

DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
ACTIVITY REPORT: Scheduled Inspection

N800452590

FACILITY: SUMPTER ENERGY ASSOCIATES	SRN / ID: N8004
LOCATION: 36450 29 MILE RD, LENOX TWP	DISTRICT: Warren
CITY: LENOX TWP	COUNTY: MACOMB
CONTACT: Emily Zambuto , Manager of Environmental Programs	ACTIVITY DATE: 02/26/2020
STAFF: Robert Joseph	COMPLIANCE STATUS: Compliance
SOURCE CLASS: MAJOR	
SUBJECT: Section 2: Scheduled inspection of Landfill Gas to Energy Plant (formerly N8004 now N5984).	
RESOLVED COMPLAINTS:	

Section 2 - Sumpter Energy Associates (N5984)

On February 26, 2020, I, Michigan Department of Energy, Great Lakes, and Energy-Air Quality Division (EGLE-AQD) staff Robert Joseph, conducted a scheduled inspection of Sumpter Energy Associates (SRN: N5984) located at 36450 29 Mile Road, Lenox Township, Macomb County, Michigan. The purpose of the inspection was to determine the facility's compliance with the requirements of the Federal Clean Air Act; Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, Michigan Department of Environment, Great Lakes, and Energy-Air Quality Division Administrative Rules, and conditions of the facility's Renewable Operating Permit (ROP) MI-ROP-N5984-2019.

General Information

I arrived at the facility shortly before 11 a.m. and met with Emily Zambuto, Aria Manager of Environmental Programs. I introduced myself and presented my identification and credentials and stated the purpose of my visit. I asked Emily to provide me some general information regarding the facility.

She indicated that Sumpter Energy is a subsidy of Aria Energy and has been at its present location since approximately 1998. Sumpter Energy Associates, LLC receives its fuel, landfill gas (LFG), for nine internal combustion engines from Pine Tree Acres Landfill (PTA) located nearby. The two companies have a contractual agreement in which PTA sells LFG to Sumpter Energy Associates, LLC. The facility sells the energy produced to DTE through a 20-year service contract.

The facility operates its engines 24 hours/7 days a week (unless maintenance is being performed) with staff on-site from 7:30 a.m. to 4:30 p.m. The facility employs roughly four people.

Facility Tour

Sumpter Energy Associates, LLC has two buildings located adjacent to PTA's two enclosed flares and landfill gas treatment systems.

Building #1 (referred to as Phase I) houses engines #1 through #7. These 7 engines are reciprocating internal combustion engines manufactured by Caterpillar, Inc. (All have the Model No. CAT G3516 and are rated at 1,138 horsepower and 8.6 MMBtu/hr) with 16 cylinders each. Sumpter Energy receives their landfill gas from PTA with the sulfur content removed through PTA's sulfur removal process before using it as fuel in engines #1 through #7.

Building #2 (referred to as Phase II) houses engines #8 and #9. These 2 engines are reciprocating internal combustion engines manufactured by Caterpillar, Inc. (both with Model No. CAT G3520C and rated at 2233 brake-horsepower with 1.6 megawatts of gross electrical output) with 20 cylinders each. Engines #8 through #9 do not receive their gas with the sulfur content removed. This was known at the time Sumpter Energy applied for the permit, and instead of undergoing PSD review and potentially installing a sulfur removal treatment, Sumpter Energy accepted permit limits for Engines #8 and #9.

Engines #8 and #9 maintain a sulfur monitoring and SO₂ emission curtailment plan due to the Violation Notice issued by the department in November 2012 regarding H₂S and SO₂ exceedances. The facility currently decreases the flow and engine load to meet the permit limits.

These engines operate as lean burn reciprocating internal combustion engines which mean that the combustion

mixture contains excess air as compared to stoichiometric combustion. The engines are turbocharged and equipped with aftercoolers to further increase the intake charge density. Rich-burn engines operate at almost stoichiometric air/fuel ratio (AFR) and require after-treatment, whereas lean burn engines use a lot of excess air, usually about twice the stoichiometric amount. The air dilution effectively cools down the peak combustion temperature in the cylinder that reduces NO_x emissions.

Environmental Compliance per MI-ROP-N5984-2019: Records since the department's last inspection (08/28/18) were reviewed onsite with Emily and referred to when applicable below.

EU-ICEENGINE10

On June 20, 2016, the facility applied for a permit for an additional engine, EU-ICEENGINE 10. Permit to Install (105-16) was approved on October 25, 2016. This engine has permit limits for the same pollutants as Engines #8 and #9 with the addition of Formaldehyde. This engine has not yet been installed and was given an extension by the AQD in December 2017 and was rolled into the facility's ROP in 2019. The facility anticipates installation to occur sometime later this year.

