



Marathon Petroleum Company  
1300 South Fort Street  
Detroit, MI 48217

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**REPORT ON RATA & COMPLIANCE TESTING**

Performed for:  
**MARATHON PETROLEUM COMPANY  
DETROIT REFINERY**

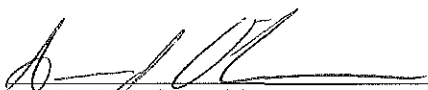
**ZURN BOILER STACK (SV22-BR7)**

Client Reference No: 4100665755  
CleanAir Project No: 12964-2  
Revision 0: June 6, 2016

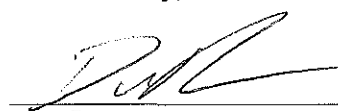
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To the best of our knowledge, the data presented in this report are accurate, complete, error free and representative of the actual emissions during the test program. Clean Air Engineering operates in conformance with the requirements of ASTM D7036-04 Standard Practice for Competence of Air Emission Testing Bodies.

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**REVISION HISTORY**

**REPORT ON RATA & COMPLIANCE TESTING**

***DRAFT REPORT REVISION HISTORY***

<b>Revision:</b>	<b>Date</b>	<b>Pages</b>	<b>Comments</b>
D0a	05/24/16	All	Draft version of original document.

***FINAL REPORT REVISION HISTORY***

<b>Revision:</b>	<b>Date</b>	<b>Pages</b>	<b>Comments</b>
0	06/06/16	All	Final version of original document.

## PROJECT OVERVIEW

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### INTRODUCTION

Marathon Petroleum Company (MPC) contracted Clean Air Engineering (CleanAir) to perform emissions measurements at the Detroit Refinery for relative accuracy test audit (RATA) and compliance purposes.

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). These regulations are referenced in the Michigan Department of Environmental Quality, Air Quality Division Permit to install No. 63-08D, issued on May 12, 2014.

### Key Project Participants

Individuals responsible for coordinating and conducting the test program were:

Crystal Davis – Marathon Petroleum Company  
Joe Reidy – Marathon Petroleum Company LP  
A. Obuchowski – CleanAir  
M. Cendana – CleanAir

### Test Program Parameters

The testing was performed at the Zurn Boiler Stack on April 13-14, 2016, and included the following emissions measurements:

- particulate matter (PM), assumed equivalent to filterable particulate matter (FPM) only
- sulfuric acid mist (H<sub>2</sub>SO<sub>4</sub>)
- volatile organic compounds (VOCs), assumed equivalent to total hydrocarbons (THC) minus the following constituents:
  - methane (CH<sub>4</sub>)
  - ethane (C<sub>2</sub>H<sub>6</sub>)
- nitrogen oxide (NO<sub>x</sub>)
- carbon monoxide (CO)
- flue gas composition (e.g., O<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>O)
- flue gas flow rate
- flue gas temperature

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**PROJECT OVERVIEW**

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**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	Zurn Boiler Stack	USEPA Method 5	FPM	04/13/16	09:52	11:58
2	Zurn Boiler Stack	USEPA Method 5	FPM	04/13/16	12:50	14:54
3	Zurn Boiler Stack	USEPA Method 5	FPM	04/13/16	15:30	17:35
1	Zurn Boiler Stack	USEPA Method 3A/7E/10	O <sub>2</sub> /CO <sub>2</sub> /NO <sub>x</sub> /CO	04/13/16	09:47	10:08
2	Zurn Boiler Stack	USEPA Method 3A/7E/10	O <sub>2</sub> /CO <sub>2</sub> /NO <sub>x</sub> /CO	04/13/16	10:21	10:42
3	Zurn Boiler Stack	USEPA Method 3A/7E/10	O <sub>2</sub> /CO <sub>2</sub> /NO <sub>x</sub> /CO	04/13/16	10:53	11:14
4	Zurn Boiler Stack	USEPA Method 3A/7E/10	O <sub>2</sub> /CO <sub>2</sub> /NO <sub>x</sub> /CO	04/13/16	11:25	11:46
5	Zurn Boiler Stack	USEPA Method 3A/7E/10	O <sub>2</sub> /CO <sub>2</sub> /NO <sub>x</sub> /CO	04/13/16	11:55	12:16
6	Zurn Boiler Stack	USEPA Method 3A/7E/10	O <sub>2</sub> /CO <sub>2</sub> /NO <sub>x</sub> /CO	04/13/16	12:33	12:54
7	Zurn Boiler Stack	USEPA Method 3A/7E/10	O <sub>2</sub> /CO <sub>2</sub> /NO <sub>x</sub> /CO	04/13/16	13:09	13:30
8	Zurn Boiler Stack	USEPA Method 3A/7E/10	O <sub>2</sub> /CO <sub>2</sub> /NO <sub>x</sub> /CO	04/13/16	13:40	14:01
9	Zurn Boiler Stack	USEPA Method 3A/7E/10	O <sub>2</sub> /CO <sub>2</sub> /NO <sub>x</sub> /CO	04/13/16	14:13	14:34
10	Zurn Boiler Stack	USEPA Method 3A/7E/10	O <sub>2</sub> /CO <sub>2</sub> /NO <sub>x</sub> /CO	04/13/16	14:45	15:06
1	Zurn Boiler Stack	USEPA 3A/18/25A	O <sub>2</sub> /CO <sub>2</sub> /CH <sub>4</sub> /C <sub>2</sub> H <sub>6</sub> /THC	04/13/16	09:47	11:14
2	Zurn Boiler Stack	USEPA 3A/18/25A	O <sub>2</sub> /CO <sub>2</sub> /CH <sub>4</sub> /C <sub>2</sub> H <sub>6</sub> /THC	04/13/16	11:25	12:54
3	Zurn Boiler Stack	USEPA 3A/18/25A	O <sub>2</sub> /CO <sub>2</sub> /CH <sub>4</sub> /C <sub>2</sub> H <sub>6</sub> /THC	04/13/16	13:09	14:34
0	Zurn Boiler Stack	Draft ASTM CCM	H <sub>2</sub> SO <sub>4</sub>	04/14/16	08:23	09:23
1	Zurn Boiler Stack	Draft ASTM CCM	H <sub>2</sub> SO <sub>4</sub>	04/14/16	10:28	11:28
2	Zurn Boiler Stack	Draft ASTM CCM	H <sub>2</sub> SO <sub>4</sub>	04/14/16	12:14	13:14
3	Zurn Boiler Stack	Draft ASTM CCM	H <sub>2</sub> SO <sub>4</sub>	04/14/16	13:56	14:56

