EMISSIONS STUDY

for

FORMALDEHYDE

UNIT 2

BLUE WATER RENEWABLES, LLC
Kimball, Michigan

February 7, 2013

Prepared By
Environmental Management & Resources
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EXECUTIVE SUMMARY

DTE Energy's Environmental Management and Resources (EM&R), Field Services Group, performed formaldehyde emissions testing at Blue Water Renewables, LLC, located in Kimball, Michigan. The fieldwork, performed on February 7, 2013. The purpose of the testing was to determine formaldehyde emission levels from one of the two comparable engines (Unit 2).

The results of the emissions testing are highlighted below:

Emissions Testing Summary – Unit 2
Blue Water Renewables, LLC
Kimball, MI
February 7, 2013

	Formaldehyde	
	(ppm)	(lb/hr)
Unit 2	76.9	1.9

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1.0 INTRODUCTION

DTE Energy's Environmental Management and Resources (EM&R), Field Services Group, performed formaldehyde emissions testing at Blue Water Renewables, LLC, located in Kimball, Michigan. The fieldwork, performed on February 7, 2013. The purpose of the testing was to determine formaldehyde emission levels from one of the two comparable engines (Unit 2).

Testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Methods 1-3A, and 320.

The fieldwork was performed in accordance with EPA Reference Methods and EM&R's Intent to Test[1], which was approved by the Michigan Department of Environmental Quality (MDEQ)[2]. The following EM&R personnel participated in the testing program: Mr. Mark Grigereit, Senior Environmental Specialist, Mr. Thomas Snyder and Mr. Fred Meinecke, Environmental Technicians. Mr. Grigereit was the project leader. Ms. Lindsey Wells, Prism Analytical Technologies Incorporated (PATI) was contracted to perform FTIR analysis.

Mr. David Terry, Facility Operator, DTE Biomass Energy, provided on-site operation of the units. Mr. Tom Maza, MDEQ, reviewed the Test Plan. Mr. Thomas Maza and Mr. Eric Gurshaw, MDEQ, observed the testing.

2.0 SOURCE DESCRIPTION

The Blue Water Renewables, LLC power generating facility, located at 6797 Smiths Creek Road, Kimball, MI is a power generating facility. The facility consists of two (2) landfill gas-fired internal combustion engines with associated electrical generators.

The systems are Caterpillar G3520C – 1200 RPM 1600 kW Gas Generator Sets. The purpose of the source is to utilize land-fill gas from the Blue Water Renewables Landfill to produce energy that is sent to the electrical grid. Unit 2 was tested while operating at greater than 90% of full load conditions.

See Figure 1 for a diagram of the unit sampling locations and stack dimensions.

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[1] MDEQ, Test Plan, Submitted January 31, 2013. (Attached-Appendix A)
[2] MDEQ, Acceptance Letter, February 6, 2013. (Attached-Appendix A)

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3.0 SAMPLING AND ANALYTICAL PROCEDURES

DTE Energy obtained emissions measurements in accordance with procedures specified in the USEPA *Standards of Performance for New Stationary Sources*. The sampling and analytical methods used in the testing program are indicated in the table below

Sampling Method	Parameter	Analysis
USEPA Methods 1-2	Exhaust Gas Flow Rates	Field data analysis and reduction
USEPA Method 3A	Oxygen & Carbon Dioxide	Instrumental Analyzer Method
USEPA Method 320	Formaldehyde/ Moisture Content	FTIR

3.1 STACK GAS VELOCITY AND FLOWRATES (USEPA METHODS 1-2)

3.1.1 Sampling Method

Stack gas velocity traverses were conducted in accordance with the procedures outlined in USEPA Method 1, "Sample and Velocity Traverses for Stationary Sources," and Method 2, "Determination of Stack Gas Velocity and Volumetric Flowrate." Two (2) sampling ports were utilized on the Unit's exhaust duct, sampling at six (6) points per port for a total of twelve (12) points. A flow traverse was conducted prior to and at the completion of each gas test. The results were averaged and used to determine emission rates.

