erthwrks

AIR EMISSIONS TESTING FOR INDUSTRY

Relative Accuracy Test Audit and PM Compliance Test

Demonstration of Performance of the Continuous Emission Monitoring System

on the

GOHT Heater 1 (EU08-GOHTCHARHTR-S1)

at the

Marathon Detroit Refinery

in

Detroit, MI

subject to

Permit No. MI-ROP-A9831-2012c Title 40 CFR Part 60, Appendix F

prepared for

MARATHON Marathon Petroleum Company LP

Test Date: May 22, 2024

Erthwrks Project No. 9565.1.B5

STAC STACK TESTING ACCREDITATION COUNCIL

A2LA ACCREDITED TO ASTM D7036 ONLY CERT #6147.01

Louisiana Environmental Lab Accreditation Program LELAP

CARB

Endorsement Page

This report was developed in accordance with the requirements designated in the applicable regulatory permit(s) and or regulatory rules. To the best of my knowledge the techniques, instrumentation, and calculations presented in this report will serve to accurately and efficiently detail the results of the test campaign requirements.

Erthwrks, Inc.

Name: Jason Dunn

Title: QAQC Specialist

Signature: 

This report has been reviewed for accuracy and completeness. The actions presented in this report are, to the best of my knowledge, an accurate representation of the results and findings of the test campaign. Erthwrks, Inc. operates in conformance with the requirements on ASTM D7036-04 Standard Practice for Competence of Air Emission Testing Bodies and is accredited as such by the Stack Testing Accreditation Council (STAC) and the American Association for Laboratory Accreditation (A2LA).

Erthwrks, Inc.

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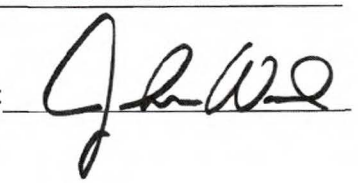
Signature: 

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1.0 INTRODUCTION

1.1 Identification, location and dates of tests

Erthwrks, Inc. was contracted to conduct an emissions compliance test and a relative accuracy test audit (RATA) on the continuous emissions monitor system (CEMS) that is installed on the GOHT Heater 1 exhaust in operation at the Marathon Detroit Refinery in Detroit, MI. The testing was conducted on May 22, 2024.

1.2 Purpose of Testing

This RATA was conducted to demonstrate the accuracy and reliability of the CEMS installed on the GOHT Heater 1. The purpose of this test program was to evaluate the relative accuracy of the oxides of nitrogen (NOx), carbon monoxide (CO), and oxygen (O_2) CEMS.

In addition, a compliance test was conducted to determine mass emission rates of filterable particulate matter (PM).

1.3 Contact Information

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2.0 SUMMARY OF RESULTS

Table 2.1: GOHT Heater 1 CEMS RATA Results

Pollutant Measured	Performance Specification	Relative Accuracy	Applicable Limit	Pass/Fail
NOx (lb/mmBTU)	Performance Spec. 2	5.8%	<10%	Pass
CO (ppmvd)	Performance Spec. 4A	0.7 ppm	<5 ppm	Pass
O_2 (%vd)	Performance Spec. 3	0.01% RA_{MD}	<1%	Pass

Table 2.2: GOHT Heater 1 Emissions Compliance Results

Pollutant Measured	Measured Result	Applicable Limit	Pass/Fail
PM	0.0002 lb/mmBTU	0.0019 lb/mmBTU	Pass

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 #1 Heater (EU08-GOHTCHARHTR-S1) is fired by refinery fuel gas. Emissions are vented to the atmosphere via the GOHT #1 Heater Stack (SV08-H1), where testing was performed.

Table 3.1: GOHT Heater 1 CEMS Description

Pollutant Measured	Analyzer Manufacturer	Analyzer Model	Serial Number
NO_X	ABB	Limas 11	3.342976.1
CO	ABB	Uras 26	3.342974.1
O_2	ABB	Magnos 206	3.342977.1

3.2 Applicable permit and source designation

The GOHT Heater 1 is operated under Permit No. MI-ROP-A9831-2012c. The emission test was conducted pursuant to annual test requirements.

3.3 Type and quantity of materials processed during tests

During the emission testing on May 22, 2024, at the Marathon Petroleum Company LP refinery, the GOHT Heater 1 was tested while operating at the maximum achievable load condition. This operational data was provided by MPC and is located in Attachment G of this report.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 Gaseous Sampling – NOx, CO, O_2, and CO_2

The following EPA reference methods were utilized to complete this testing program:

- EPA Method 3A for the determination of O_2 and CO_2 concentration
- EPA Method 7E for the determination of NOx concentration
- EPA Method 10 for the determination of CO concentration

A calibration error (CE) test was conducted as specified in US EPA Method 7E §8.2.3. In accordance with this requirement, a three-point analyzer calibration error test was conducted prior to exhaust sampling. The CE test was conducted by introducing the low, mid, and high-level calibration gasses (as defined by EPA Method 7E §3.3.1-3) sequentially and the response was recorded.