**PROJECT OVERVIEW**

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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 through 2-12.

**Table 1-2:  
Summary of Test Results**

<u>Source</u> Constituent	<u>Sampling</u> Method	<u>Average</u> Emission	<u>Permit Limit</u> <sup>1</sup>
<u>Zurn Boiler Stack</u>			
PM (lb/MMBtu)	USEPA 5	0.0008	0.0019
H <sub>2</sub> SO <sub>4</sub> (ppmdv)	Draft ASTM CCM	0.0136	N/A
H <sub>2</sub> SO <sub>4</sub> (lb/MMBtu)	Draft ASTM CCM	5.4E-05	N/A
VOC (lb/MMBtu)	USEPA 18/25A	<0.0006	0.0055
NO <sub>x</sub> (lb/MMBtu)	USEPA 7E	0.18	0.20
CO (lb/MMBtu)	USEPA 10	0.03	0.10

<sup>1</sup> Permit limits obtained from MDEQ Permit To Install No. 63-08D.

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**Table 1-3:  
Summary of RATA Results**

<u>Source</u> Constituent	<u>Reference</u> Method	<u>Relative</u> Accuracy (%) <sup>1</sup>	<u>Applicable</u> Specification	<u>Specification</u> Limit <sup>2</sup>
<u>Zurn Boiler Stack</u>				
O <sub>2</sub> (% dv)	EPA 3A	0.14	PS3	±1.0 % dv
NO <sub>x</sub> (lb/MMBtu)	EPA 7E, 3A, 19	0.00	PS2	20% of RM
CO (lb/MMBtu)	EPA 10, 3A, 19	0.00	PS4	10% of RM

<sup>1</sup> Relative Accuracy is expressed in terms of comparison to the reference method (% RM) or applicable emission standard (% Std.) The specific expression used depends on the specification limit cited.

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<sup>2</sup> Specification limits obtained from 40 CFR 60, Appendix B, Performance Specifications.

**PROJECT OVERVIEW**

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***Discussion of Test Program******FPM Testing - EPA Method 5***

For this test program, PM emission rate is assumed equivalent to FPM emission rate. Three 120-minute Method 5 test runs were performed on April 13, 2016. The final result was expressed as the average of three valid runs.

***H<sub>2</sub>SO<sub>4</sub> Testing - Draft ASTM Controlled Condensation Method***

Three 60-minute test runs were performed on April 14, 2016. The final result was expressed as the average of three valid runs.

***O<sub>2</sub> and NO<sub>x</sub> Emissions / RATA Testing - EPA Methods 3A and 7E; Performance Specifications 2 and 3***

Minute-average data points for O<sub>2</sub>, CO<sub>2</sub> and NO<sub>x</sub> (dry basis) were collected over a period of 21 minutes for each RATA Reference Method (RM) run. The average result for each RM run was calculated and compared to the average result from the facility CEMS over an identical time interval in order to calculate relative accuracy (RA).

RM NO<sub>x</sub> and CO RATA results were also presented to demonstrate compliance with permit limits. The final result was expressed as the average of all 10 RATA runs.

