



## REPORT ON RATA TESTING

Detroit Refinery

GOHT Heater

Marathon Petroleum Company LP  
1300 South Fort Street  
Detroit, MI 48217  
Client Reference No. 4101815470

CleanAir Project No. 13924-1  
A2LA ISO 17025 Certificate No. 4342.01  
A2LA / STAC Certificate No. 4342.02  
Revision 0, Final Report  
August 30, 2019

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SEP 25 2019  
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# 1. PROJECT OVERVIEW

## TEST PROGRAM SUMMARY

Marathon Petroleum Company LP (MPC) contracted CleanAir Engineering (CleanAir) to successfully complete testing at the GOHT Heater (EU08-GOHTCHARHTR-S1) at the Detroit Refinery, located in Detroit, Michigan. The test program included the following objective:

- Perform a relative accuracy test audit (RATA) on the facility's continuous emissions monitoring system (CEMS) for oxygen (O<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>).

A summary of the test program results is presented below. Section 2 Results provides a more detailed account of the test conditions and data analysis.

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

Source Constituent	Reference Method	Relative Accuracy (%) <sup>1</sup>	Applicable Specification	Specification Limit <sup>1</sup>
<u>GOHT Heater</u>				
O <sub>2</sub> (% dv)	EPA 3A	0.21	PS3	± 1.0% dv
NO <sub>x</sub> (lb/MMBtu)	EPA 7E	6.8	PS2	20% of RM

<sup>1</sup> Specification limits obtained from 40 CFR 60, Appendix B, Performance Specifications.

## TEST PROGRAM DETAILS

### PARAMETERS

The test program included the following measurements:

- oxygen (O<sub>2</sub>)
- carbon dioxide (CO<sub>2</sub>)
- nitrogen oxides (NO<sub>x</sub>)

## SCHEDULE

Testing was performed on July 16, 2019. The on-site schedule followed during the test program is outlined in Table 1-2.

**Table 1-2:  
Test Schedule**

Run Number	Location	Method	Analyte	Date	Start Time	End Time
1	GOHT Heater	USEPA Methods 3A / 7E	O <sub>2</sub> / NO <sub>x</sub>	07/16/19	07:50	08:11
2	GOHT Heater	USEPA Methods 3A / 7E	O <sub>2</sub> / NO <sub>x</sub>	07/16/19	08:23	08:44
3	GOHT Heater	USEPA Methods 3A / 7E	O <sub>2</sub> / NO <sub>x</sub>	07/16/19	08:57	09:18
4	GOHT Heater	USEPA Methods 3A / 7E	O <sub>2</sub> / NO <sub>x</sub>	07/16/19	09:30	09:51
5	GOHT Heater	USEPA Methods 3A / 7E	O <sub>2</sub> / NO <sub>x</sub>	07/16/19	10:02	10:23
6	GOHT Heater	USEPA Methods 3A / 7E	O <sub>2</sub> / NO <sub>x</sub>	07/16/19	10:35	10:56
7	GOHT Heater	USEPA Methods 3A / 7E	O <sub>2</sub> / NO <sub>x</sub>	07/16/19	11:09	11:30
8	GOHT Heater	USEPA Methods 3A / 7E	O <sub>2</sub> / NO <sub>x</sub>	07/16/19	11:42	12:03
9	GOHT Heater	USEPA Methods 3A / 7E	O <sub>2</sub> / NO <sub>x</sub>	07/16/19	12:16	12:37
10	GOHT Heater	USEPA Methods 3A / 7E	O <sub>2</sub> / NO <sub>x</sub>	07/16/19	12:50	13:11

## DISCUSSION

### *O<sub>2</sub> and NO<sub>x</sub> RATA Testing*

Minute-average data points for O<sub>2</sub> and NO<sub>x</sub> (dry basis) were collected over a period of 21 minutes for each run utilizing EPA Methods 3A and 7E. Relative accuracy (RA) was determined based on nine (9) of 10 total runs conducted per procedures outlined in Performance Specification (PS) 2, Section 8.4.4.

Sampling occurred at the three (3) points, as specified in Section 8.1.3.2 of PS 2, during each run. The average result for each run was converted to identical units of measurement as the facility CEMS and compared for RA.

Minute average data points for CO<sub>2</sub> were collected for supplementary purposes.

### *Fuel Analysis*

Emission results in units of dry volume-based concentration (lb/dscf, ppm<sub>dv</sub>) were converted into units of lb/MMBtu by utilizing an MPC-provided oxygen-based fuel factor (F<sub>d</sub>).

