erthwrks

AIR EMISSIONS TESTING FOR INDUSTRY

# *Relative Accuracy Test Audit and Performance Testing*

*for*

## Marathon Petroleum Company LP

*at the*

**Marathon Detroit Refinery in Detroit, MI**

*on the*

**GOHT Heater 1**

**Unit: EU08-GOHTCHARHTR-S1**

**Permit No. MI-ROP-A9831-2012c**

***Prepared for:***

MARATHON **Marathon Petroleum Company LP**

**Test Date: October 4, 2022**

**Erthwrks Project No. 9049.1.D1**

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: Jarrod Hoskinson

Title: Senior Project Manager

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.**

Name: John Wood

Title: Technical Director

Signature: 

# Table of Contents

# 1.0 INTRODUCTION

## 1.1 Identification, location and dates of tests

Erthwrks, Inc. was contracted to conduct emission testing on the GOHT Heater 1 in operation at the Marathon Detroit Refinery, located in Detroit Michigan. The testing program was conducted on October 4, 2022.

## 1.2 Purpose of Testing

The exhaust from GOHT Heater 1 was sampled and analyzed to determine the compliance status of the units' emissions of particulate matter (PM). The oxygen ($O_2$) and carbon dioxide ($CO_2$) concentration was also measured in order to determine stack gas molecular weight.

## 1.3 Description of Source

Marathon Petroleum Company LP operates the GOHT Heater 1 designated as EU08-GOHTCHARHTR-S1 in the refinery. This report addresses the required compliance test for Particulate Matter.

## 1.4 Contact Information

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**Facility Location:**
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Detroit, MI 48217

# 2.0 SUMMARY OF RESULTS

**Table 2.1—Marathon GOHT Heater 1 Stack Compliance Test Results**

| Pollutant Measured | Methodology | Measured Results | Applicable Limit | Pass/Fail |
|---|---|---|---|---|
| PM | EPA Method 5 | 0.0005 lb/MMbtu | 0.0019 lb/MMbtu | Pass |
| $PM/PM_{10}$ | EPA Method 5/202 | 0.0024 lb/MMBtu | 0.0076 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 will be performed.

## 3.2 Applicable permit and source designation

Marathon Petroleum Company LP operates the GOHT Heater 1 (EU08-GOHTCHARHTR-S1) under EGLE Renewable Operating Permit No. MI-ROP-A9831-2012c.

## 3.3 Type and quantity of materials processed during tests

During the emission testing on October 4, 2022, 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 Emissions – $O_2$ and $CO_2$

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 ±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 was repeated with the low-level gas and the response recorded. During this activity, the sample system response time was also be recorded. This specification is acceptable if the calculated values of the system calibration error check are within ±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 ±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 is adjusted for bias using equation 7E-5B.