***VOC Testing - EPA Methods 25A and 18***

Three VOC test runs were performed concurrently with the RATA testing. Nine 21-minute Method 25 test runs for THC were performed concurrently with three Method 18 bag collections for CH<sub>4</sub> and C<sub>2</sub>H<sub>6</sub>, with each Method 18 sample collected over a period of about 63 minutes. Method 18 samples were collected as follows:

- Method 18 Run 1: Collected during RATA Runs 1, 2 and 3
- Method 18 Run 2: Collected during RATA Runs 4, 5 and 6
- Method 18 Run 3: Collected during RATA Runs 7, 8 and 9

## PROJECT OVERVIEW

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The VOC emission rate is normally equivalent to THC emission rate, minus CH<sub>4</sub> and C<sub>2</sub>H<sub>6</sub> emission rate. The calculated emission rate of CH<sub>4</sub> and C<sub>2</sub>H<sub>6</sub> detected through analysis of each Method 18 sample bag exceeded the amount of THC measured by the on-line THC analyzer.

This is likely due to variations in the calibration standards, measurement and analytical technique. Therefore, VOC emissions are reported as a value "less than" 1% of the calibration span of THC instrument. The final results were calculated using the average of three valid test runs, all using a concentration of 1% of the instrument span and reported as "less than" the amount.

### *Calculation of Final Results*

Emission results in units of dry volume-based concentration (lb/dscf, ppm<sub>dv</sub>) were converted to units of pounds per million Btu (lb/MMBtu) using the oxygen-based fuel factor (F<sub>d</sub>) for natural gas in EPA Method 19, Table 19-2.

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*End of Section 1 – Project Overview*

**RESULTS****Table 2-1:  
Zurn Boiler Stack – FPM Emissions (USEPA 5)**

Run No.		1	2	3	Average
Date (2016)		Apr 13	Apr 13	Apr 13	
Start Time (approx.)		09:52	12:50	15:30	
Stop Time (approx.)		11:58	14:54	17:35	
<b>Process Conditions</b>					
P <sub>1</sub>	Fuel gas flow rate (Mscf/day)	271	269	272	271
F <sub>d</sub>	Oxygen-based F-factor (dscf/MMBtu)	8,710	8,710	8,710	8,710
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	8,760
<b>Gas Conditions</b>					
O <sub>2</sub>	Oxygen (dry volume %)	5.3	5.3	5.2	5.3
CO <sub>2</sub>	Carbon dioxide (dry volume %)	8.8	8.9	8.9	8.9
T <sub>s</sub>	Sample temperature (°F)	356	363	361	360
B <sub>w</sub>	Actual water vapor in gas (% by volume)	14.7	14.0	14.2	14.3
<b>Gas Flow Rate</b>					
Q <sub>a</sub>	Volumetric flow rate, actual (acfm)	56,700	62,400	62,300	60,500
Q <sub>s</sub>	Volumetric flow rate, standard (scfm)	36,300	39,800	39,700	38,600
Q <sub>std</sub>	Volumetric flow rate, dry standard (dscfm)	31,000	34,200	34,100	33,100
Q <sub>a</sub>	Volumetric flow rate, actual (acf/hr)	3,400,000	3,750,000	3,740,000	3,630,000
Q <sub>s</sub>	Volumetric flow rate, standard (scf/hr)	2,180,000	2,390,000	2,380,000	2,320,000
Q <sub>std</sub>	Volumetric flow rate, dry standard (dscf/hr)	1,860,000	2,050,000	2,040,000	1,990,000
<b>Sampling Data</b>					
V <sub>mstd</sub>	Volume metered, standard (dscf)	64.02	68.42	67.71	66.71
%I	Isokinetic sampling (%)	101.4	98.1	97.5	99.0
<b>Laboratory Data</b>					
m <sub>n</sub>	Total FPM(g)	0.00194	0.00230	0.00161	
n <sub>MIDL</sub>	Number of non-detectable fractions	N/A	N/A	N/A	
DLC	Detection level classification	ADL	ADL	ADL	
<b>FPM Results</b>					
C <sub>sd</sub>	Particulate Concentration (lb/dscf)	6.68E-08	7.41E-08	5.24E-08	6.45E-08
E <sub>lb/hr</sub>	Particulate Rate (lb/hr)	0.124	0.152	0.107	0.128
E <sub>T/yr</sub>	Particulate Rate (Ton/yr)	0.544	0.667	0.470	0.560
E <sub>Fd</sub>	Particulate Rate - F <sub>d</sub> -based (lb/MMBtu)	7.80E-04	8.65E-04	6.08E-04	7.51E-04

Average includes 3 runs.