The initial system bias and system calibration error check were conducted in accordance with EPA Method 7E §8.2.5. The upscale calibration gas will be introduced at the probe upstream of all sample system components and the response will be recorded. The procedure was repeated with the low-level gas concentration and response recorded.

After each test run, the sample system bias check was conducted to validate the run data. The low-level and upscale drift was calculated using equation 7E-4. The arithmetic average of all valid concentration values was adjusted for bias using equation 7E-5B.

The nitrogen dioxide (NO_2) to nitric oxide (NO) conversion efficiency test was conducted prior to each field test in accordance with EPA Method 7E §8.2.4.1. This was conducted by introducing the converter efficiency gas (~50 ppm NO_2) directly to the NOx analyzer and recording the NO value. The NO_2-NO Conversion Efficiency test was within acceptable limits.

All gaseous sampling was done utilizing three appropriate traverse points. The three traverse points were selected to ensure acquisition of a representative sample over the stack cross section as required by 40 CFR Part 60, Appendix B, Performance Specification 2 §8.1.3.2.

See Figure 1 below for a sample system diagram.

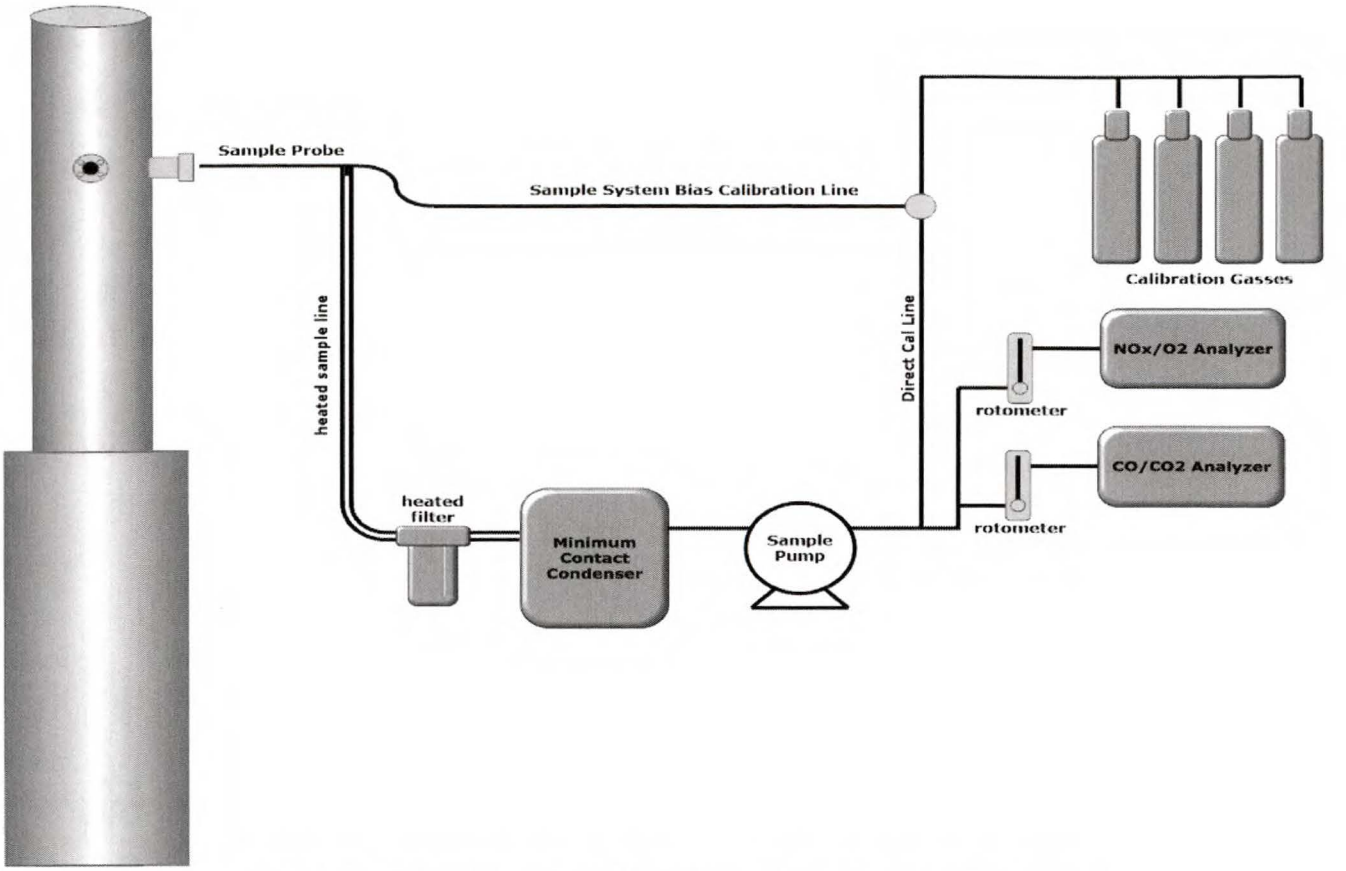


Figure 1: Example Erthwrks Gaseous Sampling System Diagram

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 NOx relative accuracy
- EPA Performance Specification 3 for O_2 relative accuracy
- EPA Performance Specification 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 NOx, 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 O_2, 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.

