Relative Accuracy Test Report
For
NO_X and O_2
Thermal Oxidizer
The Andersons Marathon Holdings, LLC-Albion
Albion, MI
March 7, 2023

Conducted
By

Comprehensive Emission Services, Inc.
P.O. Box 910
Waukee, IA 50263
CES Project No. 1923

Phone 515-987-0200

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PREFACE

This report was prepared by Comprehensive Emission Services, Inc. in response to a relative accuracy test conducted at The Andersons Marathon Holdings, LLC-Albion The testing was performed at the RTO stack (C-10), on March 7, 2023. To the best of our knowledge the data contained in this report is accurate and complete. Any questions concerning this report should be directed to Mr. Joe Bourek or Mr. Doug Ostrander.

Comprehensive Emission Services, Inc.

Joe Bourek
Test Leader

Matt Milligan
Approved By

Date: April 10, 2023

SECTION 1

INTRODUCTION

A relative accuracy test was conducted by Comprehensive Emission Services, Inc. (CES) for NO_x and O_2 on the RTO stack (C-10) at The Andersons Marathon Holdings, LLC-Albion in Albion, MI.

Coordinating the field test:

Doug Ostrander - Comprehensive Emission Services, Inc.
Tony Sloma - The Andersons Clymers Ethanol, LLC

Conducting the field test:

Joe Bourek - Comprehensive Emission Services, Inc.
Matt Milligan - Comprehensive Emission Services, Inc.

Observing the field test:

Andrew Riley - Department of Environment, Great Lakes, And Energy. Air Quality Division

The results were used to evaluate the unit's Continuous Emission Monitors performance with regards to the following:

- Relative Accuracy

The appendices to this report contain the following information and data:

Appendix A	Reference CEM Data
Appendix B	Plant CEM Data
Appendix C	Reference CEM Calibration Results
Appendix D	Protocol 1 Gas Certification Sheets

SECTION 2

SUMMARY OF RESULTS

The relative accuracy test for the gas monitors was conducted at normal load.

Table 1
Summary of Results

	Acceptance Criteria	Calculated Value
Relative Accuracy (Units)		
NO_X (lb/mmBtu)	≤20%	9.07 %
O_2 (%)	≤1% average difference	-0.118 %

SECTION 3

SAMPLING AND ANALYTICAL PROCEDURES

3.1 Continuous Emission Monitors

The reference continuous emission monitoring was performed by using the following methods and instruments:

Parameter	EPA Method	Instrument
NO_x	7E	Thermo 42i HL
O_2	3A	California 100p

3.2 Stack Gas Monitoring System

A Gas Sample for the reference CEM system was continuously extracted from the stack through a heated stainless steel sample probe. The extracted sample was pulled through a series of heated filters to remove any particulate matter. Directly after the probe, the sample was conditioned by a series of refrigeration dryers to remove the moisture from the gas stream. After the refrigeration dryers, the sample was transported through a Teflon line to the analyzers. The flow of the stack gas sample was regulated at a constant rate to minimize drift.

3.3 Calibration Procedure

At the start of the day, the each monitor was checked for calibration error by introducing zero, mid-range, and high-range EPA Protocol 1 gases to the measurement system at a point upstream of the analyzers. Comprehensive Emission Services, Inc. refers to the calibration error test as the instrument calibration. The gas was injected into the sampling valve located at the outlet of the sampling probe. The bias test was conducted before and after each consecutive test run by introducing zero and upscale calibration gases for each monitor. The upscale calibration gases used for the each monitors bias tests were the calibration gases which most closely approximates the effluent concentration monitored during the test runs.

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3.4 Measurement system performance specifications

- Analyzer Calibration Error. Less than ± 2% of the span of the zero, mid-range, and high-range calibration gases.
- Sampling System Bias. Less than ± 5% of the span for the zero, and mid- or high-range calibration gases.
- Zero Drift. Less than ± 3% of the span over the period of each run.
- Calibration Drift. Less than ± 3% of the span over the period of each set of runs.

SECTION 4

TEST RESULTS

4.1 Relative Accuracy - Nitric Oxides Analyzer

The results of the relative accuracy testing are listed in Table 2. The relative accuracy for the NO_x monitor is 9.07 %, within the acceptance criteria.

Table 2
Test Runs Results
Nitric Oxides

Test Run for Relative Accuracy					
Run	Start Time	Stop Time	Run Used	Plant CEM lb/mmBtu	Reference Method Monitor lb/mmBtu
Run 1	08:10 am	08:31 am	y	0.073	0.067
Run 2	08:37 am	08:58 am	y	0.073	0.067
Run 3	09:03 am	09:24 am	y	0.072	0.066
Run 4	09:30 am	09:51 am	y	0.073	0.067
Run 5	09:56 am	10:17 am	y	0.074	0.068
Run 6	10:22 am	10:43 am	y	0.074	0.068
Run 7	10:48 am	11:09 am	y	0.074	0.069
Run 8	11:15 am	11:36 am	y	0.075	0.069
Run 9	11:42 am	12:03 pm	y	0.075	0.069
Run 10	12:09 pm	12:30 pm	n	0.076	0.069

Figure 1

Nitric Oxide Relative Accuracy Equations

$$N = 9$$

$$RM = .068$$

$$\sum d_i^2 = 0.000$$

$$\sum d_i = -0.053$$

$$\left(\sum d_i\right)^2 = 0.003$$

$$S_d = \sqrt{\frac{\sum d_i^2 - \frac{\left(\sum d_i\right)^2}{N}}{N - 1}} = 0.000$$

$$CC = \frac{2.306 * S_d}{\sqrt{N}} = 0.000$$

$$RA = \frac{| \overline{d_i} | + | CC |}{\overline{RM}} = 9.07\%$$

N = Number of Data Points

RM = Average Reference Value

di = Difference of CEM Readings and Reference CEM Readings

Sd = Standard Deviation

CC = Confidence Coefficient

RA = Relative Accuracy

4.2 Relative Accuracy - Oxygen Analyzer

The results of the relative accuracy testing are listed in Table 3. The relative accuracy for the O_2 monitor is -0.118 % average difference, within the acceptance criteria.

Table 3
Test Runs Results
Oxygen

Test Run for Relative Accuracy					
Run	Start Time	Stop Time	Run Used	Plant CEM %	Reference Method Monitor %
Run 1	08:10 am	08:31 am	y	5.950	5.900
Run 2	08:37 am	08:58 am	y	5.950	5.900
Run 3	09:03 am	09:24 am	y	5.860	5.800
Run 4	09:30 am	09:51 am	y	5.940	5.800
Run 5	09:56 am	10:17 am	y	5.970	5.800
Run 6	10:22 am	10:43 am	y	6.070	6.000
Run 7	10:48 am	11:09 am	y	6.050	5.900
Run 8	11:15 am	11:36 am	y	6.040	5.900
Run 9	11:42 am	12:03 pm	y	6.070	5.900
Run 10	12:09 pm	12:30 pm	n	6.280	6.100

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