17	15:09	15:30
4	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	10/31/17	17:05	17:26
5	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	10/31/17	17:54	18:15
6	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	10/31/17	18:45	19:06
7	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	10/31/17	20:04	20:25
8	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	10/31/17	20:50	21:11
9	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	10/31/17	21:44	22:05
10	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	10/31/17	22:31	22:52
11	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	11/01/17	12:44	13:05
12	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	11/01/17	13:44	14:05

Table 1-4:
Test Schedule – RATA #2

Run Number	Location	Method	Analyte	Date	Start Time	End Time
1	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	11/02/17	09:08	09:29
2	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	11/02/17	10:24	10:45
3	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	11/02/17	11:38	11:59
4	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	11/02/17	12:32	12:53
5	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	11/02/17	15:05	15:26
6	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	11/02/17	15:53	16:14
7	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	11/02/17	16:39	17:00
8	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	11/02/17	17:28	17:49
9	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	11/02/17	18:24	18:45
10	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	11/02/17	19:08	19:29
11	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	11/02/17	20:04	20:25
12	Combustion Stack	USEPA Methods 3A, 6C, 7E, 10	O_2/CO_2, SO_2, NOx, CO	11/02/17	20:57	21:18
1	Combustion Stack	USEPA Method 4	Moisture	11/02/17	09:08	10:54
2	Combustion Stack	USEPA Method 4	Moisture	11/02/17	11:38	13:02
3	Combustion Stack	USEPA Method 4	Moisture	11/02/17	15:05	16:59
4	Combustion Stack	USEPA Method 4	Moisture	11/02/17	17:28	19:29
5	Combustion Stack	USEPA Method 4	Moisture	11/02/17	20:05	21:27
1	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	11/02/17	09:08	09:29
2	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	11/02/17	10:24	10:45
3	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	11/02/17	11:38	11:59
4	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	11/02/17	12:32	12:53
5	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	11/02/17	15:05	15:26
6	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	11/02/17	15:53	16:14
7	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	11/02/17	16:39	17:00
8	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	11/02/17	17:28	17:49
9	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	11/02/17	18:24	18:45
10	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	11/02/17	19:09	19:30
11	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	11/02/17	20:04	20:25
12	Combustion Stack	USEPA Method 2 USTI Flow Data	Velocity & Flow Rate	11/02/17	20:57	21:18

Discussion

Project Synopsis

Relative Accuracy Testing

The RATA performed at the Combustion Stack consisted of concurrent pollutant emissions measurements using the facility CEMS and a RM monitoring system (CleanAir).

Each RATA was comprised of 12 runs of paired gaseous and flow measurements, with each measurement being performed for 21 minutes. The minimum requirement for RATA testing is nine test runs and the overall RATA relative accuracy and bias was calculated based on nine test runs.

The first RATA test began on October 31, 2017. A total of 10 RATA tests were performed with the remaining two tests being performed the next day. Initially, results indicated the CO (lb/hr) was above the previously-used

specification from Performance Specification 4 (10% RA). A second RATA was performed on November 02, 2017. Both RATAs consisted of twelve runs with the RA calculation based on nine tests.

Discussions at the end of the project with EES and MDEQ determined the CO specification should follow Performance Specification 6 instead of 4. This changed the relative accuracy specification from 10% versus the RM to 20% versus the RM. Both RATAs passed all parameters and both are included in this test report.

Copies of the RM one-minute average test run data, including pre-and-post run bias checks, are located in Appendix G. Additional data reduction and calculated results parameters are found in Appendix C.

From past data supplied by EES, gas stratification was not expected to be present and because the stack diameter is greater than 2.4 meters (7.8 ft), the sample points were sampled on the short line of 0.4, 1.0 and 2.0 meters per Section 8.1.2 of EPA Method 7E and as described in Performance Specification 2.

