Emission Test Report

Permit to Install No. 131-12
State Registration Number N2407
Leachate Evaporation System
8230 West Forest Lawn Road
Three Oaks, Michigan 49128

Prepared for Shaw Environmental & Infrastructure, Inc. (a CB&I Company)
16406 U.S. Route 224 E
Findlay, Ohio 45840

Prepared by Shaw Environmental & Infrastructure, Inc. (a CB&I Company)
5050 Section Avenue
Cincinnati, Ohio 45212

CB&I PN 150056-01

August 2013

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1.0 Introduction

On August 21, 2013, personnel from Shaw Environmental and Infrastructure, Inc., a CB&I company (CB&I) conducted an atmospheric emission test program on a leachate evaporation system designated Emission Unit EUEVAPSYS, located at the Forest Lawn municipal solid waste landfill in Three Oaks, Michigan. The purpose of this test program was to demonstrate compliance with the facility's Permit to Install No. 131-12. This permit places a limit on the emission concentration of nonmethane organic compounds (NMOC) expressed as hexane (C_6) at a 3 percent oxygen (O_2) level. The permit limit is 20 parts per million (ppm) NMOC expressed as C_6.

CB&I's Stack Test Project Manager for this project was:

Mr. Chuck Bruffey (QSTI)
Operations Manager, Stack Testing Services
Shaw Environmental & Infrastructure, Inc. (a CB&I company)
5050 Section Avenue
Cincinnati, Ohio 45212
Phone: 513/782-4890
Fax: 513/782-4807
Mobile Phone: 513/479-3181
Email: chuck.bruffey@cbifederalservices.com

CB&I's onsite Test Supervisor was:

Mr. Brian Garls (QSTI)
Senior Scientist, Stack Testing Services
Shaw Environmental & Infrastructure, Inc. (a CB&I company)
5050 Section Avenue
Cincinnati, Ohio 45212
Phone: 513/782-4898
Fax: 513/782-4807
Mobile Phone: 513/315-2694
Email: brian.garls@cbifederalservices.com

The facilities point of contact is:

Mr. Patrick Woodhull
Shaw E&I, Inc. (a CB&I Company)
16406 U.S. Route 224 E
Findlay, Ohio 45840
Phone: 419/425-6175
Email: patrick.woodhull@cbi.com

2.0 Summary of Test Results

Table 1 summarizes the emission data. In summary, the test data show the NMOC concentration averaged 1.6 parts per million as hexane corrected to a 3 percent oxygen level.

Table 1
Summary of Flue Gas and Nonmethane Organic Compound Emissions Data
Leachate Evaporator Exhaust
Three Oaks, Michigan
August 21, 2013 (CB&I PN 150056-01)

Parameter	Units[a]	Test 1	Test 2	Test 3	Average
Start time	24-hour	0908	1045	1208	
Stop time	24-hour	1008	1145	1308	
Flue gas flow rate	acfm[a]	5,475	5,747	5,552	5,591
	dscfm[b]	2,217	2,330	2,240	2,262
Flue gas composition					
Oxygen	% by volume	8.9	9.0	9.0	9.0
Carbon dioxide	% by volume	10.4	10.3	10.3	10.4
Moisture as measured	% by volume	54.2	54.3	54.2	54.2
Moisture at saturation	% by volume	50.4	50.5	50.7	50.5
Flue gas temperature	°F	179	179	179	179
Nonmethane organics concentration	ppm @3% oxygen as hexane	1.4	1.8	1.6	1.6

[a] acfm = Actual cubic feet per minute; dscfm = dry standard cubic feet per minute; standard conditions are 68°F and 29.92 in.Hg; ppm = parts per million; lb/h = pounds per hour.

Testing for NMOC consisted of three tests, each a minimum of 60 minutes in duration. Testing was conducted to satisfy the requirements of New Source Performance Standards Subparts A and WWW of 40 CFR 60 as they apply to the leachate evaporator system. For these sources, the Subpart WWW requirement for compliance is less than 20 parts per million of NMOC at 3 percent O_2 expressed as C_6. The concentration of NMOC corrected to a 3 percent O_2 level and expressed as C_6 was measured using the procedures of U.S. EPA Methods 3A and 25A (40 CFR 60, Appendix A). Samples were extracted from one of two identical evaporator exhaust stacks using a JUM Engineering Model 109A methane/nonmethane hydrocarbon analyzer. This analyzer uses two individual heated flame-ionization detectors (FIDs) and two individual signal amplifiers with zero and span manual adjustments. A sample is introduced into one FID for a total hydrocarbon (THC) reading. The same sample is also run through a heated nonmethane cutter, which eliminates all hydrocarbons except methane; the methane is run through a second FID. The analyzer subtracts the two numbers to give a THC-less-methane reading, or NMOC. The methane-corrected organic compound concentration is corrected to a 3 percent O_2 level expressed as C_6, as specified in Subpart WWW of 40 CFR 60. With each test, the gas stream volumetric flow rate

and composition [percent water vapor, O_2, and carbon dioxide (CO_2)] was measured using the procedures of U.S. EPA Methods 1 through 4 (40 CFR 60, Appendix A).

Flue gas moisture content was calculated two ways, as required by U.S. EPA Method 4. The first calculation uses psychometric data (gas temperature, stack pressure, and barometric pressure) to calculate the saturation percent moisture. The second calculation uses the water condensate collected in the impinger section of the sampling trains, coupled with the metered sample volume, to determine the as-measured moisture value. As required by Method 4, the lower of the two values is used in all flow rate and emission rate calculations.

A drawing of the E-Vap® unit showing the stack layout is included as Figure 1.

3.0 Data Quality Assurance

All test equipment used in this test program was operated and calibrated in accordance with each specific reference method and the procedures outlined in "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Methods," EPA 600/R-04-083c, September 1994. The following routine standard reference method quality control procedures were followed throughout the test program:

- Onsite dry gas meter and thermocouple calibration checks
- Train configuration and calculation checks
- Sampling train and pitot tube system leak checks

Protocol 1 calibration gas standards of propane, O_2, and CO_2 were used to calibrate each analyzer to method specifications. These standards and an Environics gas dilution system were used to generate calibration gases based on the ranges of pollutants measured in each source. The gas dilution procedures described in U.S. EPA Method 205 (40 CFR 51, Appendix M) were used to dilute the gas standards to desired levels. All calibration and system bias checks met method specifications. In addition, a Protocol 1 standard of methane was used to check the accuracy of the "cutter" in the JUM Model 109A methane/nonmethane hydrocarbon analyzer.

landfill. Stack samples were collected from one of two identical E-Vap® discharge stacks. Table 2 summarizes average process data collected by plant computer systems during each test. Process data are contained in Appendix C.

Table 2
Summary of Process Data
Leachate Evaporator
Three Oaks, Michigan
August 21, 2013 (CB&I PN 150056-01)

Test Number	Time (24-hour)	Average Daily Production Rate (gallons per day)	Average Gas Flow to Evaporator (scfm)[a]	Average Burner Temperature (°F)
1	0908-1008	31,344	530	1846
2	1045-1145	32,160	526	1869
3	1208-1308	32,448	524	1874

[a] scfm = Standard cubic feet per minute.

The average daily production rate (gallons per day) is approximately 6 percent lower than the target production rate given in the approved test protocol (34,000 gallons per day). The production rate was slightly lower due to the condition of the landfill gas fuel during the testing; however, the NMOC concentration was significantly below the 20-ppm limit in the permit. Based on these data, the E-Vap® emissions at the normal production capacity of 34,000 gallons per day will still meet the permit conditions.