### *Test Conditions*

The unit was operated at greater than 50% operating capacity during each of the RATA test runs. MPC was responsible for logging any relevant process-related data and providing it to CleanAir for inclusion in the test report.

## 2. RESULTS

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

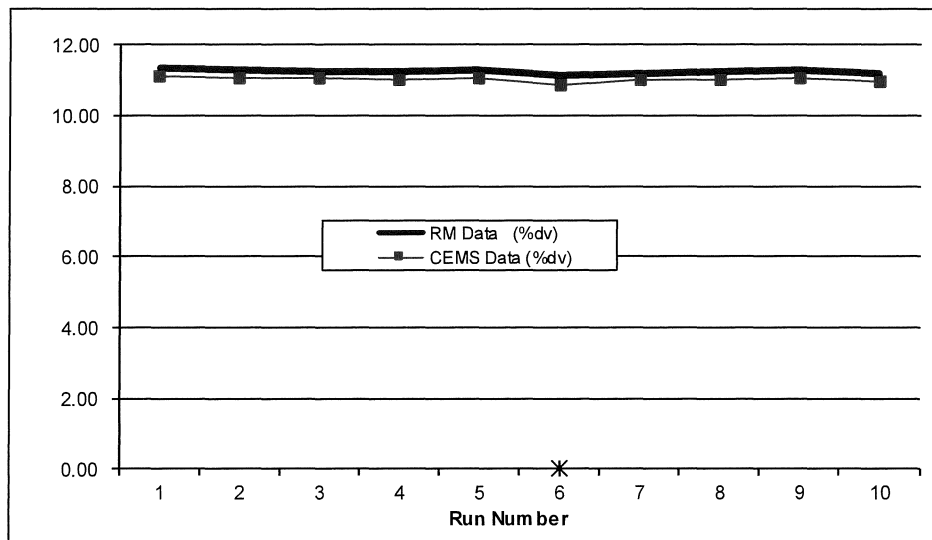
**Table 2-1:  
 GOHT Heater Stack – O<sub>2</sub> (% dv) RATA**

Run No.	Start Time	Date (2019)	RM Data (%dv)	CEMS Data (%dv)	Difference (%dv)	Difference Percent
1	07:50	Jul 16	11.33	11.10	0.23	2.0%
2	08:23	Jul 16	11.28	11.07	0.21	1.9%
3	08:57	Jul 16	11.23	11.03	0.20	1.8%
4	09:30	Jul 16	11.23	10.99	0.24	2.1%
5	10:02	Jul 16	11.26	11.06	0.20	1.8%
6 *	10:35	Jul 16	11.12	10.87	0.25	2.2%
7	11:09	Jul 16	11.19	10.99	0.20	1.8%
8	11:42	Jul 16	11.22	10.98	0.24	2.1%
9	12:16	Jul 16	11.26	11.07	0.19	1.7%
10	12:50	Jul 16	11.18	10.97	0.21	1.9%
<b>Average</b>			<b>11.24</b>	<b>11.03</b>	<b>0.21</b>	<b>1.9%</b>

### Relative Accuracy Test Audit Results

Standard Deviation of Differences	0.0187	
Confidence Coefficient (CC)	0.0144	
t-Value for 9 Data Sets	2.306	
<b>Avg. Abs. Diff. (%dv)</b>	<b>0.21</b>	<b>Limit</b>
		<b>1.0</b>

RM = Reference Method (CleanAir Data) 073019 163718  
 CEMS = Continuous Emissions Monitoring System (Marathon Petroleum Company Data)  
 RATA calculations are based on 9 of 10 runs. \* indicates the excluded run.



**Table 2-2:  
 GOHT Heater Stack – NO<sub>x</sub> (lb/MMBtu) RATA**

Run No.	Start Time	Date (2019)	RM Data (lb/MMBtu)	CEMS Data (lb/MMBtu)	Difference (lb/MMBtu)	Difference Percent
1	07:50	Jul 16	0.0379	0.0395	-0.0016	-4.2%
2	08:23	Jul 16	0.0372	0.0390	-0.0018	-4.8%
3	08:57	Jul 16	0.0366	0.0390	-0.0024	-6.6%
4	09:30	Jul 16	0.0362	0.0386	-0.0024	-6.6%
5	10:02	Jul 16	0.0370	0.0394	-0.0024	-6.5%
6	10:35	Jul 16	0.0365	0.0388	-0.0023	-6.3%
7	11:09	Jul 16	0.0368	0.0393	-0.0025	-6.8%
8	11:42	Jul 16	0.0366	0.0389	-0.0023	-6.3%
9	12:16	Jul 16	0.0370	0.0396	-0.0026	-7.0%
10 *	12:50	Jul 16	0.0359	0.0386	-0.0027	-7.5%
<b>Average</b>			<b>0.0369</b>	<b>0.0391</b>	<b>-0.0023</b>	<b>-6.1%</b>