After successful completion of an initial system bias and calibration error check, a passing converter efficiency check was performed on the RM NOx analyzer according to Section 16.2 of USEPA Method 7E. Copies of the RM calibration error, NOx converter efficiency check, calibration gas certifications and other RM quality assurance and quality control (QA/QC) information are located in Appendix D.

EPA Method 4 Moisture

CleanAir determined moisture content in the gas sample stream using EPA Method 4. Stack gas was extracted at a constant rate, removing the moisture from the sampling stream. The moisture content of the sample was determined by gravimetric analysis of the condensate. CleanAir supplied USTI with flue gas moisture and diluent concentrations (O_2/CO_2) for flow rate calculations.

USTI Flue Gas Velocity Data

USTI provided data collected from their auto-probe including pressure, temperature, velocity (ft/sec) and volumetric flow rate (scfm). CleanAir utilized the flow data supplied by USTI for lb/hr calculations. USTI run data is found in Appendix I. The facility plant data is located in Appendix H.

Exhaust Flow Factor Tuning

CleanAir and USTI performed pre-RATA tuning measurements before the RATA began on Tuesday, October 31, 2017 on the Underfire Combustion Stack. The purpose of this testing was to evaluate preliminary measurements pertaining to the EES flow coefficient. All preliminary measurements are found in Appendix J. The EES coefficient factor of 0.839 was derived during the 2016 RATA. This factor was used from the September 2016 RATA until October 31, 2017. The preliminary measurements conducted during this test program resulted in a new flow coefficient of 0.946. This value was used for all RATA runs and no changes were made during the testing.

End of Section

2. RESULTS

This section summarizes the test program results. Additional results are available in the report appendices, specifically Appendix C Parameters.

Table 2-1:
Underfire Combustion Stack – CO_2 (%wv) – RATA #1

Run No.	Start Time	Date (2017)	RM Data (%wv)	CEMS Data (%wv)	Difference (%wv)	Difference Percent
1	13:40	Oct 31	4.57	4.7	-0.1338	-2.9%
2	14:24	Oct 31	4.57	4.7	-0.1338	-2.9%
3	15:09	Oct 31	4.64	4.8	-0.1586	-3.4%
4	17:04	Oct 31	4.63	4.8	-0.1726	-3.7%
5 *	17:54	Oct 31	4.62	4.8	-0.1791	-3.9%
6	18:45	Oct 31	4.73	4.9	-0.1674	-3.5%
7	20:04	Oct 31	4.76	4.9	-0.1427	-3.0%
8 *	20:50	Oct 31	4.76	5.0	-0.2443	-5.1%
9	21:44	Oct 31	4.72	4.9	-0.1788	-3.8%
10	22:31	Oct 31	4.65	4.8	-0.1459	-3.1%
11 *	12:45	Nov 1	4.47	4.7	-0.2322	-5.2%
12	13:44	Nov 1	4.60	4.6	-0.0048	-0.1%
Average			**4.6513**	**4.7889**	**-0.1376**	**-3.0%**

Relative Accuracy Test Audit Results

Standard Deviation of Differences	0.052467	
Confidence Coefficient (CC)	0.040329	
t-Value for 9 Data Sets	2.306	
		Limit
Avg. Abs. Diff. (%wv)	**0.138**	**1.0**

RM = Reference Method (CleanAir Data)
CEMS = Continuous Emissions Monitoring System (EES Coke Battery, L.L.C. Data)
RATA calculations are based on 9 of 12 runs. * indicates the excluded runs.

