

EXECUTIVE SUMMARY

BT Environmental Consulting, Inc. (BTEC) was retained by DTE Energy Services (DTEES) to evaluate nitrogen oxides (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), hydrogen chloride (HCl), and volatile organic compound (VOC) emission rates from two engines at the Blue Water Renewables, Inc. (BWR) facility located in Smiths Creek, Michigan. The emissions test program was conducted on January 23-24, 2018.

Testing consisted of triplicate 60-minute test runs for NO_x , CO, SO₂, HCl, and VOC on each of the two engines. The emissions test program was required by permit 163-09D, and 40CFR Part 60 Subpart JJJJ. The results of the emission test program are summarized by Table I.

Pollutant	Emission Rates	Emission Rates	Emission Limits
	EUICENGINE	EUICENGINE	
	1	2	
	2.2 lbs/hr	2.8 lbs/hr	3.0 lbs/hr
Oxides of Nitrogen (NOx)	31.3 ppm @ 15% O ₂	40.7 ppm @ 15% O ₂	2.0 g/bhp-hr Or 150 ppm @ 15% O ₂
	10.1 lbs/hr	10.8 lbs/hr	16.3 lbs/hr
Carbon Monoxide (CO)	236.4 ppm @ 15% O ₂	255.3 ppm @ 15% O ₂	5.0 g/bhp-hr Or 610 ppm @ 15% O ₂
Non-Methane Organic Compounds (NMOC)	9.6 ppm @ 15% O ₂	12.3 ppm @ 15% O ₂	1.0 g/bhp-hr Or 80 ppm @ 15% O ₂
Hydrogen Chloride (HCl)	0.02 lbs/hr	0.02 lbs/hr	0.51 lbs/hr
Sulfur Dioxide (SO ₂)	1.0 lbs/hr	1.0 lbs/hr	6.21 lbs/hr

Table IEUICENGINE 1&2Test Date: January 23-24, 2018

P\$262-TEST-20180123



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BTEC Project No. 049AS-324444 March 16, 2018



1. Introduction

BT Environmental Consulting, Inc. (BTEC) was retained by DTE Energy Services (DTEES) to evaluate nitrogen oxides (NOx), carbon monoxide (CO), sulfur dioxide (SO₂), hydrogen chloride (HCl), and volatile organic compounds (VOC) emission rates from two engines at the Blue Water Renewables, Inc. (BWR) facility located in Smiths Creek, Michigan. The emissions test program was conducted on January 23-24, 2018.

AQD has published a guidance document entitled "Format for Submittal of Source Emission Test Plans and Reports" (December 2013). The following is a summary of the emissions test program and results in the format suggested by the aforementioned document.

1.a Identification, Location, and Dates of Test

Sampling and analysis for the emission test program was conducted on January 23-24, 2018 at the BWR facility located in Smiths Creek, Michigan. The test program included evaluation of NOx, CO, SO₂, HCl, and VOC emissions from two engines.

1.b Purpose of Testing

AQD issued Renewable Operating Permit No. 163-09D. This permit limits emissions from each Engine as summarized by Table 1.

Source	Pollutant	Emission Limit
		3.0 lb/hr*
Caterpillar G3520C Engines (EUICENGINE 1 & 2)	Oxides of Nitrogen (NO _x)	2.0 g/bhp-hr or 150 ppm @ 15% O ₂ *
		16.3 lb/hr*
	Carbon Monoxide (CO)	or 610 ppm @ 15% Oc*
	Non-Methane Organic Compounds (NMOC)	1.0 g/bhp-hr or 80 ppm @ 15% O ₂ *
	Hydrogen Chloride (HCl)	0.51 lb/hr*
	Sulfur Dioxide (SO ₂)	6.21 lb/hr*

Table 1						
Permit No.	163-09D	Emission	Limits			

*Applies to each engine



1.c Source Description

Blue Water Renewables operates two Caterpillar G3520C Engines with associated generator sets. The Engines are fueled by landfill gas generated by the landfill and produce electricity which is sent to the electric grid.

1.d Test Program Contacts

The contact for the source and test report is:

Rob Sanch, CHMM Environmental Supervisor DTE Energy Resources 414 South Main Street Suite 600 Ann Arbor, Michigan 48104 (734) 302-5383

Names and affiliations for personnel who were present during the testing program are summarized by Table 2.

1 est Personnei						
Name and Title	Affiliation	Telephone				
Mr. Rob Sanch Environmental Supervisor	414 South Main St. Suite 600 Ann Arbor, MI 48104	(734)302-5383				
Mr. David Patterson Environmental Quality Analyst	MDEQ Air Quality Division	(517)284-6782				
Mr. Matthew Young Client Project Manager	BTEC 4949 Fernlee Royal Oak, MI 48073	(586)744-9133				
Mr. Mike Nummer Field Technician	BTEC 4949 Fernlee Royal Oak, MI 48073	(248)548-7980				
Mr. Shane Rabideau Field Technician	BTEC 4949 Fernlee Royal Oak, MI 48073	(248)548-7980				

Table 2

2. Summary of Results

Sections 2.a through 2.d summarize the results of the emissions compliance test program.



2.a Operating Data

Process data was collected during each test run at 15 minute intervals. This data included engine KW, speed, tourque, fuel flow, the engine serial number, and the total operating hours of the engine. This data is included in Appendix F.

2.b Applicable Permit

The applicable permit for this emissions test program is Permit to Install No. 163-09D, and 40CFR Part 60 Subpart JJJJ.

2.c Results

The overall results of the emission test program are summarized by Table 3 (see Section 5.a).

3. Source Description

Sections 3.a through 3.e provide a detailed description of the process.

3.a Process Description

Blue Water Renewables operates two Caterpillar G3520C Engines with associated generator sets. The Engines are fueled by landfill gas generated by the landfill and produce electricity which is sent to the electric grid.

3.b Process Flow Diagram

Due to the simplicity of the engines, a process flow diagram is not necessary.

3.c Raw and Finished Materials

The raw material used by the process is landfill gas.