Detection level classifications are defined as follows:

ADL = Above Detection Level - all fractions are above detection limit



**RESULTS****Table 2-2:  
Uncertainty Analysis – FPM (USEPA 5)**

	FPM Results (lb/MMBtu)		FPM Results (lb/hr)		FPM Results (Ton/yr)	
Method	5		5		5	
Run No.	1	7.80E-04	1	0.124	1	0.544
	2	8.65E-04	2	0.152	2	0.667
	3	6.08E-04	3	0.107	3	0.470
<b>SD</b>		1.31E-04		0.023		0.0995
<b>AVG</b>		<b>7.51E-04</b>		<b>0.128</b>		<b>0.560</b>
<b>RSD</b>		17.4%		17.8%		17.8%
<b>N</b>		3		3		3
<b>SE</b>		7.56E-05		1.3115E-02		0.0574
<b>RSE</b>		10.1%		10.3%		10.3%
<b>P</b>		95.0%		95.0%		95.0%
<b>TINV</b>		4.303		4.30		4.303
<b>CI +</b>		1.08E-03		1.84E-01		0.807
<b>AVG</b>		<b>7.51E-04</b>		<b>1.28E-01</b>		<b>0.560</b>
<b>CI -</b>		4.26E-04		7.15E-02		0.313
<b>TB +</b>		1.75E-03		3.02E-01		1.32

AVG (average) is the mean value of the runs; N is the number of individual runs.

SD (standard deviation) and RSD (relative standard deviation) are measures of the variability of individual runs.

SE (standard error) and RSE (relative standard error) are measures of the variability of the average of the runs.

P (probability) is the confidence level associated with the two-tailed Student's t-distribution.

TINV (t-value) is the value of the Student's t-distribution as a function of P (probability) and N-1 (degrees of freedom).

CI (confidence interval) indicates that if the test is conducted again under the same conditions, the average would be expected to fall within the interval (CI- to CI+) about 95% of the time.

TB+ (upper tolerance bound) is the value below which 95% of future runs are expected to fall (assuming testing at the same conditions).

**RESULTS****Table 2-3:  
Zurn Boiler Stack – H<sub>2</sub>SO<sub>4</sub> Emissions (Draft ASTM CCM)**

Run No.		1	2	3	Average
Date (2016)		Apr 14	Apr 14	Apr 14	
Start Time (approx.)		10:28	12:14	13:56	
Stop Time (approx.)		11:28	13:14	14:56	
<b>Process Conditions</b>					
P <sub>1</sub>	Fuel gas flow rate (Mscf/day)	247	385	425	<b>352</b>
F <sub>d</sub>	Oxygen-based F-factor (dscf/MMBtu)	8,710	8,710	8,710	<b>8,710</b>
<b>Gas Conditions</b>					
O <sub>2</sub>	Oxygen (dry volume %)	5.3	5.2	5.3	<b>5.3</b>
CO <sub>2</sub>	Carbon dioxide (dry volume %)	8.9	8.9	8.9	<b>8.9</b>
T <sub>s</sub>	Sample temperature (°F)	363	368	372	<b>367</b>
B <sub>w</sub>	Actual water vapor in gas (% by volume)	14.97	15.17	14.53	<b>14.55</b>
<b>Sampling Data</b>					
V <sub>mstd</sub>	Volume metered, standard (dscf)	26.35	26.53	26.10	<b>26.33</b>
<b>Laboratory Data (Ion Chromatography)</b>					
m <sub>n</sub>	Total H <sub>2</sub> SO <sub>4</sub> collected (mg)	0.0482	0.0701	0.0469	
<b>Sulfuric Acid Vapor (H<sub>2</sub>SO<sub>4</sub>) Results</b>					
C <sub>sd</sub>	H <sub>2</sub> SO <sub>4</sub> Concentration (lb/dscf)	4.04E-09	5.826E-09	3.962E-09	<b>3.456E-09</b>
C <sub>sd</sub>	H <sub>2</sub> SO <sub>4</sub> Concentration (ppmdv)	0.0159	0.0229	0.0156	<b>0.0136</b>
E <sub>Fd</sub>	H <sub>2</sub> SO <sub>4</sub> Rate - F <sub>d</sub> -based (lb/MMBtu)	4.71E-05	6.755E-05	4.623E-05	<b>5.363E-05</b>

Average includes three runs.

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**RESULTS**

**Table 2-4:  
Uncertainty Analysis – H<sub>2</sub>SO<sub>4</sub> Emissions (Draft ASTM CCM)**

Method Run No.	H2SO4 Results (ppmdv)		H2SO4 Results (lb/MMBtu)	
		CCM		CCM
	1	1.59E-02	1	4.71E-05
	2	2.29E-02	2	6.76E-05
	3	1.56E-02	3	4.62E-05
<b>SD</b>		4.15E-03		1.21E-05
<b>AVG</b>		<b>1.81E-02</b>		<b>5.36E-05</b>
<b>RSD</b>		22.9%		22.5%
<b>N</b>		3		3
<b>SE</b>		2.39E-03		6.97E-06
<b>RSE</b>		13.2%		13.0%
<b>P</b>		95.0%		95.0%
<b>TINV</b>		4.303		4.303
<b>CI +</b>		2.84E-02		8.36E-05
<b>AVG</b>		<b>1.81E-02</b>		<b>5.36E-05</b>
<b>CI -</b>		7.81E-03		2.37E-05
<b>TB +</b>		0.050		1.46E-04

AVG (average) is the mean value of the runs; N is the number of individual runs.