Table 2-2:
Underfire Combustion Stack – SO_2 (lb/hr) – RATA #1

Run No.	Start Time	Date (2017)	RM Data (lb/hr)	CEMS Data (lb/hr)	Difference (lb/hr)	Difference Percent
1	13:40	Oct 31	389.7220	438.8	-49.0780	-12.6%
2 *	14:24	Oct 31	381.7839	448.5	-66.7161	-17.5%
3 *	15:09	Oct 31	374.2720	439.6	-65.3280	-17.5%
4	17:04	Oct 31	369.8163	429.8	-59.9837	-16.2%
5 *	17:54	Oct 31	356.5484	421.4	-64.8516	-18.2%
6	18:45	Oct 31	379.1195	437.6	-58.4805	-15.4%
7	20:04	Oct 31	381.6243	441.6	-59.9757	-15.7%
8	20:50	Oct 31	380.0459	441.4	-61.3541	-16.1%
9	21:44	Oct 31	375.1047	438.8	-63.6953	-17.0%
10	22:31	Oct 31	371.4897	431.1	-59.6103	-16.0%
11	12:45	Nov 1	381.2360	442.0	-60.7640	-15.9%
12	13:44	Nov 1	371.0539	428.4	-57.3461	-15.5%
Average			**377.6903**	**436.6111**	**-58.9209**	**-15.6%**

Relative Accuracy Test Audit Results

Standard Deviation of Differences	4.098576	
Confidence Coefficient (CC)	3.150439	
t-Value for 9 Data Sets	2.306	
		Limit
Relative Accuracy (as % of RM)	**16.4%**	**20.0%**

RM = Reference Method (CleanAir Data)
CEMS = Continuous Emissions Monitoring System (EES Coke Battery, L.L.C. Data)
RATA calculations are based on 9 of 12 runs. * indicates the excluded runs.

Table 2-3:
Underfire Combustion Stack – NO_x (lb/hr) – RATA #1

Run No.	Start Time	Date (2017)	RM Data (lb/hr)	CEMS Data (lb/hr)	Difference (lb/hr)	Difference Percent
1	13:40	Oct 31	194.7	215.3	-20.5926	-10.6%
2 *	14:24	Oct 31	191.4	216.0	-24.5707	-12.8%
3 *	15:09	Oct 31	183.2	207.0	-23.7822	-13.0%
4	17:04	Oct 31	177.8	200.1	-22.3116	-12.5%
5	17:54	Oct 31	181.1	203.4	-22.3093	-12.3%
6	18:45	Oct 31	164.4	185.3	-20.9485	-12.7%
7	20:04	Oct 31	156.6	176.0	-19.4223	-12.4%
8	20:50	Oct 31	149.4	167.2	-17.7726	-11.9%
9	21:44	Oct 31	150.4	168.8	-18.4345	-12.3%
10	22:31	Oct 31	157.2	175.6	-18.4005	-11.7%
11 *	12:45	Nov 1	160.9	183.4	-22.4921	-14.0%
12	13:44	Nov 1	165.1	184.5	-19.4132	-11.8%
Average			**166.2883**	**186.2444**	**-19.9561**	**-12.0%**

Relative Accuracy Test Audit Results

Standard Deviation of Differences	1.679216	
Confidence Coefficient (CC)	1.290757	
t-Value for 9 Data Sets	2.306	
		Limit
Relative Accuracy (as % of RM)	**12.8%**	**20.0%**

RM = Reference Method (CleanAir Data)
CEMS = Continuous Emissions Monitoring System (EES Coke Battery, L.L.C. Data)
RATA calculations are based on 9 of 12 runs. * indicates the excluded runs.

Table 2-4:
Underfire Combustion Stack – CO (lb/hr) – RATA #1

Run No.	Start Time	Date (2017)	RM Data (lb/hr)	CEMS Data (lb/hr)	Difference (lb/hr)	Difference Percent
1	13:40	Oct 31	44.73	49.1	-4.3672	-9.8%
2 *	14:24	Oct 31	41.93	47.0	-5.0667	-12.1%
3	15:09	Oct 31	41.69	46.4	-4.7118	-11.3%
4 *	17:04	Oct 31	43.37	48.6	-5.2314	-12.1%
5	17:54	Oct 31	39.27	42.5	-3.2332	-8.2%
6	18:45	Oct 31	38.87	42.8	-3.9273	-10.1%
7	20:04	Oct 31	39.80	44.0	-4.2004	-10.6%
8	20:50	Oct 31	44.23	48.7	-4.4690	-10.1%
9	21:44	Oct 31	47.35	51.9	-4.5473	-9.6%
10	22:31	Oct 31	43.76	46.8	-3.0439	-7.0%
11 *	12:45	Nov 1	34.68	38.9	-4.2203	-12.2%
12	13:44	Nov 1	48.33	51.9	-3.5721	-7.4%
Average			**43.1142**	**47.1222**	**-4.0080**	**-9.3%**