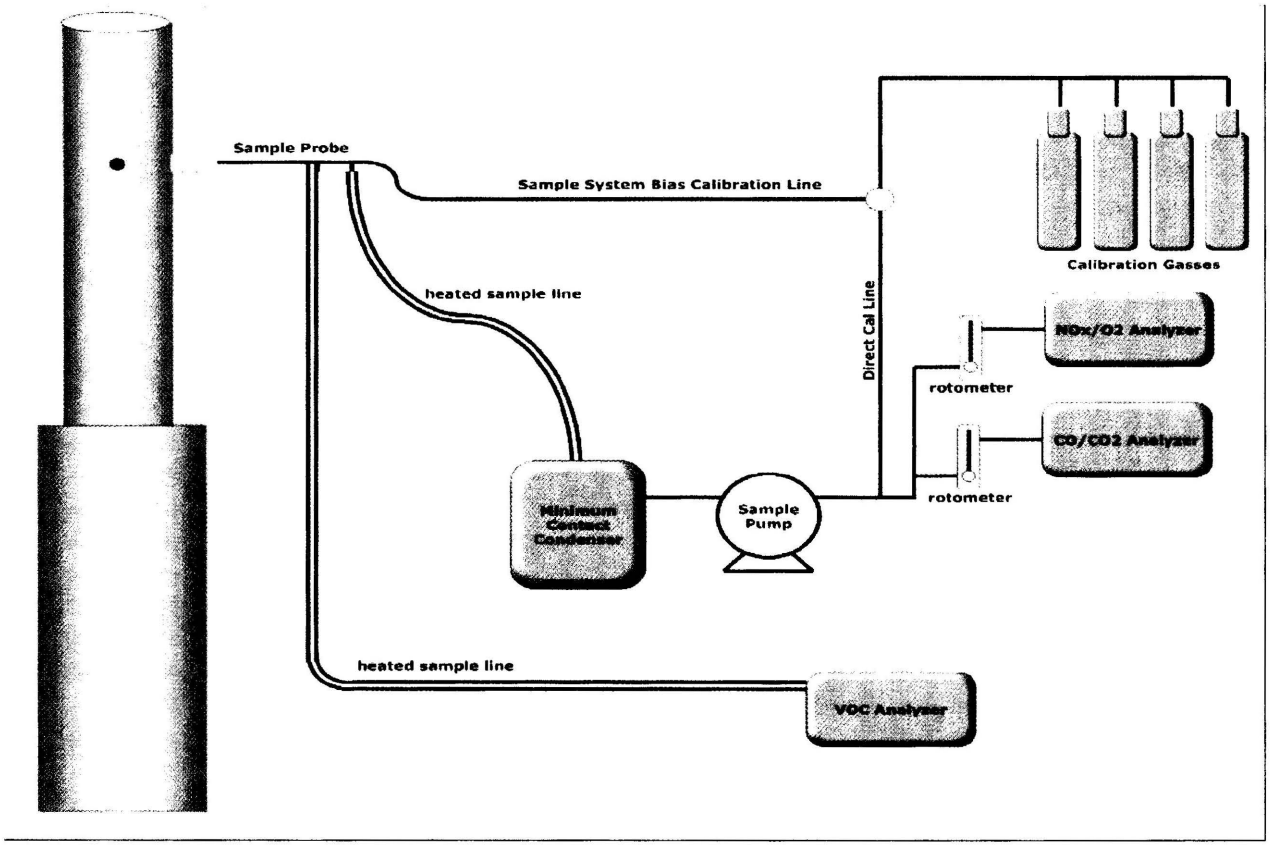


**Figure 1: Example Erthwrks Gaseous Sampling System Diagram**

## 4.2 Filterable Particulate Matter Sampling – EPA Method 5

EPA Test Method 1 will be 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 will be 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 will be 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.