SD (standard deviation) and RSD (relative standard deviation) are measures of the variability of individual runs.

SE (standard error) and RSE (relative standard error) are measures of the variability of the average of the runs.

P (probability) is the confidence level associated with the two-tailed Student's t-distribution.

TINV (t-value) is the value of the Student's t-distribution as a function of P (probability) and N-1 (degrees of freedom).

CI (confidence interval) indicates that if the test is conducted again under the same conditions, the average would be expected to fall within the interval (CI- to CI+) about 95% of

TB+ (upper tolerance bound) is the value below which 95% of future runs are expected to fall (assuming testing at the same conditions).

**RESULTS****Table 2-5:  
Zurn Boiler Stack – THC, CH<sub>4</sub>, C<sub>2</sub>H<sub>6</sub> and VOC Emissions (USEPA 25A / 18)**

Run No.		1	2	3	Average
Date (2016)		Apr 13	Apr 13	Apr 13	
Start Time (approx.)		09:47	11:25	13:09	
Stop Time (approx.)		11:14	12:54	14:34	
<b>Process Conditions</b>					
P <sub>1</sub>	Natural gas flow rate (Mscf/day)	271	271	269	270
F <sub>d</sub>	Oxygen-based F-factor (dscf/MMBtu)	8,710	8,710	8,710	8,710
<b>Gas Conditions</b>					
O <sub>2</sub>	Oxygen (dry volume %)	5.2	5.1	5.2	5.2
CO <sub>2</sub>	Carbon dioxide (dry volume %)	9.0	9.0	9.0	9.0
B <sub>w</sub>	Actual water vapor in gas (% by volume) <sup>1</sup>	14.7	14.0	14.2	14.3
<b>THC Results</b>					
C <sub>ed</sub>	Concentration (ppmdvas C <sub>3</sub> H <sub>8</sub> )	16.64	13.86	13.93	14.81
C <sub>sd</sub>	Concentration (lb/dscf)	1.90E-06	1.59E-06	1.59E-06	1.70E-06
E <sub>Fd</sub>	Emission Rate - F <sub>d</sub> -based (lb/MMBtu)	0.0221	0.0183	0.0184	0.0196
<b>Methane Results</b>					
C <sub>sd</sub>	Concentration (ppmdv)	47.2	46.0	45.0	46.1
C <sub>sd</sub>	Concentration (lb/dscf)	1.97E-06	1.92E-06	1.87E-06	1.92E-06
E <sub>Fd</sub>	Emission Rate - F <sub>d</sub> -based (lb/MMBtu)	0.0228	0.0221	0.0217	0.0222
<b>Ethane Results</b>					
C <sub>sd</sub>	Concentration (ppmdv)	2.50	2.51	2.53	2.51
C <sub>sd</sub>	Concentration (lb/dscf)	1.95E-07	1.96E-07	1.97E-07	1.96E-07
E <sub>Fd</sub>	Emission Rate - F <sub>d</sub> -based (lb/MMBtu)	2.27E-03	2.26E-03	2.28E-03	2.27E-03
<b>VOC Results</b>					
E <sub>Fd</sub>	Emission Rate - F <sub>d</sub> -based (lb/MMBtu)	<5.54E-04	<5.51E-04	<5.52E-04	<5.52E-04

Average includes 3 runs.

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<sup>1</sup> Moisture data used for ppmv to ppmvd correction obtained from the average of nearly-concurrent Method 5 runs.

For VOCs, '&lt;' indicates a measured/calculated response below the detection limit (assumed to be 1% of the instrument calibration span).

