mostardi platt

Formaldehyde Compliance Emission Report

Indeck Energy Services, Inc.
EUCTGHRSG1 and EUCTGHRSG2
Niles, Michigan

Michigan Department of Environment, Great Lakes, and Energy
Permit to Install 75-16B
State Registration No. N6921
June 13 and 14, 2023

Report Submittal Date
July 19, 2023

Project No. M232311B

Crown Point, IN | Mendota Heights, MN | Denver, CO | Henderson, NV

Corporate Headquarters
888 Industrial Drive
Elmhurst, Illinois 60126
630-993-2100

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

Mostardi Platt performed a formaldehyde (CH_2O) compliance emissions test program for Indeck Niles Energy Center facility in Niles, Michigan, on the EUCTGHRSG1 and EUCTGHRSG2 on June 13 and 14, 2023. Testing was conducted in accordance with United States Environmental Protection Agency (USEPA) Methods 1, 3A, and 320, while operating the unit at/near 100 percent load, plus or minus 10 percent, while the unit was combusting natural gas.

The test location, test date, test parameters, and test methodologies are summarized below.

TEST INFORMATION			
Test Location	**Test Date**	**Test Parameters**	**Test Methodologies**
EUCTGHRSG1	June 14, 2023	Oxygen (O_2) and formaldehyde	USEPA Method 3A, 40CFR60, Appendix A and Method 320, 40CFR63, Appendix A
EUCTGHRSG2	June 13, 2023		

The purpose of this test program was to demonstrate formaldehyde concentrations meet the requirement of Table 1 of USEPA Title 40, Code of Federal Regulations, Part 63, Subpart YYYY – "National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines".

Selected results of the test program are summarized below. A complete summary of emission test results follows the narrative portion of this report.

TEST RESULTS		
Test Location	**Formaldehyde Emission Limit**	**Formaldehyde Test Result**
EUCTGHRSG1	91 ppbvd @ 15% O_2	9.07 ppbvd @ 15% O_2
EUCTGHRSG2		8.10 ppbvd @ 15% O_2

The identifications of the individuals associated with the test program are summarized below.

TEST PERSONNEL INFORMATION		
Location	**Address**	**Contact**
Test Facility	Indeck-Niles Energy Center 2200 Progressive Drive Niles, Michigan 49120	Thomas Krysiak Environmental, Health and Safety Manager (716) 225-6478 (phone) tkrysiak@indeckenergy.com
Testing Company Supervisor	Mostardi Platt 888 Industrial Drive Elmhurst, Illinois 60126	Joshua Kukla Project Supervisor 630-993-2100 (phone) jkukla@mp-mail.com

2.0 TEST METHODOLOGY

Emissions testing was conducted following the methods specified in 40CFR60 and 40CFR63, Appendix A. A schematic of the test section diagram is found in Appendix A and a schematic of the sampling train used is included in Appendix B. Calculation, nomenclature and sample calculations are included in Appendix C. Copies of analyzer print-outs for each test run are included in Appendix D and FTIR QA/QC is found in Appendix E.

The following methodologies were used during the test program:

2.1 Method 3A Oxygen (O_2) Determination

Stack gas O_2 concentrations were determined in accordance with USEPA Method 3A, 40CFR60, Appendix A. A Servomex analyzer was used to determine O_2 concentrations in the manner specified in the Method. The instrument was operated in the nominal range of 0% to 25% with the specific range determined by the high-level span calibration gas. High-range calibrations were performed using U.S. EPA Protocol gas. Zero nitrogen (a low ppm pollutant in balance nitrogen calibration gases) was introduced during other instrument calibrations to check instrument zero. High- and a mid-range % O_2 levels in balance nitrogen were also introduced. Zero and mid-range calibrations were performed using U.S. EPA Protocol gas after each test run. Copies of the gas cylinder certifications are found in Appendix F. This testing met the performance specifications as outlined in the Method.

2.2 Method 320 Fourier Transform Infrared (FTIR) Detector for Formaldehyde Determination

Extractive Fourier transform infrared (FTIR) spectrometry following USEPA Method 320 was performed for determination of formaldehyde.