A cyclonic flow check was performed during the January 2013 compliance emissions testing. Testing in the stack demonstrated that no cyclonic flow was present according to procedures in USEPA Method 2.

The EPA Method 2 sampling equipment consisted of a 0-10" incline manometer, S-type Pitot tube (C_p = 0.84) and a Type-K calibrated thermocouple.

3.2 OXYGEN AND CARBON DIOXIDE (USEPA METHOD 3A)

3.2.1 Sampling Method

Oxygen (O_2) and Carbon Dioxide (CO_2) emissions were evaluated using USEPA Method 3A, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight (Instrumental Analyzer Method)". The analyzers utilize paramagnetic sensors. Single point grab sampling was performed simultaneously with the Method 4 sampling.

The EPA Method 3A sampling system (Figure 2) consisted of the following:

(1) Single-point sampling probe (located in the centroid of the exhaust stack)
(2) Flexible unheated Teflon™ sampling line into a tedlar sample bag
(3) Servomax 1400 O_2/CO_2 gas analyzer
(4) Appropriate USEPA Protocol 1 calibration gases
(5) Data Acquisition System

3.2.2 Sampling Train Calibration

The O_2 and CO_2 analyzers were calibrated according to procedures outlined in USEPA Methods 3A. Zero, span, and mid range calibration gases were introduced directly into the analyzer to verify the instruments linearity. A zero and mid range span gas for each diluent was then introduced through the entire sampling system to determine sampling system bias for each analyzer at the start and completion of the days testing.

3.2.3 Quality Control and Assurance

All sampling and analytical equipment was calibrated according to the guidelines referenced in Methods 3A. Calibration gases were EPA Protocol 1 gases and the concentrations were within the acceptable ranges (40-60% mid range and span) specified in Method 7E. Calibration gas certification sheets are located in Appendix C.

3.2.4 Data Reduction

Data collected during the emissions testing was recorded at 10-second intervals and averaged in 1-minute increments. The O_2/CO_2 emissions were recorded in percent (%).

3.3 MOISTURE (USEPA METHOD 320)

3.3.1 Sampling Method

Moisture content in the exhaust was evaluated using USEPA Method 320, "Measurement of Vapor Phase Organic Emissions By Extractive Fourier Transform Infrared (FTIR)". DTE Energy retained Prism Analytical Technologies (PATI) to perform the FTIR analysis.

PATI's emissions testing report is attached. (Appendix D).

3.4 FORMALDEHYDE (USEPA METHOD 320)

3.4.1 Sampling Method

Formaldehyde emissions were evaluated using USEPA Method 320, "Measurement of Vapor Phase Organic Emissions By Extractive Fourier Transform Infrared (FTIR)". DTE Energy retained Prism Analytical Technologies (PATI) to perform the FTIR analysis. Single point sampling was performed. Triplicate 60-minute test runs were performed.

The EPA Method 320 sampling system (Figure 3) consisted of the following:

(1) Single-point sampling probe (located in the centroid of the exhaust stack)
(2) Flexible heated Teflon™ sampling line
(3) MKS MultiGas 2030 FTIR spectrometer
(4) Appropriate calibration gases
(5) Data Acquisition System

3.4.2 Sampling Train Calibration

The FTIR was calibrated according to procedures outlined in USEPA Methods 320. Nitrogen, acetaldehyde, and ethylene gas standards were made at the test location to confirm concentrations. Acetaldehyde was used as a surrogate for formaldehyde per Method 320.

PATI's emissions testing report is attached. (Appendix D).

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4.0 OPERATING PARAMETERS

The test program included the collection of generator load (kW), engine speed (RPM), inlet manifold air pressure (psi), fuel upper heating value (BTU), fuel flow (scfm) and generator operating hours (kW-hour).

