Gude Landfill Compliance Emissions Test Report Summary

For Full Report Please Contact Rao Malladi @ rao.malladi@montgomerycountymd.gov

AVOGADRO Environmental Corporation

Clean Air and Water, for Today and Tomorrow

COMPLIANCE EMISSIONS TEST REPORT
FOR
EVALUATION OF THE JENBACHER ENGINE

GUDE LANDFILL
ROCKVILLE, MARYLAND

Prepared for:
SCS ENGINEERS
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Submitted to:
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Avogadro Environmental Corporation Project No. 14-2143

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APPENDICES

1.0 INTRODUCTION

1.1 PROJECT SUMMARY

A Subpart JJJJ compliance emissions test program was performed on the outlet of the Jenbacher engine at the **GUDE LANDFILL (GUDE)** in Rockville, Maryland. The purpose of this test program was to measure emissions of carbon monoxide (CO), nitrogen oxides (NO_x) and total non-methane hydrocarbons (VOC) for comparison with emission limits as specified in the operating permit conditions for the engine and to demonstrate compliance with the requirements of 40 CFR 60 Subpart JJJJ.

AVOGADRO ENVIRONMENTAL CORPORATION (Avogadro) was retained by **SCS ENGINEERS (SCS)** to prepare the test protocol, to conduct the Subpart JJJJ compliance evaluation of the engine, and to submit a test report.

This report is organized as follows. Section 3.0 describes the test procedures, Section 4.0 describes the process and Section 5.0 presents test results along with test dates and times.

1.2 PROGRAM RESPONSIBLE PARTIES

Consultant:
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2.0 PERSONNEL AND CERTIFICATIONS

SAMPLING ON THIS PROJECT WAS PERFORMED BY:

Chet Sattizahn	Avogadro Environmental Corp.
Thomas Weber	Avogadro Environmental Corp.

CALCULATIONS AND REPORT PREPARATION WERE PERFORMED BY:

Amber-Rose Cifra	Avogadro Environmental Corp.

THE TESTING WAS OBSERVED BY:

Tyrone Jackson	SCS Engineers
Rory Mandelke	SCS Engineers

REPORT PREPARED BY:

Amber-Rose Cifra
QA/QC Scientist

REPORT REVIEWED AND CERTIFIED BY:

I certify that I have personally examined and am familiar with the information developed or received by Avogadro personnel in this report and, to the best of my knowledge, this information is true, accurate, and complete.

Thomas J. Weber, QSTI
Senior Project Manager

3.0 TECHNICAL APPROACH / METHODOLOGY

3.1 SAMPLING PROCEDURES

Testing was performed in accordance with the protocol and correspondence presented in Appendix I. All test methods utilized for this compliance evaluation are summarized in Table 1 and conform to Title 40, Code of Federal Regulations, Part 60, (40 CFR 60) Appendix A test procedures or those of the MDE. Three, one-hour test runs were conducted on the outlet of the engine.

TABLE 1: SUMMARY OF TEST METHODS

Parameters	USEPA Test Method
Velocity / Volumetric Flowrate	USEPA Methods 1 & 2, "Determination of stack gas velocity and volumetric flow rate (Type S pitot tube)"
Carbon Dioxide (CO_2), Oxygen (O_2)	USEPA Method 3A, "Determination of oxygen and carbon dioxide concentrations in emissions from stationary sources (instrumental analyzer procedure)"
Moisture	USEPA Method 4, "Determination of moisture content in stack gases"
Nitrogen Oxides (NO_x)	USEPA Method 7E, "Determination of nitrogen oxides emissions from stationary sources (instrumental analyzer procedure)"
Carbon Monoxide (CO)	USEPA Method 10, "Determination of carbon monoxide emissions from stationary sources"
Total Hydrocarbons (THC) as Methane	USEPA Method 25A, "Determination of total gaseous organic concentration using a flame ionization analyzer"
Methane	USEPA Method 18, "Measurement of gaseous organic compound emissions by gas chromatography"
Total Non-Methane Hydrocarbons as Propane (VOC)	USEPA Methods 25A/18 (By Difference)

3.2 QUALITY ASSURANCE INFORMATION

Calibration of the equipment employed to measure the parameters of interest is required per the USEPA test methods. All calibration data for this test program is contained in Appendix V of this report. All quality assurance data for this test program is contained in Appendix VI of this report. The following equipment calibration and quality assurance checks warrant individual discussion.