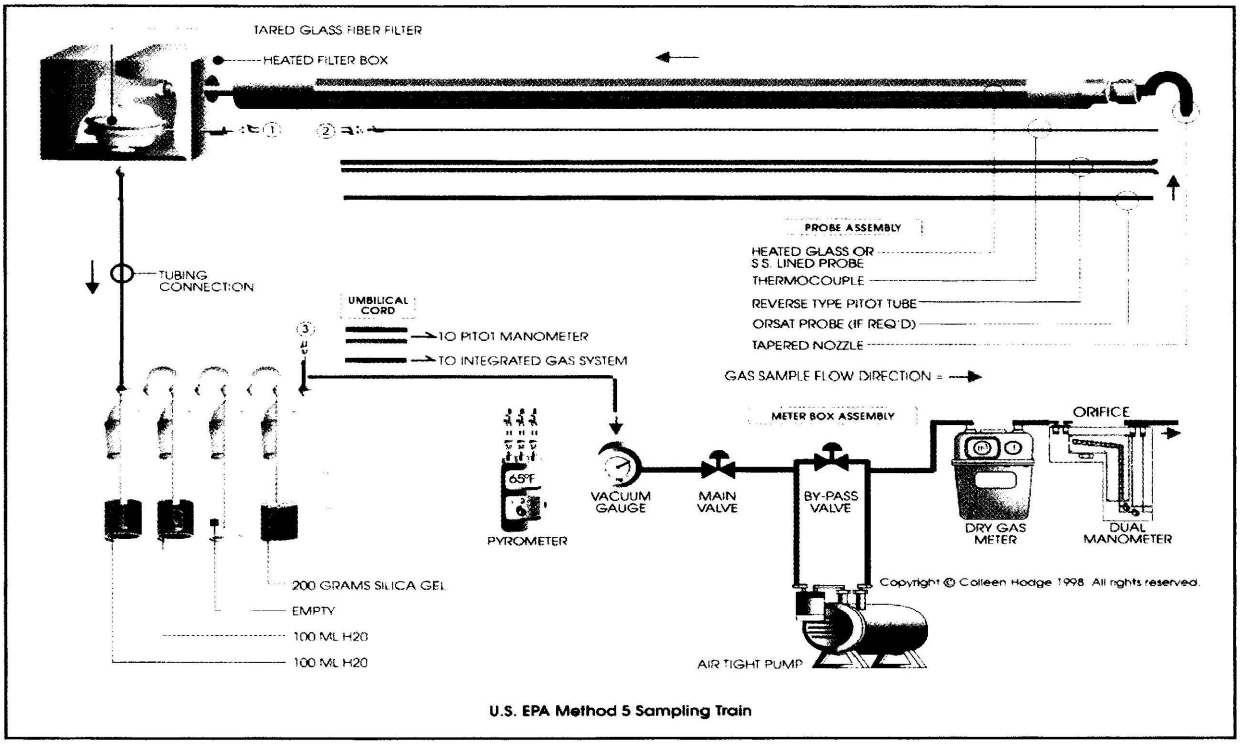


**Figure 2: Example Erthwrks PM System Diagram**

## 4.3 Condensable Particulate Matter Sampling – EPA Method 202

For the determination of $PM/PM_{10}$, condensable particulate matter (CPM) was measured via EPA Method 202. The Method 202 components begin at the back half of the Method 5 filter housing. The filterable particulate matter is removed in these "front half" components. The condensable particulate matter is then collected by drawing the filtered gas through a water jacketed, spiral condenser maintained at 65° – 85° F. The cooled effluent gas is then passed through two empty impingers and finally through a hexane extracted Teflon filter. Upon completion of each test run, the moisture collected in this portion of the sampling train is purged with ultra-high purity (UHP) nitrogen gas for one hour to remove any dissolved sulfur dioxide. The moisture is collected in a container and combined with the deionized water used to rinse all Method 202 sampling glassware two times.

The glassware is next rinsed with hexane and acetone. These rinses are collected and combined in an additional container. The Teflon filter is removed from the filter housing,

labeled, and collected. Gravimetric analysis is then conducted on the extracted, evaporated samples for each run.

## 4.4 Discussion of sampling procedure or operational variances

During the particulate matter testing, EGLE discussed the long sampling times at each traverse point with the Erthwrks project manager on site. It was discussed that it appeared that the differential pressure at the sampling points differed by my greater than 20% from point to point and that Erthwrks should record additional pressure readings between each point. This methodology language is found in Section 8.5.1 of EPA Method 5. Erthwrks typically interprets this language to be applied to units where the unit exhaust flow changes over time, as opposed to measurement location, which may necessitate additional adjustments in the sampling flow rate during each point to maintain isokinetic sampling. It was decided between Erthwrks and EGLE that Erthwrks would start recording the intermediate data starting mid-way through Run 2 and throughout Run 3. No adjustments to the sampling flow rate were made based on the intermediate data in this case. Further discussion can be had with EGLE personnel in order to define the best practice moving forward.

# Attachment A
# Detailed Results of Emission Test