Operational data is located in Appendix F.

5.0 DISCUSSION OF RESULTS

Table No. 1 presents the formaldehyde emission testing results from Unit 2 while operating at greater than 90% of full load conditions. The formaldehyde emissions are presented in parts per million (ppm) and pounds per hour (lb/hr). Additional test data presented for each test includes the engine load in percentage (%), kilowatts generated (kW), and the air/fuel ratio.

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6.0 CERTIFICATION STATEMENT

"I certify that I believe the information provided in this document is true, accurate, and complete. Results of testing are based on the good faith application of sound professional judgment, using techniques, factors, or standards approved by the Local, State, or Federal Governing body, or generally accepted in the trade."

Mark R. Grigereit, QSTI

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RESULTS TABLES

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TABLE NO. 1
FORMALDEHYDE EMISSION TESTING RESULTS - UNIT 2
Blue Water Renewables, LLC
Smiths Creek, MI
February 7, 2013

Test	Test Date	Test Time	Engine Load (BHp)	Oxygen (%)	Exhaust Gas Flowrate (SCFM)	Exhaust Gas Flowrate (DSCFM)	Formaldehyde Emissions (ppm)	Formaldehyde Emissions (lb/hr)
Test 1	**7-Feb-13**	9:20-10:20	2,233	8.7	5,377	4,765	76.8	1.9
Test 2		10:41-11:41	2,233	8.7	5,305	4,700	76.9	1.9
Test 3		11:58-12:58	2,233	8.6	5,349	4,739	77.0	1.9
		Average:	*2,233*	*8.7*	*5,344*	*4,735*	*76.9*	*1.9*

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FIGURES

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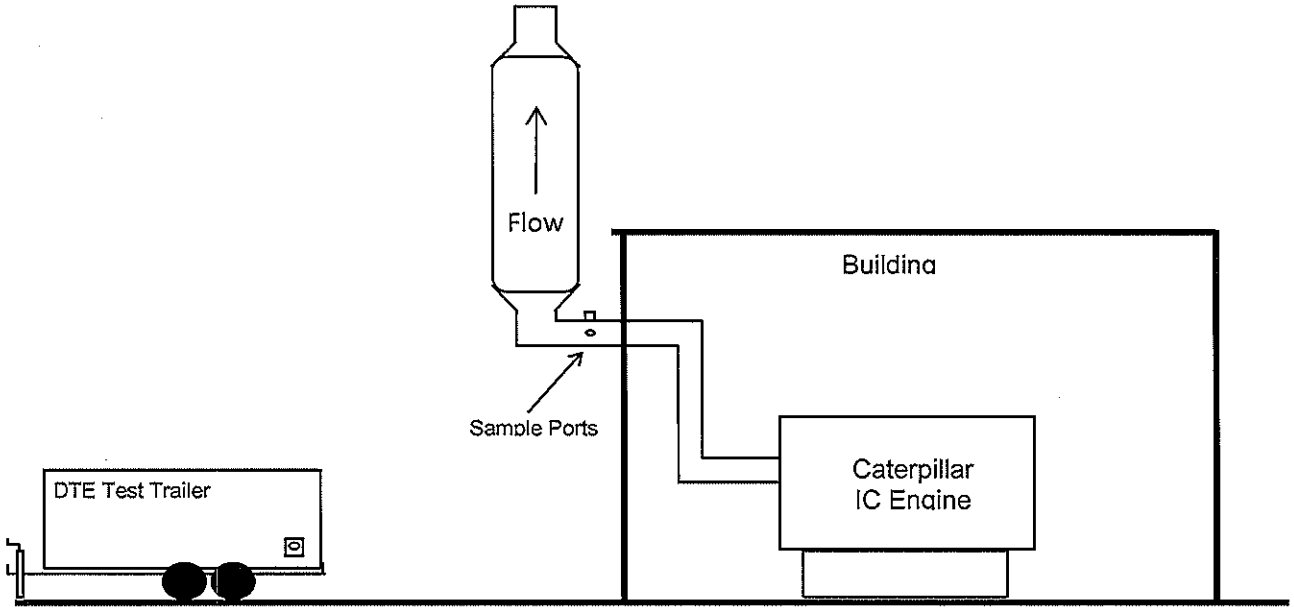
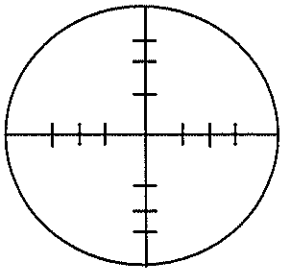
Figure 1 – Stack Drawing and Exhaust Sampling Point Location
Blue Water Renewables – Unit 2
February 07, 2013