**Relative Accuracy Test Audit Results**

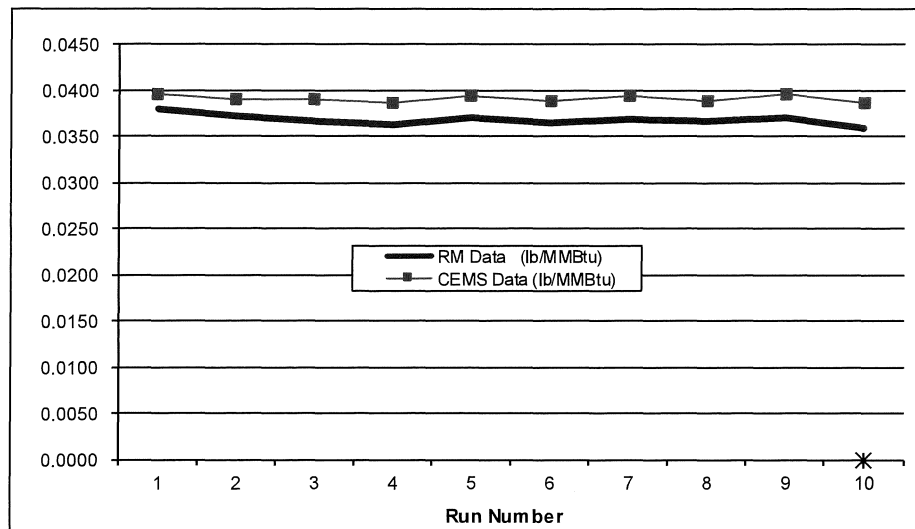
Standard Deviation of Differences	0.000332	
Confidence Coefficient (CC)	0.000255	
t-Value for 9 Data Sets	2.306	
		Limit
Relative Accuracy (as % of RM)	<b>6.8%</b>	<b>20.0%</b>

RM = Reference Method (CleanAir Data)

073019 163718

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

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



End of Section

### 3. DESCRIPTION OF INSTALLATION

#### PROCESS DESCRIPTION

MPC's facility in Detroit, Michigan, produces refined petroleum products from crude oil. MPC must continue to demonstrate that select process units are in compliance with permitted emission limits.

The Gas Oil Hydrotreater Unit (EU08-GOHT) reacts sour gas oil streams with hydrogen over a catalyst bed to remove sulfur. The GOHT unit consists of process vessels (reactors, distillation tower, absorbing towers, stripper tower), a charge heater (EU08-GOHTCHARHTR-S1), cooling tower, flare, compressors, pumps, piping, drains and various components (pumps and compressor seals, process valves, pressure relief valves, flanges, connectors, etc.).

The GOHT Heater (EU08-GOHTCHARHTR-S1) is fired by refinery fuel gas. Emissions are vented to the atmosphere via the GOHT Heater Stack (SV08-H1), where testing was performed.