3.d Process Capacity

Both engines are identical Spark ignition, lean burn, reciprocating internal combustion engine (Caterpillar G3520C, 2,233 bhp at 100% load) for combusting treated landfill gas to produce electricity (1.6 megawatt gross electrical output).

3.e Process Instrumentation

Process data was collected during each test run at 15 minute intervals. This data included engine KW, speed, tourque, fuel flow, the engine serial number, and the total operating hours of the engine. This data is included in Appendix F.

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4. Sampling and Analytical Procedures

Sections 4.a through 4.d provide a summary of the sampling and analytical procedures used.

4.a Sampling Train and Field Procedures

The following U.S. EPA reference test methods found in 40 CFR, Part 60, Appendix A were used:

- Method 1 "Sample and Velocity Traverses for Stationary Sources"
- Method 2 "Determination of Stack Gas Velocity and Volumetric Flowrate"
- Method 3A "Determination of Oxygen and Carbon Dioxide Concentrations in Emissions From Stationary Sources (Instrumental Analyzer Procedure)"
- Method 4 "Determination of Moisture Content in Stack Gases (FTIR)"
- Method 25A "Determination of Total Gaseous Organic concentration using a flame ionization analyzer"
- Method 320 "Measurement of Vapor Phase Organic and Inorganic Emissions by Extractive Fourier Transform Infared (FTIR) Spectroscopy"

Stack gas velocity traverses were conducted in accordance with the procedures outlined in Method 1 and Method 2. S-type pitot tubes with thermocouple assemblies, calibrated in accordance with Method 2 were used to measure exhaust gas velocity pressures (using a manometer) and temperatures during testing. The s-type pitot tube dimensions were within specified limits, therefore, a baseline pitot tube coefficient of 0.84 (dimensionless) was assigned. One stack gas velocity traverse was conducted per test run.

Cyclonic flow checks were performed at the sampling location. The existence of cyclonic flow is determined by measuring the flow angle at each sample point. The flow angle is the angle between the direction of flow and the axis of the stack. If the average of the absolute values of the flow angles is greater than 20 degrees, cyclonic flow exists.

USEPA Method 3A was used to determine the O_2 concentrations; BTEC used a zero gas along with US EPA protocol 1 calibration gases with 40-60%, and 80-100% of the span value. A sample of the gas stream was drawn through an insulated stainless-steel probe with an in-line glass fiber filter to remove any particulate, a heated Teflon[®] sample line, and through a Universal Analyzers 3080PV electronic sample conditioner to remove the moisture from the sample before it enters the analyzer. Data was recorded at 4-second

4



intervals on a PC equipped with Labview[®] II data acquisition software. A schematic drawing of the sampling train is provided as Figure 1

USEPA Method 320 was used to measure NO_x , CO, Methane, Ethane, HCl, SO₂, and Moisture concentrations. The exhaust gas was measured using an MKS MultiGas 2030 FTIR spectrometer. A heated, 3 ft., 3/8 inch diameter, stainless steel probe, maintained at 191°C, was used to direct effluent gas to the FTIR. A heated filter box (191°C) will contain the connection from the probe to the filter assembly to a 100 ft., heated, 3/8 inch, Teflon transfer line. A 0.1µ glass filter was used for particulate matter removal. A schematic drawing of the sampling train is provided as Figure 2.

USEPA Method 25AVolatile Organic compound (VOC) concentrations were measured according to 40 CFR 60, Appendix A, Method 25A. A sample of the gas stream was drawn through a stainless steel probe with an in-line glass fiber filter to remove any particulate, and a heated Teflon[®] sample line to prevent the condensation of any moisture from the sample before it enters the analyzer. Data was recorded at 4-second intervals on a PC equipped with Labview[®] II data acquisition software. BTEC will use a JUM Model 109A Methane/Non-Methane or a VIG THC hydrocarbon analyzer to determine the VOC concentration.

In accordance with Method 25A, a 3-point (zero, mid, and high) calibration check was performed on the THC analyzer. Calibration drift checks were performed at the completion of each run.

4.b Recovery and Analytical Procedures

No sample recovery required for testing.

4.c Sampling Ports

Figures 1 and 2 show relevant sampling ports and traverse point locations.

4.d Traverse Points

The traverse points are included in the stack drawings as Figures 1 and 2.

5. Test Results and Discussion

Sections 5.a through 5.k provide a summary of the test results.

5.a **Results Tabulation**

The overall results of the emissions test program are summarized by Table 3. Detailed results for the emissions test program are summarized by Tables 4-7.

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Table 3					
Riverview	Energy Systems Overall Emission Summary				
	Test Date: January 23-24, 2018				

Pollutant	Emission Rates	Emission Rates EUICENGINE	Emission Limits
	1	2	
	2.2 lbs/hr	2.8 lbs/hr	3.0 lbs/hr
Oxides of Nitrogen (NOx)	31.3 ppm @ 15% O ₂	40.7 ppm @ 15% O ₂	2.0 g/bhp-hr Or 150 ppm @ 15% O ₂
	10.1 lbs/hr	10.8 lbs/hr	16.3 lbs/hr
Carbon Monoxide (CO)	236.4 ppm @ 15% O ₂	255.3 ppm @ 15% O ₂	5.0 g/bhp-hr Or 610 ppm @ 15% O ₂
Non-Methane Organic Compounds (NMOC)	9.6 ppm @ 15% O ₂	12.3 ppm @ 15% O ₂	1.0 g/bhp-hr Or 80 ppm @ 15% O ₂
Hydrogen Chloride (HCl)	0.02 lbs/hr	0.02 lbs/hr	0.51 lbs/hr
Sulfur Dioxide (SO ₂)	1.0 lbs/hr	1.0 lbs/hr	6.21 lbs/hr

5.b Discussion of Results

The overall results of the emission test program are summarized by Table 3 (see Section 5.a and detailed in tables 4-7.

5.c Process or Control Device Upsets

No upset conditions occurred during testing.

5.d Control Device Maintenance

There was no control equipment maintenance performed during the emissions test program.

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5.e Re-Test

The emissions test program was not a re-test.



5.f Audit Sample Analyses

No audit samples were collected as part of the test program.