FTIR technology works on the principle that most gases absorb infrared light. This is true for all compounds with the exception of homonuclear diatomic molecules and noble gases such as: N_2, O_2, H_2, He, Ne, and Ar. Vibrations, stretches, bends, and rotations within the bonds of a molecule determine the infrared absorption distinctiveness. The absorption creates a "fingerprint" which is unique to each given compound. The quantity of infrared light absorbed is proportional to the gas concentration. Most compounds have absorbencies at different infrared frequencies, thus allowing the simultaneous analysis of multiple compounds at one time. The FTIR software compares each sample spectrum to a user-selected list of calibration references and concentration data is generated.

FTIR data was collected using an MKS MultiGas 2030 FTIR spectrometer equipped with a low level detector in order to routinely quantify formaldehyde concentrations in the low double digit parts per billion range. Analyte spiking was performed to assure the ability of the FTIR to quantify analytes in the presence of effluent gas. All analyte spikes were introduced using an instrument grade stainless steel rotometer. All QA/QC procedures were within the acceptance criteria allowance of Method 320.

An O_2 stratification test was performed for the CH_2O testing and is included in Appendix E. All sampling was conducted from one port sampling at 2.0 meters from the inside stack wall, 1.2 meters from the inside stack wall, and 0.4 meters from the inside stack wall during each run for 20 minutes per point. All samples below the FTIR detection limit of 10ppb for formaldehyde were corrected to the detection limit and used in averaging of each run and have also been corrected for spike recovery (R%) per 40CFR63, Subpart YYYY, Table 3 requirements.

FTIR QA/QC PROCEDURES						
QA/QC Specification	**Purpose**	**Calibration Gas Analyte**	**Delivery**	**Frequency**	**Acceptance Criteria**	**Result**
M320: Zero	Verify that the FTIR is free of contaminants & zero the FTIR	Nitrogen (zero)	Direct to FTIR	pre/post test	< MDL or Noise	**Pass**
M320: Calibration Transfer Standard (CTS) Direct	Verify FTIR stability, confirm optical path length	Methane	Direct to FTIR	pretest	+/- 5% cert. value	**Pass**
M320: CTS Response	Verify system stability, recovery, response time	Methane	Sampling System	Daily, pre/post test	+/- 5% of Direct Measurement	**Pass**
M320: Zero Response	Verify system is free of contaminants, system bias	Nitrogen (zero)	Sampling System	pretest	Bias correct data	**Pass**
M320: Analyte Spike	Verify system ability to deliver and quantify analyte of interest in the presence of other effluent gases	Formaldehyde	Dynamic Addition to Sampling System, ~1:10 effluent	pre test	+/- 30% theoretical recovery	**Pass**

Note: The determined concentrations from direct analyses were used in all system/spike recovery calculations.

CALIBRATION GAS STANDARDS				
Components	**Concentration (ppm)**	**Vendor**	**Cylinder #**	**Standard Type**
Methane	91.12	Airgas	EB0063020	Certified Standard-Spec +/- 2%
Formaldehyde/ N_2O	1.07/ 102.0	SPECGAS, Inc.	CC522693	Certified Standard-Spec +/- 5% Certified Standard-Spec +/- 2%
Zero Nitrogen	N/A	Airgas	N/A	UHP Grade

Analyte Spiking
Formaldehyde spiking was performed prior to testing and before each test run to verify the ability of the sampling system to quantitatively deliver a sample containing formaldehyde from the base of the probe to the FTIR. Analyte spiking assures the ability of the FTIR sampling system to recover acid gases in the presence of effluent gas.

As part of the spiking procedure, samples were measured to determine native formaldehyde and moisture concentrations to be used in the spike recovery calculations. Moisture in the stack gas prior to spiking and during spiking was used to determine dilution ratios of the formaldehyde. The spike target dilution ratio was 1:10 or less. The following equation illustrates the percent recovery calculation:

$$DF = 1 - \frac{H2O\ (spike)}{(native)}$$ (Sec. 9.2.3 (3) USEPA Method 320)

$$CS = DF * Spike(dir) + Unspike(1 - DF)$$ (Sec. 9.2.3 (4) USEPA Method 320)

DF = Dilution factor of the spike gas
$Spike_{dir}$ = Concentration of the analyte in the spike standard measure by the FTIR directly
CS = Expected concentration of the spiked samples
Unspike = Native concentration of analytes in unspiked samples

Detection Limit
The detection limit of each analyte was calculated following Annex A2 of ASTM D6348-12 procedure using spectra that contained similar amounts of moisture.

