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Relative Accuracy Test Audit and Emissions Compliance Test

**Demonstration of Performance
of the Continuous Emission Monitoring System**

on the

FCCU Charge Heater

Unit: EU11-FCCUCHARHTR-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
Petroleum Company LP**

Test Date: April 24, 2023

Erthwrks Project No. 9284.1.B2



A9831-TEST-20230424

1.0 INTRODUCTION

1.1 Identification, location and dates of tests

Erthwrks, Inc. was contracted to conduct a relative accuracy test audit (RATA) on a continuous emissions monitor system (CEMS) installed on the FCCU Charge Heater exhaust in operation at the Marathon Detroit Refinery in Detroit, MI. The RATA test was conducted on April 24, 2023.

1.2 Purpose of Testing

This RATA was conducted to demonstrate the accuracy and reliability of the CEMS monitors installed on the FCCU Charge Heater. The purpose of this test program was to evaluate the relative accuracy of the carbon monoxide (CO) and oxygen (O₂) CEMS. All testing and audit procedures were conducted in accordance with the requirements set forth in the 40, CFR, Part 60, Appendix B and F, which defines the CEMS performance specifications and testing procedures. In addition, a compliance test for oxides of nitrogen (NO_x) was also performed during the RATA.

1.3 Contact Information

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2.0 SUMMARY OF RESULTS

Table 2.1: FCCU Charge Heater CEMS RATA Results

Pollutant Measured	Performance Specification	Relative Accuracy	Applicable Limit	Pass/Fail
CO (ppmvd)	Performance Spec. 4A	1.55 ppm	<5 ppm	Pass
O ₂ (%vd)	Performance Spec. 3	0.10% <i>RAMD</i>	<1%	Pass

Table 2.2: FCCU Charge Heater Emissions Compliance Results

Pollutant Measured	Measured Result	Applicable Limit	Pass/Fail
NO _x (lb/mmBTU)	0.02832 lb/mmBTU	0.05 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 FCCU Charge Heater preheats the feed to the FCCU. The unit can be fired by a combination of refinery fuel gas, disulfide off-gas and natural gas. Emissions are vented to the atmosphere at the FCCU Charge Heater Stack (SV11-H1). The table below details the CEMS analyzer specifications.

Table 3.1: FCCU Charge Heater CEMS Description

Pollutant Measured	Analyzer Manufacturer	Analyzer Model	Serial Number
CO	ABB	Uras 14	3.343232.1
O ₂	ABB	Magnos 106	3.343209.1

3.2 Applicable permit and source designation

During the emission testing on April 24, 2023 at the Marathon Petroleum Company LP Refinery, the FCCU Charge Heater was tested while operating at the maximum achievable load condition. NOTE: For this testing program, the average Crude Charge was approximately 42,000 BPD and the fuel flow was approximately 2,540 MSCFD. This operational data was provided by MPC and is located in Attachment F of this report.

3.3 Type and quantity of materials processed during tests

During the emission testing on April 24, 2023, at the Marathon Petroleum Company LP refinery, the FCCU Charge Heater 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 – NO_x, CO & O₂

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

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 (NO₂) 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 NO₂) directly to the NO_x analyzer and recording the NO value. The NO₂-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.

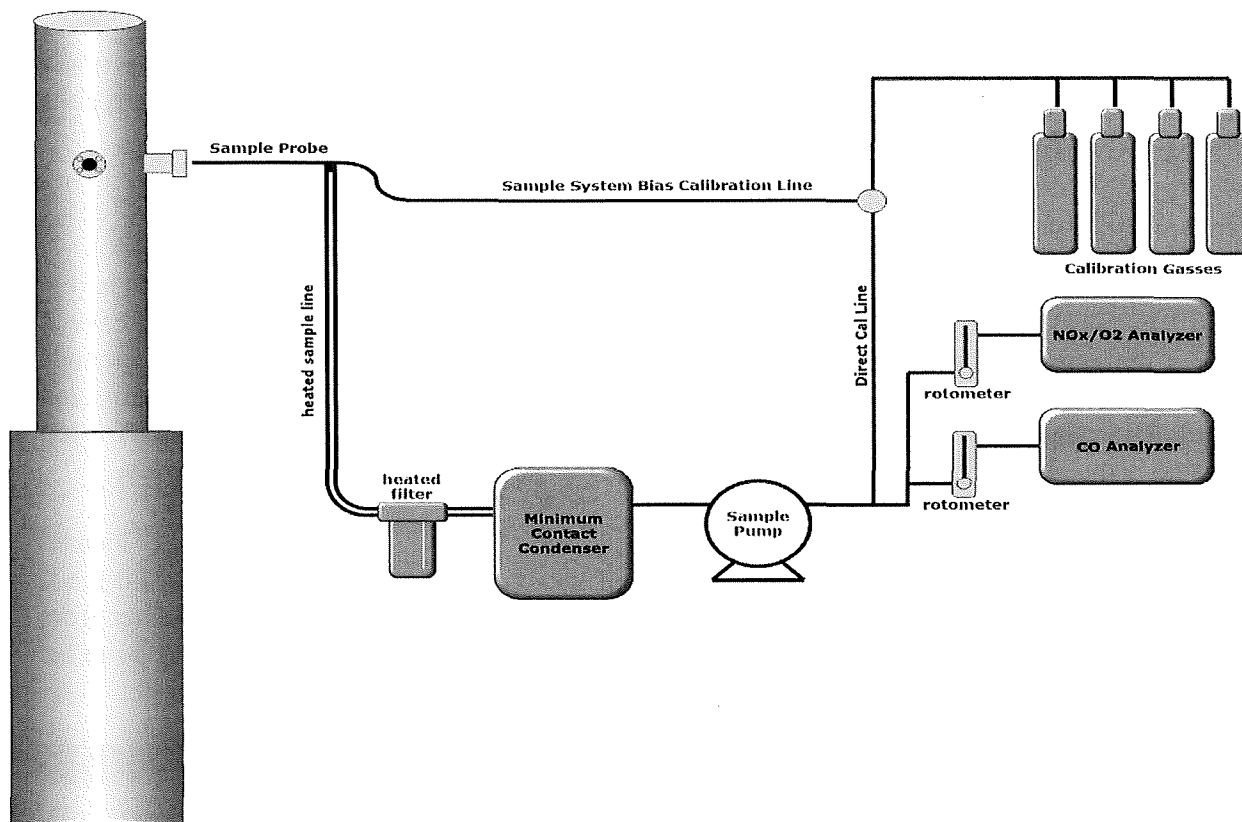


Figure 1: Example Erthwrks Gaseous Sampling System Diagram

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 3 for O₂ 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 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 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 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.