Relative Accuracy Test Audit Results

Standard Deviation of Differences	0.601153	
Confidence Coefficient (CC)	0.462086	
t-Value for 9 Data Sets	2.306	
		Limit
Relative Accuracy (as % of RM)	**10.37%**	**20.0%**

RM = Reference Method (CleanAir Data)
CEMS = Continuous Emissions Monitoring System (EES Coke Battery, L.L.C. Data)
RATA calculations are based on 9 of 12 runs. * indicates the excluded runs.

Table 2-5:
Underfire Combustion Stack – Flow (kscfm) – RATA #1

Run No.	Start Time	Date (2017)	RM Data (KSCFH)	CEMS Data (KSCFH)	Difference	Difference Percent
1	13:40	Oct 31	6095.1	6110.0	-14.9	-0.2%
2	14:24	Oct 31	6016.6	6123.7	-107.1	-1.8%
3 *	15:09	Oct 31	6005.8	6118.6	-112.8	-1.9%
4 *	17:04	Oct 31	5977.1	6095.6	-118.5	-2.0%
5	17:54	Oct 31	6022.3	6064.7	-42.4	-0.7%
6	18:45	Oct 31	6026.1	6114.0	-87.9	-1.5%
7	20:04	Oct 31	6069.3	6086.8	-17.5	-0.3%
8	20:50	Oct 31	6051.3	6060.9	-9.6	-0.2%
9	21:44	Oct 31	6001.9	6043.3	-41.4	-0.7%
10	22:31	Oct 31	6024.0	6036.4	-12.4	-0.2%
11	12:45	Nov 1	6020.5	6101.9	-81.4	-1.4%
12 *	13:44	Nov 1	5925.5	6045.6	-120.1	-2.0%
Average			**6036.34**	**6082.41**	**-46.07**	**-0.8%**

Relative Accuracy Test Audit Results

Standard Deviation of Differences	37.096900	
Confidence Coefficient (CC)	28.515151	
t-Value for 9 Data Sets	2.306	
		Limit
Relative Accuracy (as % of RM)	**1.2%**	**20.0%**

RM = Reference Method (USTI Data)
CEMS = Continuous Emissions Monitoring System (EES Coke Battery, L.L.C. Data)
RATA calculations are based on 9 of 12 runs. * indicates the excluded runs.

Table 2-6:
Underfire Combustion Stack – CO_2 (%wv) – RATA #2

Run No.	Start Time	Date (2017)	RM Data (%wv)	CEMS Data (%wv)	Difference (%wv)	Difference Percent
1	09:08	Nov 2	4.5	4.6	-0.1065	-2.4%
2	10:24	Nov 2	4.5	4.5	-0.0295	-0.7%
3 *	11:38	Nov 2	4.5	3.9	0.5973	13.3%
4	12:32	Nov 2	4.6	4.6	-0.0470	-1.0%
5	15:05	Nov 2	4.8	4.8	0.0077	0.2%
6	15:53	Nov 2	4.7	4.7	0.0257	0.5%
7	16:39	Nov 2	4.7	4.8	-0.0749	-1.6%
8 *	17:28	Nov 2	4.6	4.7	-0.1233	-2.7%
9	18:24	Nov 2	4.6	4.7	-0.1101	-2.4%
10	19:08	Nov 2	4.7	4.8	-0.0802	-1.7%
11	20:04	Nov 2	4.6	4.6	0.0116	0.3%
12 *	20:57	Nov 2	4.7	4.8	-0.1104	-2.4%
Average			**4.6330**	**4.6778**	**-0.0448**	**-1.0%**