5.g Calibration Sheets

Relevant equipment calibration documents are provided in Appendix B.

5.h Sample Calculations

Sample calculations are provided in Appendix C.

5.i Field Data Sheets

Field documents relevant to the emissions test program are presented in Appendix A

5.j Laboratory Data

There are no laboratory results for this test program. Raw CEM data is provided electronically in Appendix E.

Table 4 Engine 1 NOx, SO2, VOC, and CO Emission Rates DTE Blue Water Renewables Smiths Creek, MI BTEC Project No. 049AS-324444 Sampling Dates: 1/24/2018

Parameter	Run 1	Run 2	Run 3	Average	O2 Cor	rection
Test D is Dea	1040010	1/24/2019	1040019		C.	0.00
Test Run Date	1/24/2018	1/24/2018	1724/2018		Cont	10.00
Jest Kun Lime	1050-1150	1203-1505	1220-1420		Cma	0.01
Outlet Flowmre (dscfm)	4,005	4,065	4,025	4,032	(Cin	2.201
Outlet Flowrate (scfm)	4,536	4,609	4,563	4,569	C0, Cr	orrection
					^	
Oxygen Concentration (%)	8.1	8,1	8,1	8.1	Co	0.02
Oxygen Concentration (%, drift corrected as per USEPA 7E)	8.2	8.2	8.2	8.2	Ста	10.01
Carbon Dioxide Concentration (%)	9.7	9.7	9.7	9.7	Cm	10.12
Carbon Dioxide Concentration (%, drift corrected as per USEPA 7E)	9.6	9,7	9,6	9.6		
					NOx C	orrection
Outlet Oxides of Nitrogen Concentration (ppmv)	69.6	69.5	70.1	69.7	l i	
Outlet NOx Concentration (ppmv, corrected as per USEPA 7E)	68,4	66,8	66.8	67.3	Co	0,41
NOx Emission Rate (lb/hr)	2.3	2.3	2.3	2.3	Cma	89.8
NOx Emission Rate (lb/hr) (corrected as per USEPA 7E)	2.2	2.2	2.2	2.2	Cm	91,20
Outlet NOx Concentration (ppmv, corrected to 15% Q)	31.7	31.1	31.0	31.3		
					0.00	rrection
Outlat Cartan Managida Concentration (norm()	407.1	492.6	494 1	492.9		I
Outlet CD Concentration (nomy, corrected as per USEPA 7P)	509.4	508.0	510.2	509.2	L Co	0.45
CO Emission Bate (lb/br)	9.7	9.9	9.8	9.8	Cma	399
CO Emission Rate (lb/hr) (corrected as per USEPA 7E)	10.0	10.2	10.1	10.1	Cm	385.57
Outlet CO Concentration (ppmv, corrected to 15% Q)	236.0	236.7	236,5	236.4	1	
					l	
					SO ₂ Cr	orrection
Outlet Sulfur Dioxide Concentration (ppmv)	20.5	20.5	20.6	20.5		
Outlet SO ₂ Concentration (ppmv, corrected as per USEPA 7E)	21.3	21,1	21.3	21.2	C0	0,50
SO ₂ Emission Rate (lb/hr)	0.9	0.9	0.9	0.9	Cma	49,8
SO ₂ Emission Rate (lb/hr) (corrected as per USEPA 7E)	1.0	1.0	1.0	1.0	Cm	47.24
Outlet SO ₂ Concentration (ppmv, corrected to 15 % Q)	9,9	9.8	وو	9.9		
· ·					VOCC	Correction
Outlet VOC Concentration (ppmv as propane)	544.7	538.9	562.8	548.8		
Outlet Methane Concentration (ppmv as methane)	1152.6	1215,9	1261,3	1210.0	Co	1.77
Outlet VOC Concentration (ppmv, corrected as per USEPA 7E)	544.5	551.7	571.9	556.0	Cma	995
Outlet Methane Concentration (ppmv, corrected as per USEPA 7E)	1155,0	1247.2	1291.7	1231.3	Cm	993,92
Outlet VOC Concentration (ppmv propane, "Methane)	43.6	10.2	14.4	22,7		
Outlet VOC Concentration (ppmv propane, -Methane, corrected to 15%02)	20.2	4,8	6.7	10.5		
Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E)	42.3	9.5	10.2	20,7		
Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E, corrected to 15%O2)	19.6	4,4	4.7	9.6	<u></u>	<u>.</u>
VOC Emission Rate as Propane (lb/hr) (-Methane)	1.4	0,3	0.5	0.7	Metha	ne Correctio
IVOC Emission Rate as Pronone(lb/br) (-Methane) (corrected as per USEPA 7E)	1 1.3	1 0.3	1 0.3	0.6	1 1	1 1

Correction Co Cma Cm 4.93 7.87 7,87 995 995 995 993.67 971.65 973.39

0.00

10.01

9.82

0.02

10.01

10.04

0.70

89,8

93,15

0.62

399

0,95

49.8

47.17

3,08

995 969,27

387.04

0,00

10.01

9,88

0.02

10.01

10.06

0,76

89,8

0.67

399

1,11

49.8

46,77

3.14

995

976,99

386.52

93.91

sofm = standard cubic feet per minute dsofm = dry standard cubic feet per minute ppmv * parts per million on a volume-to-volume basis lb/hr = pounds per hour MW = molecular weight (CO = 28.01, NOx = 46.01, SO₂ = 64.05, $C_3H_8 = 44.10$) 24.14 = molar volume of air at standard conditions (70°F, 29.92° Hg) $35.31 = \Omega^3 \text{ per m}^3$ 453600 = mg per lb Response factor obtained from introducing propane into methane analyzer.