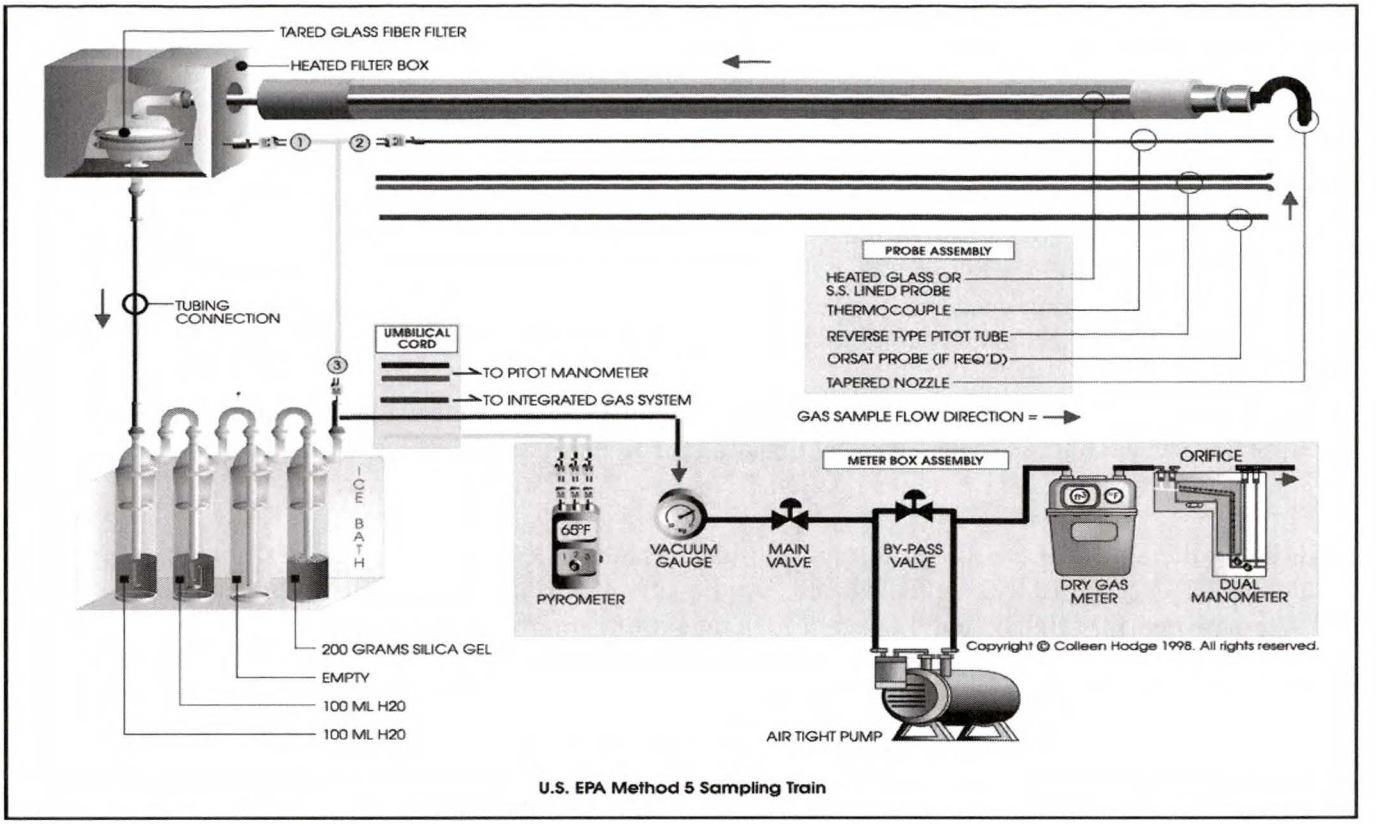
For CO, the results of the RATA test are considered acceptable if the calculated relative accuracy does not exceed 10.0% as calculated by Equation 2-6 in Performance Specification 2. Alternatively, for affected units where the average of the reference method measurements is less than 50 percent of the 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 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.

4.3 Filterable Particulate Matter Sampling – EPA Method 5

EPA Test Method 1 was used for the selection of sampling points. Stack dimensions, number of sample ports and sample port locations were confirmed prior to testing to determine the appropriate number of traverse points for the test.

EPA Test Method 5 was used to determine filterable particulate matter emission rates. Method 5 is the method at which particulate matter is withdrawn isokinetically from the source and collected on a glass fiber filter and on the lining of the isokinetic probe maintained at a temperature of 120 ± 14°C. Upon completion of each test run, the nozzle and probe liner were rinsed and brushed with acetone. The acetone rinse catch was collected and combined with the filter holder rinse and labeled as "front half rinse". The total PM mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically. Filterable PM was calculated by combining the net gravimetric gain of the filter and the net gravimetric gain of the evaporated front half rinse. Figure 2 below shows the Method 5 sampling system components.



U.S. EPA Method 5 Sampling Train

4.5 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.