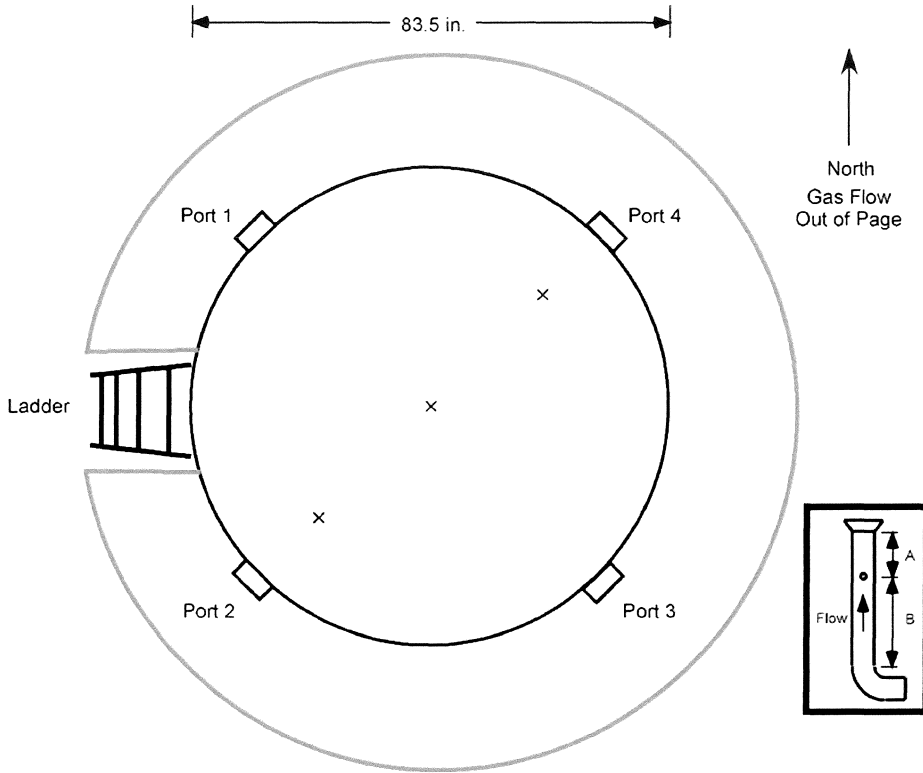
#### TEST LOCATION

The sample point locations were determined by EPA Method 7E specifications. Table 3-1 presents the sampling information for the test location described in this report. The figure shown on page 6 presents the layout of the test location.

**Table 3-1:  
 Sampling Information**

<u>Source</u> Constituent	Method	Run No.	Ports	Points per Port	Minutes per Point	Total Minutes	Figure
<u>GOHT Heater</u> O <sub>2</sub> /CO <sub>2</sub> /NO <sub>x</sub>	EPA 3A, 7E	1-10	1	3	7	21	3-1

**Figure 3-1:  
 O<sub>2</sub> and NO<sub>x</sub> Sample Point Layout (EPA Method 7E)**



Sampling Point	Port to Point Distance (meters)	Port to Point Distance (inches)
1	83.3	69.6
2	50.0	41.8
3	16.7	13.9

Duct diameters upstream from flow disturbance (A): 5.8

Limit: 0.5

Duct diameters downstream from flow disturbance (B): 7.2

Limit: 2.0

End of Section

## 4. METHODOLOGY

### PROCEDURES AND REGULATIONS

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The test program sampling measurements followed procedures and regulations outlined by the United States Environmental Protection Agency (USEPA) and the Michigan Department of Environmental Quality (DEQ). 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. Any modifications to standard test methods are explicitly indicated in this appendix. In accordance with ASTM D7036 requirements, CleanAir included a description of any such modifications along with the full context of the objectives and requirements of the test program in the test protocol submitted prior to the measurement portion of this project. Modifications to standard methods are not covered by the ISO 17025 and TNI portions of CleanAir's A2LA accreditation.

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 3A "Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)"

Method 7E "Determination of Nitrogen Oxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)"

#### TITLE 40 CFR PART 60, APPENDIX B PERFORMANCE SPECIFICATIONS

PS 2 "Specifications and Test Procedures for SO<sub>2</sub> and NO<sub>x</sub> Continuous Emission Monitoring Systems in Stationary Sources"

PS 3 "Specifications and Test Procedures for O<sub>2</sub> and CO<sub>2</sub> Continuous Emission Monitoring Systems in Stationary Sources"



## METHODOLOGY DISCUSSION

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### *O<sub>2</sub>, CO<sub>2</sub>, and NO<sub>x</sub> Testing – USEPA Methods 3A and 7E; Performance Specifications 2 and 3*

Reference method (RM) O<sub>2</sub> concentrations were determined using a paramagnetic analyzer per EPA Method 3A. RM NO<sub>x</sub> emissions were determined using a chemiluminescent analyzer per EPA Method 7E. CO<sub>2</sub> concentrations were determined using an NDIR analyzer per EPA Method 3A for supplemental purposes.

Sample gas was extracted at a constant rate, conditioned to remove moisture, and delivered to an analyzer bank which measured concentration on a dry basis (units of %dv or ppm<sub>dv</sub>). Calibration error checks were performed by introducing zero nitrogen (N<sub>2</sub>), high, and mid-range calibration gases to the inlet of each analyzer during calibration error checks. Bias checks were performed before and after each sampling run by introducing calibration gas to the inlet of the sampling system's heated filter. Documentation of interference checks are included in this report. Per EPA Methods 3A and 7E, the average results for each run were drift-corrected.

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*End of Section*