Relative Accuracy Test Audit Results

Standard Deviation of Differences	0.051689	
Confidence Coefficient (CC)	0.039731	
t-Value for 9 Data Sets	2.306	
		Limit
Avg. Abs. Diff. (%wv)	**0.055**	**1.0**

RM = Reference Method (CleanAir Data)
CEMS = Continuous Emissions Monitoring System (EES Coke Battery, L.L.C. Data)
RATA calculations are based on 9 of 12 runs. * indicates the excluded runs.

Table 2-7:
Underfire Combustion Stack – SO_2 (lb/hr) – RATA #2

Run No.	Start Time	Date (2017)	RM Data (lb/hr)	CEMS Data (lb/hr)	Difference (lb/hr)	Difference Percent
1	09:08	Nov 2	370.1	427.7	-57.5525	-15.5%
2	10:24	Nov 2	371.4	435.1	-63.7419	-17.2%
3 *	11:38	Nov 2	366.9	432.6	-65.7052	-17.9%
4 *	12:32	Nov 2	363.1	430.7	-67.5852	-18.6%
5 *	15:05	Nov 2	371.8	446.8	-75.0088	-20.2%
6	15:53	Nov 2	380.4	431.9	-51.5012	-13.5%
7	16:39	Nov 2	417.4	468.1	-50.7222	-12.2%
8	17:28	Nov 2	406.2	465.5	-59.3397	-14.6%
9	18:24	Nov 2	402.3	473.2	-70.8631	-17.6%
10	19:08	Nov 2	406.7	458.6	-51.8853	-12.8%
11	20:04	Nov 2	393.7	459.7	-66.0340	-16.8%
12	20:57	Nov 2	419.2	480.9	-61.6794	-14.7%
Average			**396.3756**	**455.6333**	**-59.2577**	**-14.9%**

Relative Accuracy Test Audit Results

Standard Deviation of Differences	7.043270	
Confidence Coefficient (CC)	5.413927	
t-Value for 9 Data Sets	2.306	
		Limit
Relative Accuracy (as % of RM)	**16.3%**	**20.0%**

RM = Reference Method (CleanAir Data)
CEMS = Continuous Emissions Monitoring System (EES Coke Battery, L.L.C. Data)
RATA calculations are based on 9 of 12 runs. * indicates the excluded runs.

Table 2-8:
Underfire Combustion Stack – NO_x (lb/hr) – RATA #2

Run No.	Start Time	Date (2017)	RM Data (lb/hr)	CEMS Data (lb/hr)	Difference (lb/hr)	Difference Percent
1	09:08	Nov 2	155.9	175.5	-19.5609	-12.5%
2	10:24	Nov 2	156.1	174.2	-18.1162	-11.6%
3 *	11:38	Nov 2	152.8	172.7	-19.9351	-13.0%
4 *	12:32	Nov 2	147.5	168.8	-21.2829	-14.4%
5 *	15:05	Nov 2	140.8	161.5	-20.6579	-14.7%
6	15:53	Nov 2	142.3	154.4	-12.1346	-8.5%
7	16:39	Nov 2	161.1	171.3	-10.2339	-6.4%
8	17:28	Nov 2	161.3	177.7	-16.3528	-10.1%
9	18:24	Nov 2	158.0	176.0	-17.9706	-11.4%
10	19:08	Nov 2	156.4	168.0	-11.5570	-7.4%
11	20:04	Nov 2	172.9	189.1	-16.2149	-9.4%
12	20:57	Nov 2	164.8	179.5	-14.7049	-8.9%
Average			**158.7616**	**173.9667**	**-15.2051**	**-9.6%**

Relative Accuracy Test Audit Results

Standard Deviation of Differences	3.262154	
Confidence Coefficient (CC)	2.507509	
t-Value for 9 Data Sets	2.306	
		Limit
Relative Accuracy (as % of RM)	**11.16%**	**20.0%**

RM = Reference Method (CleanAir Data)
CEMS = Continuous Emissions Monitoring System (EES Coke Battery, L.L.C. Data)
RATA calculations are based on 9 of 12 runs. * indicates the excluded runs.