Field Data: Appendix III contains copies of the field data sheets.

Pitot Tubes: Pitot tubes are calibrated in accordance with USEPA Method 2. All new pitot tubes or those meeting the dimensions of USEPA Method 2, section 6.1, are assigned a baseline coefficient of 0.84, per section 10.1 of this method.

Thermocouples: The thermocouples used during the test program were post-calibrated using the procedures of USEPA Alternate Method 11.

Dry Gas Meters: Dry gas meters are calibrated prior to use in accordance with USEPA Method 5, section 10.3 using a dry gas meter as described in section 16.1. Dry gas meters were calibrated in the field in accordance with Alternate Method 009.

Span Gas Certifications: Span gas certifications are provided by the supplier, and copies are presented in Appendix VI.

NOx Converter Efficiency Check: NO_x converter efficiency checks were conducted in accordance with USEPA Method 7E. This data is presented in Appendix VI.

Stratification Check: During the first test run, a stratification test was conducted, using oxygen, in accordance with USEPA Method 7E, Section 8.1.2. Stratification test data is presented in Appendix VII. As a result, a single point was sampled for all subsequent gaseous test runs.

4.0 SOURCE INFORMATION

4.1 PROCESS DESCRIPTION

The Gude Landfill covers approximately 100 acres and is located at 600 E. Gude Drive near Rockville, MD. Landfill gas, consisting of 45 to 50 percent methane, is generated as the waste biodegrades. The gas is collected with an extensive system of wells and pipes and directed to an on-site power plant consisting of a compressor that delivers gas to an 848 kW GE Jenbacher reciprocating internal combustion engine generator ("genset").

4.2 PROCESS OPERATING DATA

During each test run, values for landfill gas engine flow (scfm), engine electrical output (kW), and methane concentration (%) were recorded. These data are presented in Appendix II.

4.3 SAMPLING LOCATION INFORMATION

The sample location was verified in the field to conform to USEPA Method 1. Acceptable cyclonic flow conditions were confirmed prior to testing using USEPA Method 1, Section 11.4. Appendix III contains cyclonic flow data.

TABLE 2: SUMMARY OF SAMPLING LOCATION

Sampling Location	Stack ID	Distance from nearest flow disturbance		Number of Traverse Points
		Downstream EPA "B"	Upstream EPA "A"	
Outlet	13.25 inches	51 inches (3.85 duct diameters)	28 inches (2.11 duct diameters)	Sixteen (eight per port)

5.0 RESULTS / SUMMARY

The emission test results are summarized in Table 3. Known emission limits are listed in the table below. Detailed emission calculations are presented in Appendix IV.

TABLE 3: SUMMARY OF NO_X, CO, AND VOC EMISSIONS – JENBACHER ENGINE

Run	1	2	3	Average	Permit Emission Limit	Subpart JJJJ Emission Limit
Date	11/19/2014	11/19/2014	11/19/2014	---	---	---
Time	10:10 – 11:10	11:38 – 12:42	13:08 – 14:08	---	---	---
Nitrogen Oxides [NOx as NO_2]						
ppmv, dry	96.18	100.79	106.74	101.23	---	---
ppmv, dry @ 15% O_2	42.17	44.06	46.91	44.38	---	220
pounds/KW-hr	0.0018	0.0019	0.0020	0.0019	---	---
grams/BHP-hr	0.58	0.62	0.64	0.62	3.0	3.0
Carbon Monoxide [CO]						
ppmv, dry	609.17	616.43	617.86	614.49	---	---
ppmv, dry @ 15% O_2	267.08	269.48	271.52	269.36	---	610
grams/BHP-hr	2.23	2.32	2.27	2.28	5.0	5.0
Total Non – Methane Hydrocarbons (as Propane) [VOC] by difference						
ppmv, dry	<0.3	<0.3	<0.3	<0.3	---	---
ppmv, dry @ 15% O_2	<0.15	<0.15	<0.15	<0.15	---	80
grams/BHP-hr	<0.002	<0.002	<0.002	<0.002	1.0	1.0

ppmv, dry = parts per million by volume, dry basis
ppmv, dry @ 15% O_2 = parts per million by volume, dry basis, corrected to 15% oxygen
pounds/KW-hr = pounds per kilowatt hour of generation
grams/BHP-hr = grams per brake-horsepower hour