FTIR DETECTION LIMITS			
Analyte	**Detection Limit (ppbv wet)**	**Detection Limit (%v)**	**Detection Limit (%v wet)**
Formaldehyde	10.0	—	—
Water	—	**0.1**	**N/A**

QA/QC data are found in Appendix E. Copies of gas cylinder certifications are found in Appendix F. All concentration data were recorded on a wet, volume basis. The sample and data collection followed the procedures outlined in Method 320.

3.0 TEST RESULTS SUMMARIES

Indeck Energy Services, Inc. Niles Energy Center EUCTGHRSG Unit 1 Stack Reference Method Test Data								
Test No.	Date	Start Time	End Time	Moisture %	Formaldehyde ppbvw (R% Corrected)	Formaldehyde ppbvd	Formaldehyde ppbvd @ 15% O_2	O_2 % dry
1	6/14/2023	09:02:32	10:36:33	0.09	12.07	13.19	9.24	12.48
2	6/14/2023	11:05:33	12:40:34	0.09	11.51	12.58	8.89	12.55
3	6/14/2023	13:08:50	14:45:08	0.09	11.83	12.96	9.09	12.49
Average				**8.59%**	**11.80**	**12.91**	**9.07**	**12.51**

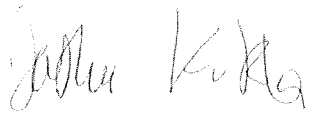
Indeck Energy Services, Inc. Niles Energy Center EUCTGHRSG Unit 2 Reference Method Test Data								
Test No.	Date	Start Time	End Time	Moisture %	Formaldehyde ppbvw (R% Corrected)	Formaldehyde ppbvd	Formaldehyde ppbvd @ 15% O_2	O_2 % dry
1	6/13/2023	09:00:01	10:34:02	8.98%	11.00	12.09	8.06	12.05
2	6/13/2023	11:14:34	12:43:35	9.00%	10.98	12.07	8.12	12.13
3	6/13/2023	13:16:27	14:47:22	9.01%	11.03	12.12	8.13	12.10
Average				**9.00%**	**11.00**	**12.09**	**8.10**	**12.09**

4.0 CERTIFICATION

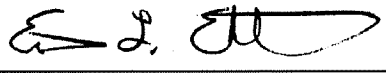
Mostardi Platt is pleased to have been of service to Indeck Energy Services, Inc. If you have any questions regarding this test report, please do not hesitate to contact us at 630-993-2100.

As project manager, I hereby certify that this test report represents a true and accurate summary of emissions test results and the methodologies employed to obtain those results, and the test program was performed in accordance with the methods specified in this test report.

MOSTARDI PLATT



Joshua R. Kukla — Program Manager



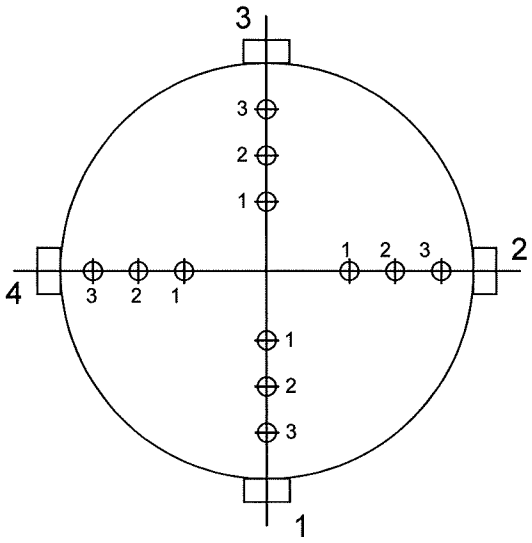
Eric L. Ehlers — Quality Assurance

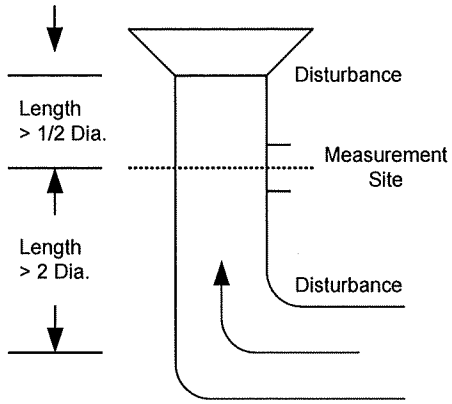
APPENDICES

Appendix A - Test Section Diagram

GASEOUS TRAVERSE FOR ROUND DUCTS

(Stratification Test)