Equations

lb/hr = ppmv * MW/24.14 * 1/35.31 * 1/453,600 * scfm * 60 $\operatorname{Conc}_{\mathfrak{g}(19^{\circ}\mathrm{sO2})} = \operatorname{Conc} * (20.9 - 15)/(20.9 - \%\mathrm{O_2})$

2.3

Table 5 Engine 1 HCl Emission Rates DTE Blue Water Renewables Smiths Creek, MI BTEC Project No. 049AS-324444 Sampling Dates: 1/24/2018

Parameter	Run 1	Run 2	Run 3	Average
Test Run Date	1/24/2018	1/24/2018	1/24/2018	
Test Run Time	1030-1130	1203-1303	1330-1430	
Outlet Flowrate (scfm)	4,536	4,609	4,563	4,569
	ŕ		-	
Outlet HCl Concentration (ppm)	0.87	0.87	0.86	0.87
HCl Emission Rate (lb/hr)	0.02	0.02	0.02	0.02

scfm = standard cubic feet per minute dscfm = dry standard cubic feet per minute ppmv = parts per million on a volume-to-volume basis lb/hr = pounds per hour MW = molecular weight (HCl = 36.46) 24.14 = molar volume of air at standard conditions (70°F, 29.92" Hg) 35.31 = ft³ per m³ 453600 = mg per lb

Equations

lb/hr = ppmv * MW/24.14 * 1/35.31 * 1/453,600 * scfm * 60 for HCl

Rev. 2.0 5/8/2012 BC

Table 6 Engine 2 NOx, SO2, VOC, and CO Emission Rates DTE Blue Water Renewables Smiths Creek, MI BTEC Project No. 049AS-324444 Sampling Dates: 1/23/2018