**RESULTS****Table 2-6:  
Zurn Boiler Stack – NO<sub>x</sub> Emissions (USEPA 7E)**

Run No.		1	2	3	4	5	6
Date (2016)		Apr 13	Apr 13	Apr 13	Apr 13	Apr 13	Apr 13
Start Time (approx.)		09:47	10:21	10:53	11:25	11:55	12:33
Stop Time (approx.)		10:08	10:42	11:14	11:46	12:16	12:54
<b>Process Conditions</b>							
P <sub>1</sub>	Natural gas flow rate (Mscf/day)	271	271	271	271	271	271
F <sub>d</sub>	Oxygen-based F-factor (dscf/MMBtu)	8,710	8,710	8,710	8,710	8,710	8,710
<b>Gas Conditions</b>							
O <sub>2</sub>	Oxygen (dry volume %)	5.4	5.2	5.2	5.2	5.1	5.1
CO <sub>2</sub>	Carbon dioxide (dry volume %)	8.9	9.0	9.0	9.0	9.0	9.1
<b>Nitrogen Oxides Results</b>							
C <sub>sd</sub>	Concentration (ppmdv)	124	128	128	130	130	131
C <sub>sd-x</sub>	Concentration @ 0% O <sub>2</sub> (ppmdv)	167	169	171	172	172	173
C <sub>sd</sub>	Concentration (lb/dscf)	1.48E-05	1.52E-05	1.53E-05	1.55E-05	1.55E-05	1.56E-05
E <sub>Fd</sub>	Emission Rate - F <sub>d</sub> -based (lb/MMBtu)	0.173	0.176	0.177	0.179	0.179	0.180
<b>Carbon Monoxide Results</b>							
C <sub>sd</sub>	Concentration (ppmdv)	37.40	37.06	37.22	36.65	37.50	37.80
C <sub>sd-x</sub>	Concentration @ 0% O <sub>2</sub> (ppmdv)	50.3	49.2	49.4	48.6	49.7	50.0
C <sub>sd</sub>	Concentration (lb/dscf)	2.72E-06	2.69E-06	2.71E-06	2.66E-06	2.73E-06	2.75E-06
E <sub>Fd</sub>	Emission Rate - F <sub>d</sub> -based (lb/MMBtu)	0.0318	0.0312	0.0313	0.0308	0.0315	0.0317
<b>Run No.</b>		<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>Average</b>	
Date (2016)		Apr 13	Apr 13	Apr 13	Apr 13		
Start Time (approx.)		13:09	13:40	14:13	14:45		
Stop Time (approx.)		13:30	14:01	14:34	15:06		
<b>Process Conditions</b>							
P <sub>1</sub>	Natural gas flow rate (Mscf/day)	269	269	269	269	<b>270</b>	
F <sub>d</sub>	Oxygen-based F-factor (dscf/MMBtu)	8,710	8,710	8,710	8,710	<b>8,710</b>	
<b>Gas Conditions</b>							
O <sub>2</sub>	Oxygen (dry volume %)	5.2	5.0	5.2	5.2	<b>5.2</b>	
CO <sub>2</sub>	Carbon dioxide (dry volume %)	9.0	9.1	9.0	9.0	<b>9.0</b>	
<b>Nitrogen Oxides Results</b>							
C <sub>sd</sub>	Concentration (ppmdv)	129	133	132	129	<b>129.2</b>	
C <sub>sd-x</sub>	Concentration @ 0% O <sub>2</sub> (ppmdv)	172	175	175	172	<b>171.7</b>	
C <sub>sd</sub>	Concentration (lb/dscf)	1.53E-05	1.59E-05	1.57E-05	1.54E-05	<b>1.54E-05</b>	
E <sub>Fd</sub>	Emission Rate - F <sub>d</sub> -based (lb/MMBtu)	0.178	0.182	0.182	0.179	<b>1.79E-01</b>	
<b>Carbon Monoxide Results</b>							
C <sub>sd</sub>	Concentration (ppmdv)	37.64	37.20	37.18	38.18	<b>37.38</b>	
C <sub>sd-x</sub>	Concentration @ 0% O <sub>2</sub> (ppmdv)	50.3	49.0	49.4	51.0	<b>49.70</b>	
C <sub>sd</sub>	Concentration (lb/dscf)	2.74E-06	2.70E-06	2.70E-06	2.78E-06	<b>2.72E-06</b>	
E <sub>Fd</sub>	Emission Rate - F <sub>d</sub> -based (lb/MMBtu)	0.0318	0.0310	0.0313	0.0323	<b>0.0315</b>	

Average includes 10 runs.

0804 10 154528

**RESULTS**

**Table 2-7:  
Zurn Boiler Stack – O<sub>2</sub> RATA (USEPA 3A / PS3)**

Run No.	Start Time	Date (2016)	RM Data (%dv)	CEMS Data (%dv)	Difference (%dv)	Difference Percent
1	09:47	Apr 13	5.36	5.50	-0.14	-2.6%
2 *	10:21	Apr 13	5.17	5.32	-0.15	-2.9%
3	10:53	Apr 13	5.17	5.31	-0.14	-2.7%
4	11:25	Apr 13	5.15	5.30	-0.15	-2.9%
5	11:55	Apr 13	5.14	5.28	-0.14	-2.7%
6	12:33	Apr 13	5.10	5.24	-0.14	-2.7%
7	13:09	Apr 13	5.25	5.39	-0.14	-2.7%
8	13:40	Apr 13	5.04	5.18	-0.14	-2.8%
9	14:13	Apr 13	5.18	5.31	-0.13	-2.5%
10	14:45	Apr 13	5.24	5.38	-0.14	-2.7%
<b>Average</b>			<b>5.18</b>	<b>5.32</b>	<b>-0.14</b>	<b>-2.7%</b>

**Relative Accuracy Test Audit Results**

Standard Deviation of Differences      0.005  
Confidence Coefficient (CC)              0.004  
t-Value for 9 Data Sets                    2.306

