



Relative Accuracy Test Audit
for
Marathon Petroleum Company LP

at the
Detroit Refinery in Detroit, MI

on the
GOHT Heater 2
(EU08-GOHTCHARHTR2-S1)

subject to
Permit No. MI-ROP-A9831-2012c

Prepared for:



**Marathon
Petroleum Company LP**

Test Date: June 21, 2022
Erthwrks Project No. 9049.1.B5



1.0 INTRODUCTION

1.1 Identification, location and dates of tests

Erthwrks, Inc. was contracted to a relative accuracy test audit (RATA) on the GOHT Heater 2 continuous emissions monitoring system (CEMS). The process unit is in operation at the Marathon Detroit Refinery, located in Detroit, Michigan. The testing program was conducted on June 21, 2022.

1.2 Purpose of Testing

The exhaust from the process unit was sampled and analyzed to determine the relative accuracy of the associated with the oxygen (O₂), carbon monoxide (CO), and nitrogen oxides (NO_x) CEMS. The testing was conducted in accordance with the requirements in the Permit No. MI-ROP-A9831-2012c and the Title 40 CFR Part 60, Appendix F.

1.3 Description of Source

Marathon Petroleum Company LP owns and operates GOHT Heater 2. This report addresses the RATA for unit's NO_x, CO and O₂ CEMS.

Table 1.1 below details the CEMS analyzer information.

Table 1.1—Marathon GOHT Heater 2 CEMS Details

Parameter	Manufacturer	Model No.	S/N
NO _x	ABB	Limas 11	3.362955.7
O ₂	ABB	Magnos 206	3.365877.7
CO	ABB	Uras 26	3.365875.7

1.4 Contact Information

Marathon Petroleum Company LP

Addie Koerner
Michigan Refining Division
330-479-5662 office
419-306-5162 cell
akoerner@marathonpetroleum.com

Erthwrks, Inc.

John Wood
Technical Director
P.O. Box 150549
Austin, TX 78745
512-585-1685 office
888-573-9994 fax
jwood@erthwrks.com

Erthwrks, Inc.

Jason Dunn
QC Specialist
P.O. Box 150549
Austin, TX 78745
614-565-9177 office
888-573-9994 fax
jdunn@erthwrks.com

Facility Location:

Marathon Petroleum Company LP
Detroit Refinery
1300 South Fort Street
Detroit, MI 48217

2.0 SUMMARY OF RESULTS

Table 2.1—Marathon GOHT Heater 2 CEMS RATA Results

Pollutant Measured	Performance Specification	Relative Accuracy	Applicable Limit	Pass/Fail
NO _x	Performance Spec. 2	4.0% <i>RA_{AS}</i>	<10%	Pass
O ₂	Performance Spec. 3	0.8% <i>RA</i>	<1%	Pass
CO	Performance Spec. 4A	0.6 ppm	<5 ppm	Pass

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3.0 SOURCE DESCRIPTION

3.1 Description of the process

Marathon Petroleum Company LP produces refined petroleum products from crude oil and is required to demonstrate that select process emission sources are operating in compliance with permitted emissions limits.

The Gas Oil Hydrotreater Unit (EU08-GOHT-S1) 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), two charge heaters (EU08-GOHTCHARHTR-S1 and EU08-GOHTCHARHTR2-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 # 2 Heater (EU08-GOHTCHARHTR2-S1) is fired by refinery fuel gas. Emissions are vented to the atmosphere via the GOHT #2 Heater Stack (SV08-H2), where testing will be performed.

3.2 Applicable permit and source designation

Marathon Petroleum Company LP operates under Permit No. MI-ROP-A9831-2012c and is required to conduct an annual RATA to demonstrate the relative accuracy of the CEMS associated with this unit.

3.3 Type and quantity of materials processed during tests

During the Marathon Detroit Refinery emission testing on June 21, 2022, the GOHT Heater 2 was tested while operating at load conditions representative of normal conditions. The load conditions during the testing were documented by Marathon Detroit Refinery and provided in Appendix F.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 Gaseous Sampling – NO_x, CO & O₂

For the gaseous sampling, Erthwrks utilized a stainless-steel probe, of sufficient length to reach all sampling points, inserted into a sampling port that is located on the stack in accordance with EPA Method 1. The sample is extracted through the probe, a heated Teflon sampling line, to a heating filter. The sample then enters a minimum contact sample conditioner that cools and removes moisture from the gas matrix prior to entering the Erthwrks sampling manifold.