0.00

10,01

10.02

0.03

10,01

9,91

0.42 89.8

90.35

0,00

399

0.46

49.8

44.54

2,60 995

976.93

2.87

995

983.01

995 1001,45

Cm

387.52

0.01

10.01

10.03

0.04

10.01

9,90

0.58 89.8

90.53

0.00

399

0.49

49.8 45.22

2.60

995

2.75

995

976.39

977.69

387.44

Test Run Date Test Run Tine 1/23/2018 <	Parameter	Run 1	Run 2	Run 3	Average	O2 Cor	rection
Test Kun Time 11/2/2/018 11/2/2/018 12/2/2/2/018 12/2/2/2/2/2/2/2/2/2/2/2/2/2/2/2/2/2/2/		1000010	1022010	1 22 2010			0.00
118 F.W.I. Time (11.55.4.1.3) (11.55.4.1.3) (11.55.4.1.3) (11.55.4.1.3) Outlet: Flowmate (dacfin) 4.038 4.054 4.067 4.089 Outlet: Flowmate (sfmf) 4.038 4.054 4.067 4.080 Oxygen Concentration (%, diff corrected as per USEPA 7E) 8.4 8.4 8.4 8.4 8.4 Divide Concentration (%, diff corrected as per USEPA 7E) 9.4 9.5 9.5 9.5 Outlet: Non-matching (pm) (correction) 65.9 8.5 65.5 Outlet: Non-concentration (%, diff corrected as per USEPA 7E) 2.8 <t< td=""><td>Test Run Date</td><td>1/23/2018</td><td>1/25/2018</td><td>1/23/2018</td><td></td><td>C</td><td>10.00</td></t<>	Test Run Date	1/23/2018	1/25/2018	1/23/2018		C	10.00
Outlet Plowrate (starfin) 4.033 4.044 4.067 4.969 4.574 Outlet Plowrate (starfin) 4.568 4.574 4.601 4.581 CD Origen Concentration (%) 8.4	lest Kun Time	11:13+12:15	12(33-13(35	14:57-15:57		Cm Cm	0,01
Outlet Flowrate (scfm) 4,568 4,574 4,601 4,581 CO, Correction Ovgen Concentration (%) 8,4	Outlet Flowrate (dscfm)	4,038	4,044	4,067	4,050		
Oxygen Concentration (%) 8.4 <td>Outlet Flowrate (sefm)</td> <td>4,568</td> <td>4,574</td> <td>4,601</td> <td>4,581</td> <td>C03 C0</td> <td>rrection</td>	Outlet Flowrate (sefm)	4,568	4,574	4,601	4,581	C03 C0	rrection
No. Source Concentration (%, drift convexted as per USEPA 7E) 8.4	Oxygen Concentration (%)	8.4	8.4	8.4	8.4	Co	0.01
Carbon Dioxide Concentration (%) Dioxide Concentration (%) Dioxide Concentration (%) Q <t< td=""><td>Overen Concentration (% drift connected as per LISEPA 7E)</td><td>8.4</td><td>8.4</td><td>8.4</td><td>8.4</td><td>Cma</td><td>10.01</td></t<>	Overen Concentration (% drift connected as per LISEPA 7E)	8.4	8.4	8.4	8.4	Cma	10.01
Carbon Dioxide Concentration (%, drift corrocted as per USEPA 7E) 9.4 9.5 9.5 9.5 9.5 Outlet Oxides of Nitrogen Concentration (ppmv) 85.9 86.6 86.1 86.2 86.5 Outlet Oxides of Nitrogen Concentration (ppmv) 2.8 2.8 2.9 2.8 2.8 2.9 2.8 2.9 2.5 2.5	Carbon Dioxide Concentration (%)	9,3	9,4	9,4	9.4	Cm	9,91
Outlet Outlet Outlet on Nitrogen Concentration (ppmv) 85.9 86.4 86.1 86.2 86.5 Outlet NOx Concentration (ppmv, corrected as per USEPA 7E) 2.8 2.8 2.9 2.8 2.8 2.9 2.8 2.8 2.9 2.8 2.8 2.9 2.8 2.8 2.9 2.8 2.8 2.9 2.8 2.8 2.9 2.8 2.8 2.9 2.8 2.8 2.9 2.8 2.8 2.9 2.8 2.8 2.9 2.9<	Carbon Dioxide Concentration (%, drift corrected as per USEPA 7E)	9.4	9.5	9.5	9.5		
Outlet VOC Concentration (ppmv, corrected as per USEPA 7E) \$5.9 \$6.6 \$6.5 \$6.6 \$6.6 \$6.7 \$6.6 \$6.7 \$6.6 \$6.7 \$6.6 \$6.7 \$6.6 \$6.7 \$6.6 \$6.7 \$6.6 \$6.7 \$6.6 \$6.7 \$6.6 \$6.7 \$6.6 \$6.7 \$6.6 \$6.7 \$6.6 \$6.7 \$6.6 \$6.7 \$6.6 \$6.7 \$6.6 \$6.7 \$6.6 \$6.7 \$6.6 \$6.8 \$6.7 \$6.6 \$6.7 \$						NO _I C	orrection
Outlet NOX Concontration (ppmv, corrected as per USEPA 7E) 86.4 86.1 86.2 86.2 Co 0.4 NOX Emission Rate (0hr) 2.8 <td< td=""><td>Outlet Oxides of Nitrogen Concentration (ppmv)</td><td>85.9</td><td>86.6</td><td>86.9</td><td>86.5</td><td></td><td></td></td<>	Outlet Oxides of Nitrogen Concentration (ppmv)	85.9	86.6	86.9	86.5		
NOZ Emission Rate (lb/hr) 2.8 2.8 2.9 2.8 2.9 2.1 2.2 <t< td=""><td>Outlet NOx Concentration (ppmv, corrected as per USEPA 7E)</td><td>86.4</td><td>86.1</td><td>86.2</td><td>86.2</td><td>Co</td><td>0.24</td></t<>	Outlet NOx Concentration (ppmv, corrected as per USEPA 7E)	86.4	86.1	86.2	86.2	Co	0.24
NOR Emission Rate (lb/hr) (corrected as per USEPA 7E) 2.8	NOx Emission Rate (lb/hr)	2.8	2.8	2.9	2.8	Cma	89.8
Outlet NOX Concentration (ppmv, corrected to 15% Q) 40.8 40.6 40.6 40.7 Outlet Curbon Monoxide Concentration (ppmv) 524.0 525.1 525.5 524.9 Outlet CO Concentration (ppmv, corrected as per USEPA 7E) 540.5 540.7 541.2 540.8 CO Emission Rate (bh/hr) 10.4 10.4 10.4 10.5 10.5 Outlet CO Concentration (ppmv, corrected as per USEPA 7E) 10.7 10.7 10.8 10.8 Outlet Sulfur Dioxide Concentration (ppmv, corrected as per USEPA 7E) 20.1 20.3 20.2 22.1 22.2 Outlet Sulfur Dioxide Concentration (ppmv, corrected as per USEPA 7E) 0.9 0.9 0.9 0.9 0.9 So, Emission Rate (bh/hr) (corrected as per USEPA 7E) 1.0 1.0 1.0 1.0 1.0 Outlet SO ₂ Concentration (ppmv, corrected to 15 % Q) 10.4 10.6 10.4 10.5 Co 0.3 Outlet VOC Concentration (ppmv, corrected to 15 % Q) 1112.0 1181.8 1186.8 1162.5 Co 2.4 Outlet VOC Concentration (ppmv, corrected as per USEPA 7E) 31.6 533.9 542.0 530.8 Co 2	NOx Emission Rate (lb/hr) (corrected as per USEPA 7E)	2.8	2.8	2.8	2.8	Cm	89.19
Outlet Carbon Monoxide Concentration (ppmv) S24.0 S25.1 S25.5 S24.9 Outlet Carbon Monoxide Concentration (ppmv, corrected as per USEPA 7E) 10.4 10.4 10.5 10.5 0.0 CO Emission Rate (lb/hr) 10.4 10.4 10.4 10.5 10.5 0.0 CO Emission Rate (lb/hr) 255.5 255.1 255.3 255.3 255.3 255.3 Outlet CO Concentration (ppmv, corrected to 15% Q) 20.1 20.3 20.3 20.2 20.2 22.2	Outlet NOx Concentration (ppmv, corrected to 15% Q)	40.8	40,6	40.6	40,7		
Outlet Carbon Monoxide Concentration (ppmv) 524.0 525.1 525.5 524.9 Co 0.00 Outlet CO Concentration (ppmv, corrected as per USEPA 7E) 10.4 10.4 10.4 10.5 10.5 Outlet CO Concentration (ppmv, corrected as per USEPA 7E) 10.7 10.7 10.8						CO Co	rection
Onlet CO Concentration (ppmv, corrected as per USEPA 7E) 540.5 540.7 541.2 540.8 Co 0.00 CO Emission Rate (lb/hr) 10.4 10.4 10.4 10.5 10.5 0.00 Outlet CO Concentration (ppmv, corrected as per USEPA 7E) 10.7 10.7 10.8 10.8 0.8 0.99 Outlet Sulfur Dioxide Concentration (ppmv, corrected as per USEPA 7E) 20.1 20.3 20.2 22.2 22.2 20.2 22.2 22.2 20.2 20.1 20.3 20.2 20.1 20.0 20.0 10.9 0.9	Outlet Carbon Monoxide Concentration (ppmy)	524.0	525,1	525.5	524.9		1
CO Emission Rate (lb/hr) 10.4 10.4 10.5 10.5 10.5 CO Emission Rate (lb/hr) corrected as per USEPA 7E) 10.7 10.7 10.8 10.8 10.8 Outlet CO Concentration (ppmv, corrected to 15% Q) 255.5 255.1 255.3 255.3 255.3 Outlet SQ Concentration (ppmv, corrected as per USEPA 7E) 20.1 20.3 20.3 20.2 22.0 22.5 22.1 22.2 20.0 0.9	Outlet CO Concentration (ppmy, corrected as per USEPA 7E)	540.5	540.7	541.2	540,8	Co	0.00