Table 2-9:
Underfire Combustion Stack – CO (lb/hr) – RATA #2

Run No.	Start Time	Date (2017)	RM Data (lb/hr)	CEMS Data (lb/hr)	Difference (lb/hr)	Difference Percent
1	09:08	Nov 2	41.6	44.9	-3.3490	-8.1%
2	10:24	Nov 2	43.2	47.1	-3.8553	-8.9%
3 *	11:38	Nov 2	41.5	46.2	-4.6977	-11.3%
4 *	12:32	Nov 2	39.9	44.8	-4.8858	-12.2%
5 *	15:05	Nov 2	48.6	54.2	-5.5842	-11.5%
6	15:53	Nov 2	44.9	47.2	-2.2941	-5.1%
7	16:39	Nov 2	45.9	47.2	-1.3495	-2.9%
8	17:28	Nov 2	42.2	46.0	-3.7991	-9.0%
9	18:24	Nov 2	49.5	54.0	-4.4523	-9.0%
10	19:08	Nov 2	53.9	56.7	-2.7898	-5.2%
11	20:04	Nov 2	40.7	44.1	-3.4173	-8.4%
12	20:57	Nov 2	51.0	55.3	-4.3355	-8.5%
Average			**45.8731**	**49.1667**	**-3.2936**	**-7.2%**

Relative Accuracy Test Audit Results

Standard Deviation of Differences	1.003087	
Confidence Coefficient (CC)	0.771040	
t-Value for 9 Data Sets	2.306	
		Limit
Relative Accuracy (as % of RM)	**8.86%**	**20.0%**

RM = Reference Method (CleanAir Data)
CEMS = Continuous Emissions Monitoring System (EES Coke Battery, L.L.C. Data)
RATA calculations are based on 9 of 12 runs. * indicates the excluded runs.

Table 2-10:
Underfire Combustion Stack – Flow (kscfh) – RATA #2

Run No.	Start Time	Date (2017)	RM Data (KSCFH)	CEMS Data (KSCFH)	Difference	Difference Percent
1	09:08	Nov 2	6118.3	6242.5	-124.2	-2.0%
2	10:24	Nov 2	6126.6	6273.4	-146.8	-2.4%
3 *	11:38	Nov 2	6047.1	6315.7	-268.6	-4.4%
4 *	12:32	Nov 2	5915.3	6292.9	-377.6	-6.4%
5 *	15:05	Nov 2	5932.6	6309.6	-377.0	-6.4%
6	15:53	Nov 2	6044.4	6116.7	-72.3	-1.2%
7	16:39	Nov 2	6485.2	6474.6	10.6	0.2%
8	17:28	Nov 2	6381.2	6537.8	-156.6	-2.5%
9	18:24	Nov 2	6338.0	6560.9	-222.9	-3.5%
10	19:08	Nov 2	6374.1	6387.5	-13.4	-0.2%
11	20:04	Nov 2	6407.4	6488.7	-81.3	-1.3%
12	20:57	Nov 2	6384.7	6513.9	-129.2	-2.0%
Average			**6295.54**	**6399.56**	**-104.01**	**-1.7%**

Relative Accuracy Test Audit Results

Standard Deviation of Differences	73.007353	
Confidence Coefficient (CC)	56.118319	
t-Value for 9 Data Sets	2.306	
		Limit
Relative Accuracy (as % of RM)	**2.54%**	**20.0%**

RM = Reference Method (USTI Data)
CEMS = Continuous Emissions Monitoring System (EES Coke Battery, L.L.C. Data)
RATA calculations are based on 9 of 12 runs. * indicates the excluded runs.