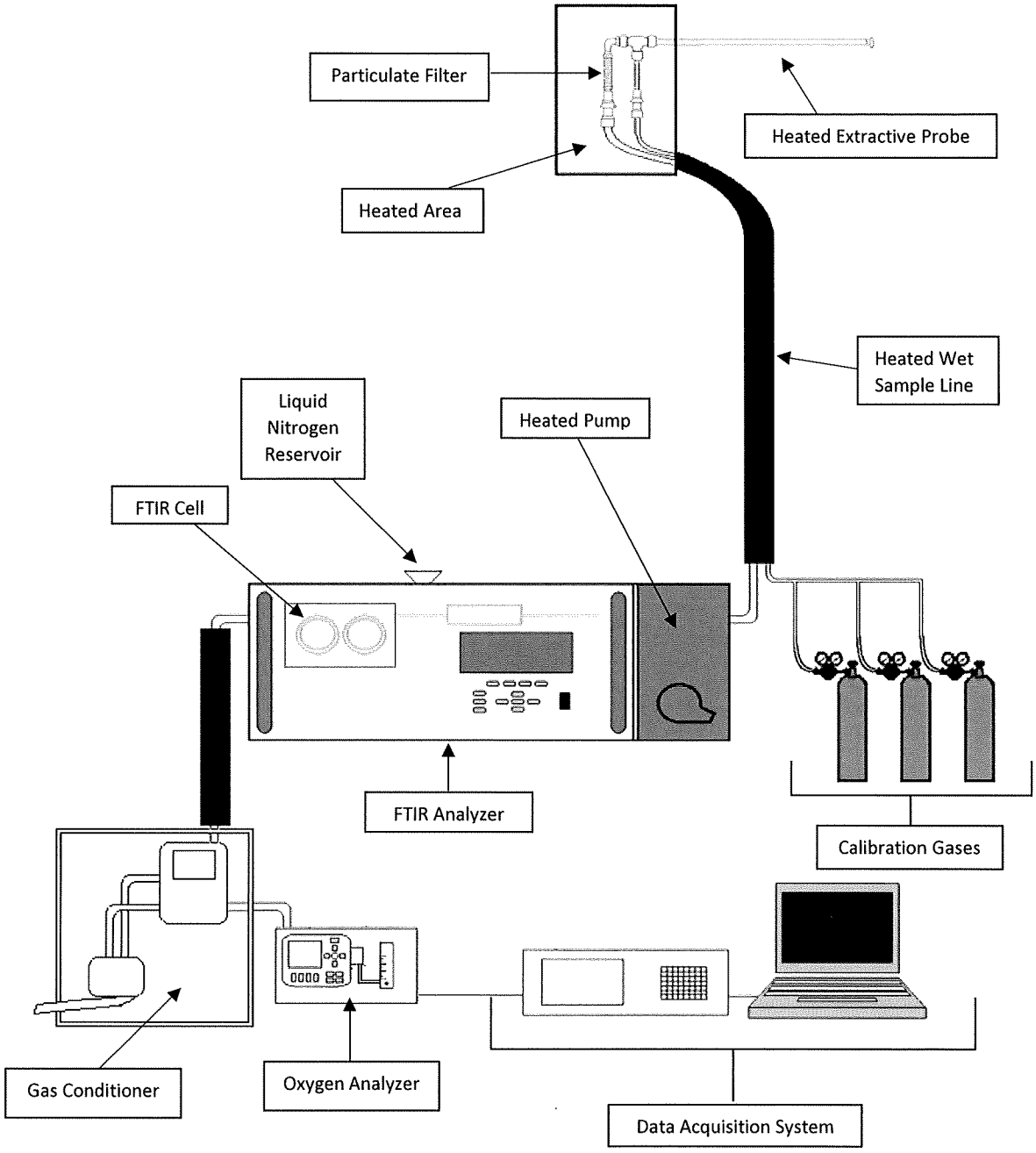
Job:	Indeck-Niles Energy Center Niles, Michigan
Date:	June 13 and 14, 2023
Test Location:	EUCTGHRSG1 and 2
Stack Diameter:	21.7 Feet
Stack Area:	369.84 Square Feet
No. Sample Points:	3

Distance from Inside Wall
To Traverse Point:

1. 83.3 % of diameter
2. 50.0 % of diameter
3. 16.7 % of diameter

Appendix B - Sample Train Diagram

USEPA Methods 3A and 320 – Sample Train Diagram



Appendix C - Calculation Nomenclature and Formulas