CO Emission Rate (lb/hr) (corrected as per USEPA 7E) 10.7 10.7 10.8 10.8 Outlet CO Concentration (ppmv, corrected to 15% Q) 255.5 255.1 255.3 255.3 Outlet Sulfur Dioxide Concentration (ppmv) 20.1 20.3 20.2 20.2 Outlet SQ_ Concentration (ppmv, corrected as per USEPA 7E) 0.9 0.9 0.9 0.9 0.9 SO_ Emission Rate (lb/hr) SO_ Emission Rate (lb/hr) (corrected as per USEPA 7E) 1.0 1.0 1.0 1.0 1.0 Outlet SO_ Concentration (ppmv, corrected as per USEPA 7E) 0.9 0.9 0.9 0.9 0.9 Outlet SO_ Concentration (ppmv, corrected as per USEPA 7E) 1.0 1.0 1.0 1.0 1.0 Outlet VOC Concentration (ppmv vas methane) 1119.0 1181.8 1186.8 1162.5 506.6 Outlet VOC Concentration (ppmv vas propane) 1112.0 1181.8 1186.8 1162.5 506.0 Cma 995.55 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 1112.0 1181.8 1186.8 1162.5 506.0 Cma 995.55 Outlet VOC Concentration (ppmv propane, -Methane, correcte	CO Emission Rate (lb/hr)	10.4	10.4	10.5	10.5	Cma	399
Outlet CO Concentration (ppmv, corrected to 15% Q) 255.5 255.1 255.3 255.3 255.3 Outlet Sulfur Dioxide Concentration (ppmv, corrected as per USEPA 7E) 20.1 20.3 20.3 20.2 SO ₂ Emission Rate (lb/hr) 0.9 0.9 0.9 0.9 0.9 0.9 SO ₂ Emission Rate (lb/hr) 0.0 1.0 1.0 1.0 1.0 1.0 Outlet SO ₂ Concentration (ppmv, corrected as per USEPA 7E) 0.0 1.0.4 10.6 10.4 10.5 Outlet VOC Concentration (ppmv as propane) 516.6 533.9 542.0 530.8 112.0 118.3 1186.8 1162.5 Outlet VOC Concentration (ppmv as propane) 511.5 542.6 550.4 536.0 Cma 995.59 Outlet VOC Concentration (ppmv, corrected as per USEPA 7E) 1112.0 1196.8 1120.0 1173.0 Cma 995.59 Outlet VOC Concentration (ppmv propane, -Methane, corrected to 15%O2) 14.2 9.5 12.3 12.0 24.3 26.1 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 10.5 11.5 12.3 26.1 24.3	CO Emission Rate (lb/hr) (corrected as per USEPA 7E)	10.7	10.7	10.8	10.8	Ст	386.77
Outlet Sulfur Dioxide Concentration (ppmv) 20.1 20.3 20.3 20.2 Outlet SQ_ Concentration (ppmv, corrected as per USEPA 7E) 22.0 22.5 22.1 22.2 SQ_ Emission Rate (lb/hr) 0.9 0.9 0.9 0.9 0.9 SQ_ Emission Rate (lb/hr) (corrected as per USEPA 7E) 1.0 1.0 1.0 1.0 1.0 Outlet SQ_ Concentration (ppmv, corrected to 15 % Q) 10.4 10.6 10.4 10.5 10.4 10.5 Outlet Mothane Concentration (ppmv, sorrected as per USEPA 7E) 515.6 533.9 542.0 530.8 10.4 50.6 Outlet Mothane Concentration (ppmv, corrected as per USEPA 7E) 515.1 542.6 550.4 536.0 Outlet VOC Concentration (ppmv, corrected as per USEPA 7E) 515.1 542.6 550.4 536.0 Outlet VOC Concentration (ppmv, corrected as per USEPA 7E) 31.1 118.3 1186.8 1162.5 Outlet VOC Concentration (ppmv, corrected as per USEPA 7E) 31.6 22.2 24.3 26.1 Outlet VOC Concentration (ppmv, propane, -Methane, corrected to 15%O2) 30.1	Outlet CO Concentration (ppmv, corrected to 15% Q)	255.5	255,1	255.3	255.3	·	
Outlet Sulfur Dioxide Concentration (ppmv) 20.1 20.3 20.3 20.2 Outlet SQ_ Concentration (ppmv, corrected as per USEPA 7E) 22.0 22.3 22.1 22.2 SQ_ Emission Rate (lb/hr) 0.9 0.9 0.9 0.9 0.9 SQ_ Emission Rate (lb/hr) (corrected as per USEPA 7E) 1.0 1.0 1.0 1.0 1.0 Outlet SQ_ Concentration (ppmv, corrected to 15 % Q) 10.4 10.6 10.4 10.5 10.4 10.5 Outlet VOC Concentration (ppmv, sorrected as per USEPA 7E) 516.6 533.9 542.0 530.8 Cm 45.16 Outlet Methane Concentration (ppmv, corrected as per USEPA 7E) 515.1 542.6 550.4 536.0 Cm 24.3 Outlet VOC Concentration (ppmv, corrected as per USEPA 7E) 515.1 542.6 550.4 536.0 Cm 295.59 Outlet VOC Concentration (ppmv, corrected as per USEPA 7E) 31.6 22.3 26.1 26.0 25.4 Outlet VOC Concentration (ppmv propane, -Methane, corrected to 15%O2) 30.1 20.1 26.0 25.4 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 31.6 <td< td=""><td></td><td></td><td></td><td></td><td></td><td>150. Ce</td><td>rection</td></td<>						150. Ce	rection
Outlet SDC Concentration (ppmv, corrected as per USEPA 7E) 22.0 22.1 22.2 22.1 22.2 SO2 Emission Rate (lb/hr) 0.9 0.9 0.9 0.9 0.9 0.9 SO2 Emission Rate (lb/hr) 0.0 1.0 1.0 1.0 1.0 1.0 1.0 Outlet SO2 Concentration (ppmv, corrected to 15 % Q) 10.4 10.6 10.4 10.5 Cm 45.16 Outlet VOC Concentration (ppmv as propane) 516.6 533.9 542.0 530.8 Cm 45.16 Outlet VOC Concentration (ppmv, corrected as per USEPA 7E) 1119.0 1181.3 1186.8 1162.5 Co 2.43 Outlet VOC Concentration (ppmv, corrected as per USEPA 7E) 511.2 22.1 22.6 25.4	Outlat Sulfur Disvide Concentration (nomu)	20.1	20.3	20.3	20.2	50100	
Contention Open Concentration (ppm, corrected as per USEPA 7E) 0.9 0.1 <td< td=""><td>Outlet S0: Concentration (name, corrected as not USEPA 7E)</td><td>22.0</td><td>20.5</td><td>221</td><td>22.2</td><td>C.</td><td>0.19</td></td<>	Outlet S0: Concentration (name, corrected as not USEPA 7E)	22.0	20.5	221	22.2	C .	0.19
SO ₂ Emission Rate (lb/hr) (corrected as per USEPA 7E) 1.0 0.0 0.0 <td>SO E-inter Deta (b b-)</td> <td>22.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>Cma</td> <td>10.0</td>	SO E-inter Deta (b b-)	22.0	0.0	0.0	0.0	Cma	10.0
SO ₂ Emission Rate (Ib/hr) (corrected as per USEPA 7E) 1.0 0.0 <td>SUE Emission Rate (10/nr)</td> <td>1.0</td> <td>1.0</td> <td>0.5</td> <td>1.0</td> <td>Cina</td> <td>45.0</td>	SUE Emission Rate (10/nr)	1.0	1.0	0.5	1.0	Cina	45.0
Outlet SO2 Concentration (ppmv, corrected to 15 % Q) 10.4 10.5 10.4 10.5 Outlet VOC Concentration (ppmv as propane) 516.6 533.9 542.0 530.8 Outlet Methane Concentration (ppmv, corrected as per USEPA 7E) 1119.0 1181.3 1136.8 1162.5 Outlet VOC Concentration (ppmv, corrected as per USEPA 7E) 515.1 542.6 550.4 Cm 995 Outlet VOC Concentration (ppmv propane, -Methane) 30.1 20.1 26.0 25.4 25.4 Outlet VOC Concentration (ppmv propane, -Methane, corrected to 15%O2) 30.1 20.1 26.0 25.4 25.5 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 31.6 22.2 24.3 26.1 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 31.6 20.2 24.3 26.1 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 0.0 0.7 0.8 0.8 VOC Emission Rate as Propane (lb/hr) (-Methane) 0.9 0.6 0.8 0.8 0.2 VOC Emission Rate as Propane(lb/hr) (-Methane) (corrected as per USEPA 7E) 1.0 0.7 0.8 0.8 0.2	SU ₂ Emission Kate (lb/hr) (corrected as per USEPA /E)	1.0	1.0	1.0	1.0		45.10