Erthwrks followed all quality assurance and quality control procedures as defined in US EPA 40 CFR 60 Appendix A. The Calibration Error (CE) Test was conducted as specified

in EPA Method 7E §8.2.3. In accordance with this requirement, a three-point analyzer calibration error test was conducted prior to sampling. The CE test was conducted by introducing the low, mid, and high-level calibration gasses (as defined in EPA Method 7E §3.3.1-3) sequentially and the response was recorded. The results of the CE test are acceptable if the calculated calibration error is within $\pm 2.0\%$ of calibration span (or ≤ 0.5 ppmv).

The Initial System Bias and System Calibration Error Check was conducted in accordance with EPA Method 7E §8.2.5. The upscale calibration gas was introduced at the probe upstream of all sample system components and the response recorded. The procedure will be repeated with the low-level gas and the response recorded. During this activity, the sample system response time will also be recorded. This specification is acceptable if the calculated values of the system calibration error check are within $\pm 5.0\%$ of the calibration span value (or ≤ 0.5 ppmv).

After each test run, the sample system bias check is conducted to validate the run data. The low-level and upscale drift are calculated using Equation 7E-4. The run data is valid if the calculated drift is within $\pm 3.0\%$ of the calibration span value (or ≤ 0.5 ppmv).

After each test run, the corrected effluent gas concentration was calculated as specified in EPA Method 7E §12.6. The arithmetic average of all valid concentration values are adjusted for bias using equation 7E-5B.

See Figure 1 below for a sample system diagram.