End of Section

3. DESCRIPTION OF INSTALLATION

Process Description

EES Coke Battery, LLC is a DTE Energy Service facility located on Zug Island in River Rouge, Michigan. The testing described in this document will be performed at the pushing emissions control system (PECS) stack location. The process includes the PECS baghouse, Pushing Stack (PECS Stack) and an Underfire Combustion Stack.

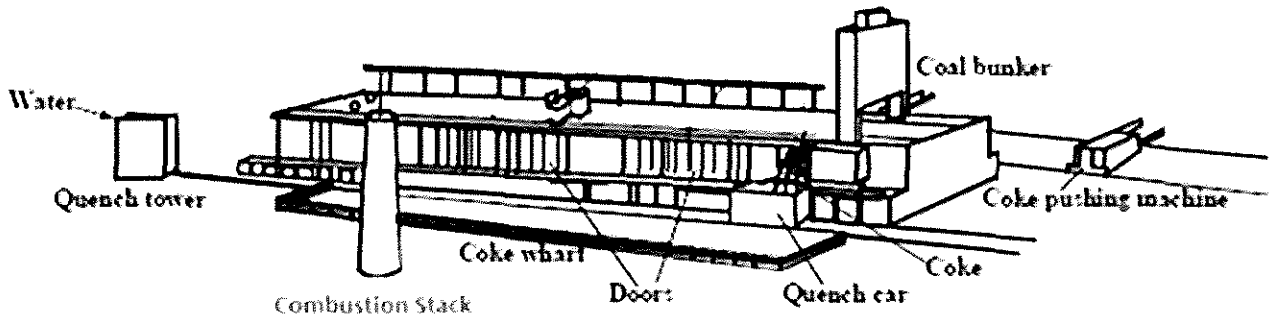
The No. 5 Coke Battery consists of 85 six-meter-high ovens producing furnace coke. A coal blend is used to charge each oven on timed intervals depending on the current production of the battery. Coking of the coal occurs in an oxygen free environment for 17 to 30 hours and the gases produced are collected, cleaned, and used to under fire the battery, supply fuel for other site sources, and sold to permitted off-site utilities.

The current permit limits allow for the charging of up to 1.420 million dry tons of coal. The design capacity heating requirement of the battery is approximately 375 MMBtu per hour. Also, the heating requirements of the battery at the current production rate are approximately 325 MMBtu per hour.

Process source description information above was taken directly from written information provided by EES.

The testing reported in this document was performed at the Underfire Combustion Stack. A schematic of the process, indicating sampling locations, is shown in Figure 3-1.

Figure 3-1:
Process Schematic



Note: The EES Coke Battery Underfire Combustion Stack is located on the other side of the battery as depicted in the drawing.