Outlet VOC Concentration (ppmv as propane)516.6533.9542.0530.8Outlet Methane Concentration (ppmv, corrected as per USEPA 7E)1119.01181.81186.81162.5Outlet VOC Concentration (ppmv, corrected as per USEPA 7E)1112.01196.81210.01173.0Outlet VOC Concentration (ppmv, corrected as per USEPA 7E)30.120.126.025.4Outlet VOC Concentration (ppmv propane, -Methane, corrected to 15%O2)14.29.512.01173.0Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E)31.622.224.326.1Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E)31.622.224.326.1Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E)0.90.60.80.8VOC Emission Rate as Propane (lb/hr) (-Methane)0.90.60.80.80.8VOC Emission Rate as Propane(lb/hr) (-Methane) (corrected as per USEPA 7E)1.00.70.80.8	Outlet SO ₂ Concentration (ppmv, corrected to 15 % Q)	10.4	10.6	10,4	10,5		
Outlet VOC Concentration (ppmv as propane) 516.6 533.9 542.0 530.8 Outlet Methane Concentration (ppmv as methane) 1119.0 11181.3 1136.8 11162.5 Outlet Mothane Concentration (ppmv, corrected as per USEPA 7E) 515.1 542.6 550.4 536.0 Outlet VOC Concentration (ppmv, corrected as per USEPA 7E) 1112.0 1196.8 1210.0 1173.0 Outlet VOC Concentration (ppmv propane, -Methane) 30.1 20.1 26.0 25.4 Outlet VOC Concentration (ppmv propane, -Methane, corrected to 15%O2) 14.2 9.5 12.3 12.0 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 31.6 22.2 24.3 26.1 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 0.9 0.6 0.8 0.8 VOC Emission Rate as Propane (lb/hr) (-Methane) 0.9 0.6 0.8 0.8 Methane Correctic VOC Emission Rate as Propane (lb/hr) (-Methane) (corrected as per USEPA 7E) 1.0 0.7 0.8 0.8						VOC	orrection
Outlet Methane Concentration (ppmv as methane) 1119.0 1181.3 1186.8 1162.5 Outlet Methane Concentration (ppmv, corrected as per USEPA 7E) 515.1 542.6 550.4 536.0 Outlet Methane Concentration (ppmv, corrected as per USEPA 7E) 11112.0 11196.8 1120.0 1173.0 Outlet Methane Concentration (ppmv, corrected as per USEPA 7E) 1112.0 1196.8 1200.0 1173.0 Outlet VOC Concentration (ppmv, propane, -Methane, corrected to 15%O2) 30.1 20.1 26.0 25.4 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 31.6 22.2 24.3 26.1 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 31.6 22.2 24.3 26.1 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 31.6 22.2 24.3 26.1 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 0.9 0.6 0.8 0.8 VOC Emission Rate as Propane (lb/hr) (-Methane) 0.7 0.8 0.8 0.2 2.44	Outlet VOC Concentration (ppmy as propage)	516.6	533.9	542.0	530.8		
Outlet VOC Concentration (ppmv, corrected as per USEPA 7E) 515.1 542.6 550.4 536.0 Cma 995 59 Outlet Methane Concentration (ppmv, corrected as per USEPA 7E) 1112.0 1196.8 1210.0 1173.0 20.1 26.0 25.4 995.59 Outlet VOC Concentration (ppmv propane, -Methane, corrected to 15%O2) 14.2 9.5 12.3 12.0 1173.0 20.1 26.0 25.4 30.1 20.1 26.0 25.4 30.1 20.1 26.0 25.4 30.1 20.1 26.0 25.4 30.1 20.1 26.0 25.4 30.1 20.1 26.0 25.4 30.1 20.1 26.0 25.4 30.1 20.1 20.0 25.4 30.1 20.1 25.4 26.1 31.6 22.2 24.3 26.1 26.1 26.1 26.1 27.2 24.3 26.1 26.0 27.4 26.1 27.2 24.3 26.1 27.2 24.3 26.1 27.2 24.3 26.1 27.2 24.3	Outlet Methane Concentration (ppmy as methane)	1119.0	1181.8	1186,8	1162,5	Co	2.43
Outlet Methane Concentration (ppmv, corrected as per USEPA 7E) 1112.0 1196.8 1210.0 1173.0 Outlet Methane Concentration (ppmv, propane, -Methane) 30.1 20.1 26.0 25.4 Outlet VOC Concentration (ppmv propane, -Methane, corrected to 15%O2) 14.2 9.5 12.3 12.0 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 31.6 22.2 24.3 26.1 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 0.9 0.6 0.8 0.8 VOC Emission Rate as Propane(lb/hr) (-Methane) 0.9 0.6 0.8 0.8 VOC Emission Rate as Propane(lb/hr) (-Methane) (corrected as per USEPA 7E) 1.0 0.7 0.8 0.8	Outlet VOC Concentration (pomy, corrected as per USEPA 7E)	515.1	542.6	550,4	536.0	Cma	995
Outlet VOC Concentration (ppmv propane, -Methane) 30.1 20.1 26.0 25.4 Outlet VOC Concentration (ppmv propane, -Methane, corrected to 15%O2) 14.2 9.5 12.3 12.0 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 31.6 22.2 24.3 26.1 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 15.0 10.5 11.5 12.3 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E, corrected to 15%O2) 15.0 10.5 11.5 12.3 VOC Emission Rate as Propane(lb/hr) (-Methane) 0.9 0.6 0.8 0.8 VOC Emission Rate as Propane(lb/hr) (-Methane) (corrected as per USEPA 7E) 1.0 0.7 0.8	Outlet Methane Concentration (ppmy, corrected as per USEPA 7E)	1112.0	1196,8	1210,0	1173.0	Cm	995.59
Outlet VOC Concentration (ppmv propane, -Methane, corrected to 15%O2) 14.2 9.5 12.3 12.0 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 31.6 22.2 24.3 26.1 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 31.6 22.2 24.3 26.1 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 15.0 10.5 11.5 12.3 VOC Emission Rate as Propane (lb/hr) (-Methane) 0.9 0.6 0.8 0.8 VOC Emission Rate as Propane(lb/hr) (-Methane) (corrected as per USEPA 7E) 1.0 0.7 0.8	Outlet VOC Concentration (ppmy propane, -Methane)	30.1	20.1	26.0	25.4		
Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 51.6 22.2 24.3 26.1 Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E) 51.6 10.5 11.5 12.3 VOC Emission Rate as Propane (lb/hr) (-Methane) 0.9 0.6 0.8 0.8 VOC Emission Rate as Propane(lb/hr) (-Methane) (corrected as per USEPA 7E) 1.0 0.7 0.8 0.8	Outlet VOC Concentration (ppmv propane, -Methane, corrected to 15%02)	14.2	9.5	12.3	12.0		
Outlet VOC Concentration (ppmv propaneMethane, corrected as per USEPA 7E, corrected to 15%O2) 15.0 10.5 11.5 12.3 VOC Emission Rate as Propane (lb/hr) (-Methane) 0.9 0.6 0.8 0.8 VOC Emission Rate as Propane(lb/hr) (-Methane) (corrected as per USEPA 7E) 1.0 0.7 0.8 0.8	Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E)	31.6	22.2	24.3	26.1		
VOC Emission Rate as Propane (lb/hr) (-Methane) 0.9 0.6 0.8 0.8 VOC Emission Rate as Propane(lb/hr) (-Methane) (corrected as per USEPA 7E) 1.0 0.7 0.8 0.8 Co 2.44	Outlet VOC Concentration (ppmv propane -Methane, corrected as per USEPA 7E, corrected to 15%02)	15.0	10.5	11.5	12.3		
VOC Emission Rate as Propane(lb/hr) (-Methane) (corrected as per USEPA 7E) 1.0 0.7 0.8 0.8 Co 2.44	VOC Emission Rate as Propane (lb/hr) (-Methane)	0.9	0.6	0.8	0.8	Metha	ne Correction
Co 2,44	VOC Emission Rate as Propane(lb/hr) (-Methane) (corrected as per USEPA 7E)	1.0	0.7	0.8	0.8		
						- Co	2,44