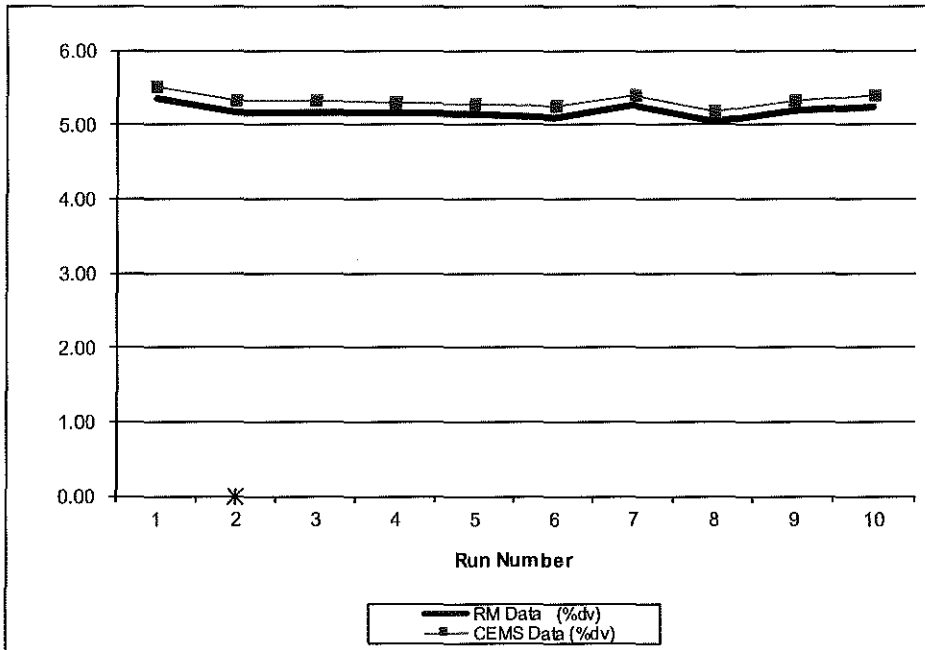
Avg. Abs. Diff. (%dv)                    **0.14**                    Limit      **1.0**

RM = Reference Method (CleanAir Data)

051816 04803

CEMS = Continuous Emissions Monitoring System (Marathon Petroleum Corporation Data)

RATA calculations are based on 9 of 10 runs. \* indicates the excluded run.



**RESULTS**

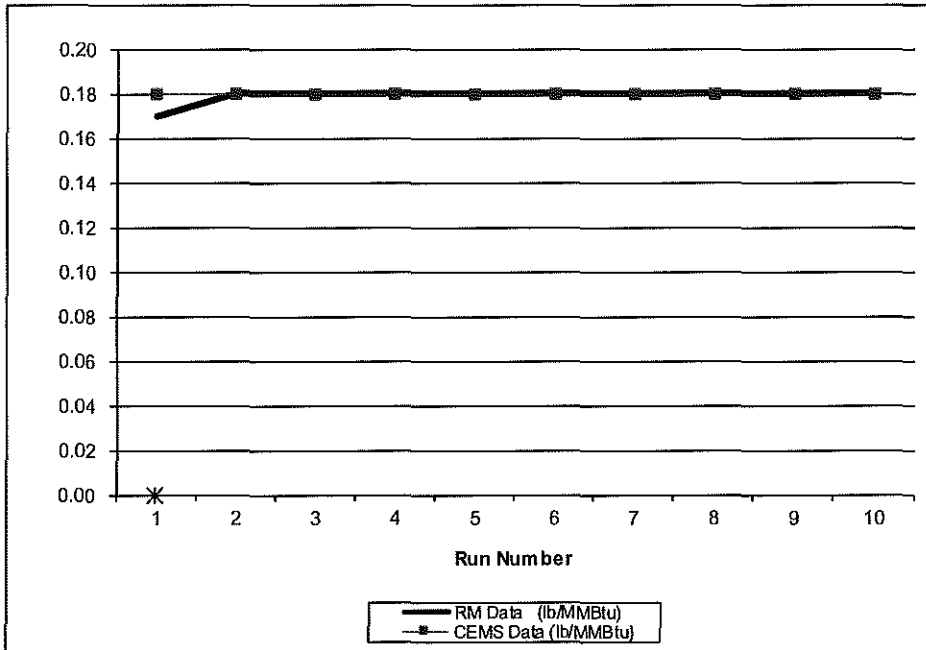
**Table 2-8:  
Zurn Boiler Stack – NO<sub>x</sub> (lb/MMBtu) RATA (USEPA 7E / PS2)**