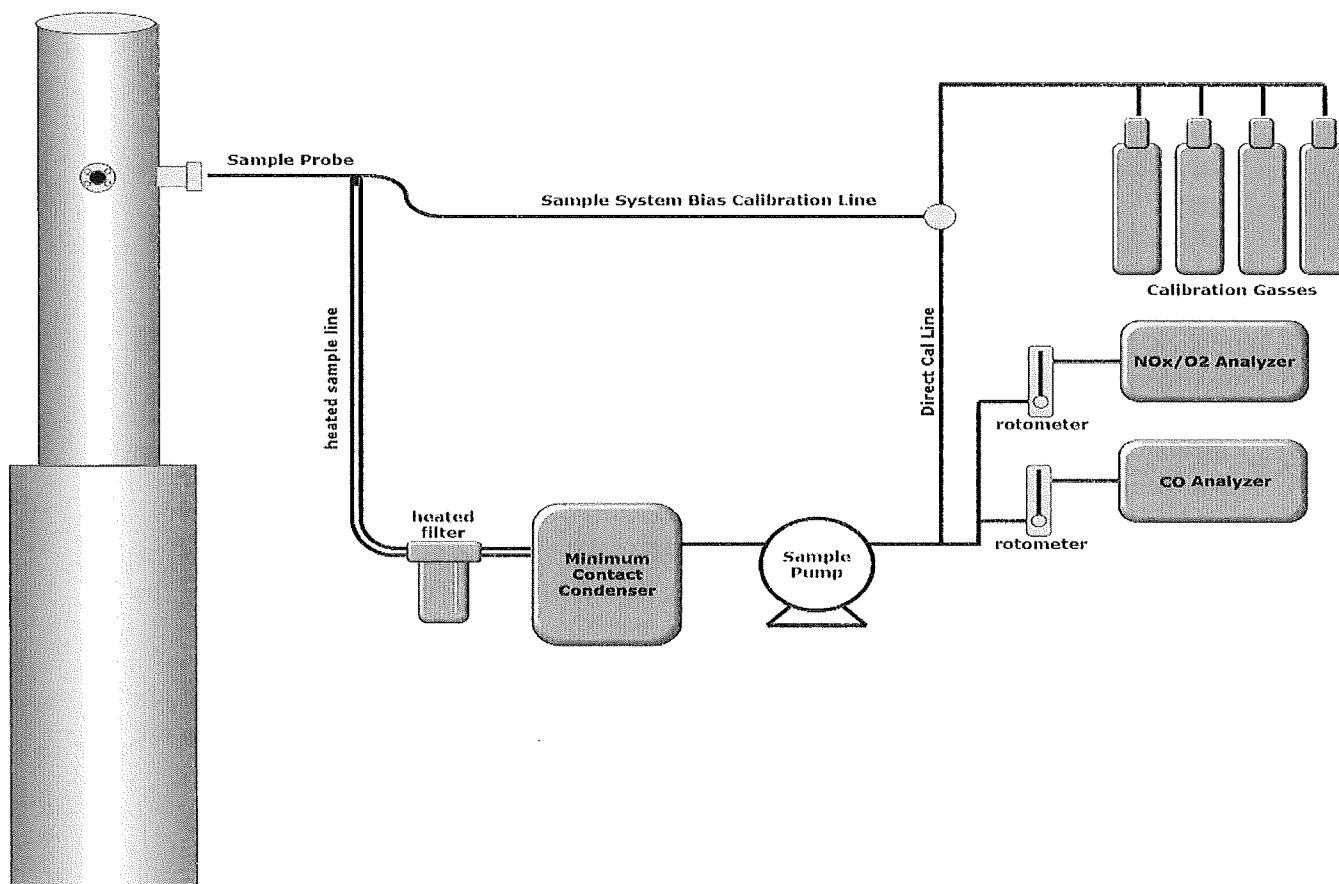


Figure 1: Example Erthwrks Gaseous Sampling System Diagram

4.2 RATA Procedures

The RATA testing was conducted following the sampling and measurement procedures found in the EPA Part 60, Appendix B, Performance Specifications which requires that EPA Reference Methods, from EPA Part 60, Appendix A, be utilized to conduct independent stack emissions measurements for comparison with installed CEMS readings. The following performance specifications will be used during this testing program.

- EPA Performance Specification 2 for NO_x relative accuracy
- EPA Performance Specification 3 for O₂ relative accuracy
- EPA Performance Specification 4/4A for CO relative accuracy

As required by these methods, the use EPA Protocol 1 gases are mandatory and were used for this portion of the project.

A minimum of nine (9) RATA test runs were conducted at each exhaust stack for a minimum duration of twenty-one (21) minutes for each run. A 3-point traverse located at

16.7%, 50.0%, and 83.3% of the way across the stack (or 0.4, 1.2, and 2.0 meters from the stack wall) was conducted during each RATA test run (7 minutes per point). A maximum of twelve (12) RATA test runs will be conducted and up to three test runs may be discarded and not used to determine relative accuracy. The results of the reference method tests were compared to CEMS measurement data from the same time periods to determine the relative accuracy of the CEMS.

For NO_x, the results of the RATA test are considered acceptable if the calculated relative accuracy does not exceed 20.0% as calculated by Equation 2-6 in Performance Specification 2. Alternatively, for affected units where the average of the reference method measurements is less than 50 percent of the emission standard (emission limit), the relative accuracy must not exceed 10% when the applicable emission standard is used in the denominator of Eq. 2-6.

For O₂, the results of the RATA test are considered acceptable if the calculated relative accuracy does not exceed 20.0% as calculated by Equation 3.1 in Performance Specification 3. The results are also acceptable if the result of Equation 3-2 is less than or equal to 1.0 percent.

For CO, the results of the RATA test are considered acceptable if the calculated relative accuracy does not exceed 10.0% as calculated by Equation 2-6 in Performance Specification 2. Alternatively, for affected units where the average of the reference method measurements is less than 50 percent of the emission standard (emission limit), the relative accuracy must not exceed 5% when the applicable emission standard is used in the denominator of Eq. 2-6. Performance Specification 4A criteria may be used to determine relative accuracy for CEMS with low emission standards (less than 200 ppmv). In these cases, the results of the RATA test are considered acceptable if the absolute average difference between the RM and CEMS is within 5 ppmv.

The RATA test is a direct comparison of the CEMS monitoring data with that data collected from an independently operated EPA Reference Method tests for each pollutant, following all the quality assurance and quality control procedures as required in the reference method. The following EPA reference methods were utilized to complete this testing program:

- EPA Method 3A for the determination of O₂ concentration
- EPA Method 7E for the determination of NO_x concentration
- EPA Method 10 for the determination of CO concentration

For this testing program, Erthwrks utilized a calibration gas dilution system, operated in accordance with EPA Method 205, for the generation of the calibration gases used to calibrate the reference method analyzers. This gas dilution system is calibration annual in accordance with section 2.1.1 of this method. This documentation is located in Attachment E. In addition, the gas diluter accuracy was verified on the day of the test in accordance with the Field Evaluation procedure defined in Section 3.2 of the method. This activity is documented in Attachment B and the raw data logs are located in Attachment D.

The reference method sampling locations are defined in the Erthwrks QA/QC worksheet located in Attachment B. Three sampling points were used in accordance with the EPA Performance Specification 2, §8.1.3.2, located at 16.7, 50.0 and 83.3 percent of the stack inner diameter from the port location. Erthwrks sampled at each traverse point individually for 7-minutes per point for each 21-minute test run.

4.2 Discussion of sampling procedure or operational variances

Erthwrks, Inc. conducted the emission testing with no sampling or procedural variances. The process unit tested and operated with no operational variances.