scfm = standard cubic feet per minute dscfm = dry standard cubic feet per minute ppmv = parts per million on a volume-to-volume basis lib/m = pounds per hour MW = molecular weight (CO = 28.01, NO_N = 46.01, SO₂ = 64.05, C₃H₈ = 44.10) 24.14 = molar volume of air at standard conditions (70°F, 29.92° Hg) 35.31 = R² per m³ 453600 = mg per lb Response factor obtained from introducing propane into methane analyzer:

Equations

lb/hr = ppmv * MW/24.14 * 1/35.31 * 1/453.600 * scfm * 60 Conc₆₀₁₈₄₀₂ * Conc * (20.9 - 15)/(20.9 - %O₂) 2.3

Table 7 Engine 2 HCl Emission Rates DTE Blue Water Renewables Smiths Creek, MI BTEC Project No. 049AS-324444 Sampling Dates: 1/23/2018

Parameter	Run 1	Run 2	Run 3	Average
Test Run Date	1/23/2018	1/23/2018	1/23/2018	
Test Run Time	1115-1215	1255-1355	1437-1537	
Outlet Flowrate (scfm)	4,568	4,574	4,601	4,581
Outlet HCl Concentration (ppm)	1.03	0.93	0.85	0.94
HCl Emission Rate (lb/hr)	0.03	0.02	0.02	0.02

scfm = standard cubic feet per minute dscfm = dry standard cubic feet per minute ppmv = parts per million on a volume-to-volume basis lb/hr = pounds per hour MW = molecular weight (HCl = 36.46) 24.14 = molar volume of air at standard conditions (70°F, 29.92" Hg) 35.31 = ft³ per m³ 453600 = mg per lb

Equations

lb/hr = ppmv * MW/24.14 * 1/35.31 * 1/453,600 * scfm * 60 for HCl