Test Location

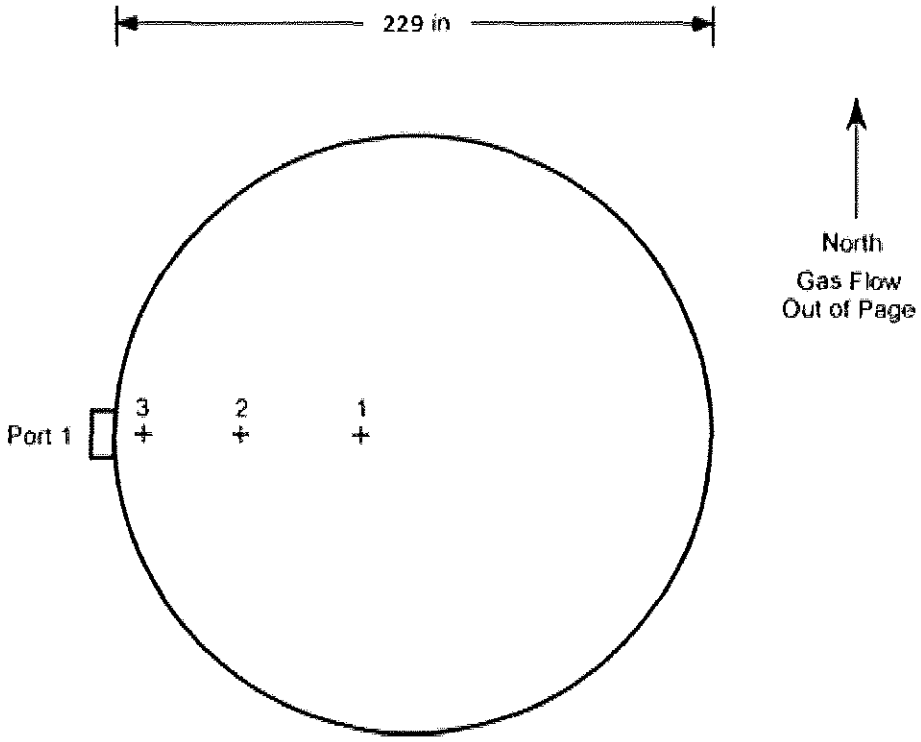
Performance Specification 2 determined the sample point locations for the gaseous RATA. Table 3-1 presents the sampling information for the test location. The figure shown on page 18 represents the layout of the test location.

Table 3-1:
Sampling Information

Source Constituent	Method	Run No.	Ports	Points per Port	Minutes per Point	Total Minutes	Figure
Underfire Comustion Stack							
O_2/CO_2, SO_2, NOx, CO	EPA 3A, 6C, 7E, 10	1-12	1	3	7	21	3-2
Moisture	EPA 4	1-5	1	1	60	60	NA

[1] Moisture sample was collected from a point near the center of the duct.

Figure 3-2:
Underfire Combustion Stack Sample Point Layout (Performance Specification 2)



Sampling Point	Port to Point Distance (inches)
1	78.7
2	47.2
3	15.7

Duct diameters upstream from flow disturbance (A): 10.9 Limit: 0.5
Duct diameters downstream from flow disturbance (B): 2.7 Limit: 2.0

End of Section

4. METHODOLOGY

Procedures and Regulations

The test program sampling measurements followed procedures and regulations outlined by the USEPA and State Agency Name. These methods appear in detail in Title 40 of the CFR and at https://www.epa.gov/emc. Appendix A includes diagrams of the sampling apparatus, as well as specifications for sampling, recovery and analytical procedures.

CleanAir follows specific QA/QC procedures outlined in the individual methods and in USEPA "Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III Stationary Source-Specific Methods," EPA/600/R-94/038C. Appendix D contains additional QA/QC measures, as outlined in CleanAir's internal Quality Manual.

Title 40 CFR Part 60, Appendix A

Method 1	"Sample and Velocity Traverses for Stationary Sources"
Method 2	"Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"
Method 3A	"Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)"
Method 4	"Determination of Moisture Content in Stack Gases"
Method 6C	"Determination of Sulfur Dioxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)"
Method 7E	"Determination of Nitrogen Oxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)"
Method 10	"Determination of Carbon Monoxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)"

Title 40 CFR Part 60, Appendix B Performance Specifications

PS2	"Specifications and Test Procedures for SO_2 and NOx Continuous Emission Monitoring Systems in Stationary Sources"
PS3	"Specifications and Test Procedures for O_2 and CO_2 Continuous Emission Monitoring Systems in Stationary Sources"
PS4	"Specifications and Test Procedures for Carbon Monoxide Continuous Emission Monitoring Systems in Stationary Sources"
PS6	"Specifications and Test Procedures for Continuous Emission Rate Monitoring Systems in Stationary Sources"

End of Section