Run No.	Start Time	Date (2016)	RM Data (lb/MMBtu)	CEMS Data (lb/MMBtu)	Difference (lb/MMBtu)	Difference Percent
1 *	09:47	Apr 13	0.17	0.18	-0.01	-5.9%
2	10:21	Apr 13	0.18	0.18	0.00	0.0%
3	10:53	Apr 13	0.18	0.18	0.00	0.0%
4	11:25	Apr 13	0.18	0.18	0.00	0.0%
5	11:55	Apr 13	0.18	0.18	0.00	0.0%
6	12:33	Apr 13	0.18	0.18	0.00	0.0%
7	13:09	Apr 13	0.18	0.18	0.00	0.0%
8	13:40	Apr 13	0.18	0.18	0.00	0.0%
9	14:13	Apr 13	0.18	0.18	0.00	0.0%
10	14:45	Apr 13	0.18	0.18	0.00	0.0%
<b>Average</b>			<b>0.18</b>	<b>0.18</b>	<b>0.00</b>	<b>0.0%</b>

**Relative Accuracy Test Audit Results**

Standard Deviation of Differences	0.000	
Confidence Coefficient (CC)	0.000	
t-Value for 9 Data Sets	2.306	
Relative Accuracy (as % of RM)	0.0%	Limit 20.0%

RM = Reference Method (CleanAir Data) 05/16 105709  
 CEMS = Continuous Emissions Monitoring System (Marathon Petroleum Corporation Data)  
 RATA calculations are based on 9 of 10 runs. \* indicates the excluded run.



**RESULTS**

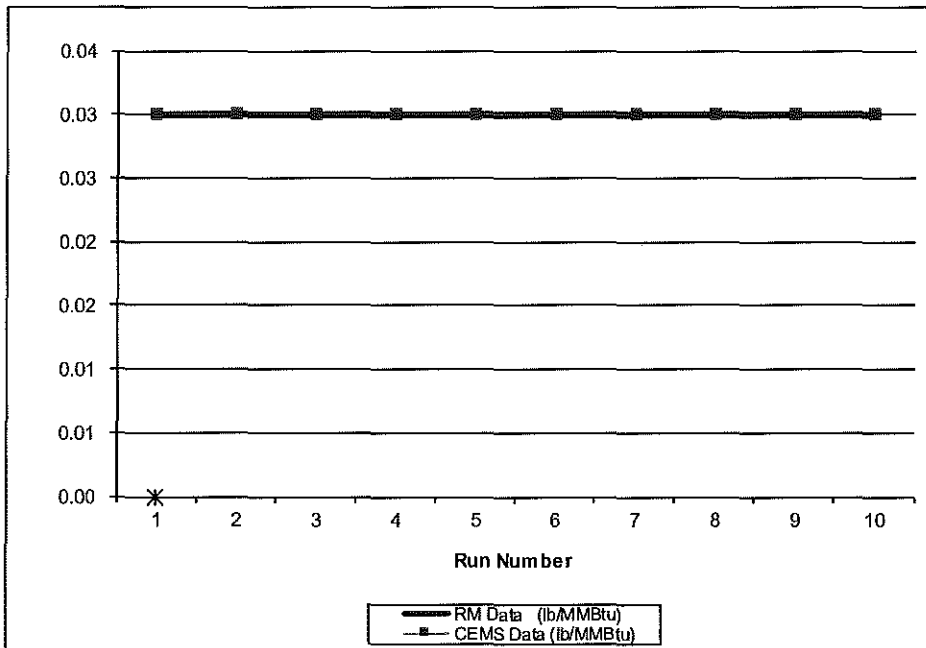
**Table 2-9:  
Zurn Boiler Stack – CO (lb/MMBtu) RATA (USEPA 10)**

Run No.	Start Time	Date (2016)	RM Data (lb/MMBtu)	CEMS Data (lb/MMBtu)	Difference (lb/MMBtu)	Difference Percent
1 *	09:47	Apr 13	0.03	0.03	0.00	0.0%
2	10:21	Apr 13	0.03	0.03	0.00	0.0%
3	10:53	Apr 13	0.03	0.03	0.00	0.0%
4	11:25	Apr 13	0.03	0.03	0.00	0.0%
5	11:55	Apr 13	0.03	0.03	0.00	0.0%
6	12:33	Apr 13	0.03	0.03	0.00	0.0%
7	13:09	Apr 13	0.03	0.03	0.00	0.0%
8	13:40	Apr 13	0.03	0.03	0.00	0.0%
9	14:13	Apr 13	0.03	0.03	0.00	0.0%
10	14:45	Apr 13	0.03	0.03	0.00	0.0%
<b>Average</b>			<b>0.03</b>	<b>0.03</b>	<b>0.00</b>	<b>0.0%</b>

**Relative Accuracy Test Audit Results**

Standard Deviation of Differences	0.000	
Confidence Coefficient (CC)	0.000	
t-Value for 9 Data Sets	2.306	
Relative Accuracy (as % of RM)	<b>0.0%</b>	<b>Limit 10.0%</b>

RM = Reference Method (CleanAir Data) 051816 104803  
 CEMS = Continuous Emissions Monitoring System (Marathon Petroleum Corporation Data)  
 RATA calculations are based on 9 of 10 runs. \* indicates the excluded run.



End of Section 2 – Results