Stack Diameter



Velocity Measurement

Points	Distance From Inner Wall
1	0.68
2	2.26
3	4.59
4	10.91
5	13.24
6	14.82

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Figure 2 – USEPA Method 3A Sampling Train
Blue Water Renewables
February 07, 2013

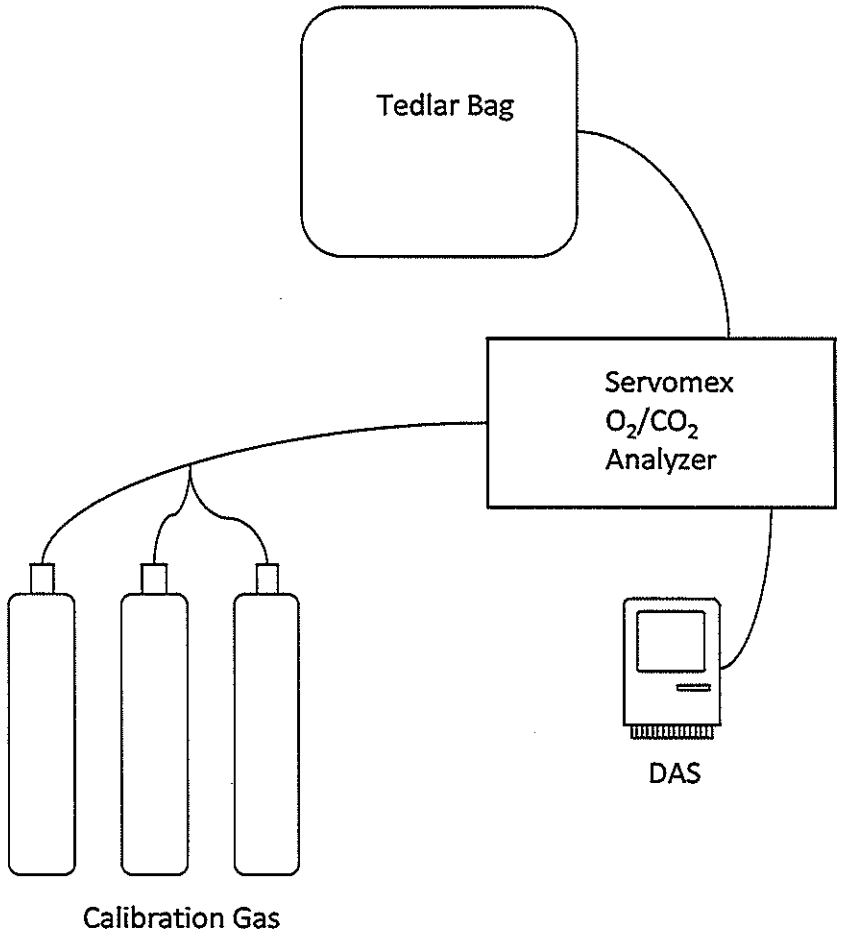

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Figure 3 – USEPA Method 320 Sampling Train
Blue Water Renewables
February 07, 2013