FG-ENGINES (Engines #1 through #7)

I. EMISSION LIMITS

Pollutant	Permit Limit	Time Period/ Operating Scenario	Stack Test Result	Current 12-month total
1. NO_x	35.2 lbs/hr	According to method	10.6 lbs/hr	N/A
2. NO_x	154.2 tons	12-month rolling time period	N/A	46.62 tons
3. CO	51.1 lbs/hr	According to method	47.5 lbs/hr	—
4. CO	223.8 tons	12-month rolling time period	—	184.40 tons
5. HCl	0.7 lbs/hr	According to method	0.636 lbs/hr	—
6. HCl	3.0 tons	12-month rolling time period	—	2.7 tons
7. NMOC	8.8 lbs/hr	According to method	4.18 lbs/hr	—
8. NMOC	38.5 tons	12-month rolling time period	—	16.42 tons

Stack test results for the above pollutants were conducted on June 3-5, 2019.

III. PROCESS/OPERATIONAL LIMITS

The facility only burns landfill gas in FG-ENGINES. The facility updated its FG-ENGINES Malfunction Abatement/Preventative Maintenance Plan which addresses the following:

- Identification of the equipment and the supervisory personnel responsible for overseeing the inspection, maintenance, and repair.
- Description of the items or conditions to be inspected and frequency of the inspections or repairs.
- Identification of the equipment and operating parameters monitored to detect a malfunction or failure, the normal operating range of these parameters and a description of the method of monitoring or surveillance procedures.

- Identification of the major replacement parts maintained.
- A description of the corrective procedures or operational changes taken in the event of a malfunction or failure to achieve compliance with the applicable emission limits.

IV. DESIGN/EQUIPMENT PARAMETER(S)

The facility adjusts and monitors the air/fuel ratio to ensure that each engine operates at its maximum design output based on the fuel available to burn. This occurs within the intake manifold. The air-to-fuel ratio is manually adjusted daily based upon LFG quality. This is performed during the morning and afternoon hours.

Each engine is equipped with a device to monitor and record the hours of operation for each engine using a non-resettable hour meter. There are notes labeled on each engine for adjustment to the engine hours as the some of the devices that record the engine hours have reached their life-cycle end. Hours are also entered electronically.

Each engine is equipped with a device to monitor and record the total daily fuel usage of the engines. The daily landfill gas usage varies between 2,500,000 ft³ and 3,500,000 ft³ for all engines.

VI. MONITORING/RECORDKEEPING

The following is each engine's value ranges for electrical output and hours of operation, and landfill gas flow (combined total flow for FG-ENGINES) in 2018 and 2019.

Engine	Electrical Output (kW)	Hours of Operation (hrs)	Landfill Gas Flow (ft ³)
Engine 1	780-820	595-742	2.5-3.5 x 10 ⁶
Engine 2	780-820	643-742	2.5-3.5 x 10 ⁶
Engine 3	780-820	200-742	2.5-3.5 x 10 ⁶
Engine 4	780-820	472-742	2.5-3.5 x 10 ⁶
Engine 5	780-820	634-740	2.5-3.5 x 10 ⁶
Engine 6	780-820	639-745	2.5-3.5 x 10 ⁶
Engine 7	780-820	555-734	2.5-3.5 x 10 ⁶

The facility also monitors and records the emissions of CO, NO_x, NMOC, and HCl.

The heating value varies with an average BTU rating between 451 and 535 for each engine.

The facility maintains the chlorinated compound content of the landfill gas. The emission rate has varied between 0.22 and 0.68 (established in the 2019 stack test) and the 12-month rolling total in 2018 and 2019 was 0.95 tons month and 2.07 tons, respectively.

The facility monitors and records the temperature of the air/fuel mixture at the after cooler outlet a minimum of once per day. The upper temperature limits were set during the recent stack test in 2014 as follows:

Engine 1: 163 F, Engine 2: 168 F, Engine 3: 173 F, Engine 4: 172 F,
Engine 5: 170 F, Engine 6: 170 F, Engine 7: 170 F.

All values range between 120 and the upper limit for each engine. There have not been any deviations of the air/fuel mixture temperature reading greater than 5 °F in excess of the maximum air/fuel mixture temperature observed.

The facility logs all maintenance activities conducted on each engine in FG-ENGINES which include spark plug replacement, cylinder head work, and engine tune-up.

The facility maintains an inventory table for each engine in FG-ENGINES:

Engine No.	Model No.		Serial No.	Manuf. Date
EU-ENGINE1	CAT G3516		3RC00663	09/14/1992
EU-ENGINE2	CAT G3516		4EK00952	06/03/1996
EU-ENGINE3	CAT G3516		4EK02088	05/26/1994
EU-ENGINE4	CAT G3516		3RC00386	6/18/1991
EU-ENGINE5	CAT G3516		4EK02485	05/05/1999
EU-ENGINE6	CAT G3516		4EK01551	10/08/1997
EU-ENGINE7	CAT G3516		CLT00644	10/03/2003

EU-ENGINE1 was originally S/N 4EK01537 with a manufacture date of 10/01/1997.

EU-ENGINE2 was originally S/N 4EK01538 with a manufacture date of 10/02/1997. S/N 4EK01538 was replaced with S/N 4EK00960 with a manufacture date of 06/06/1996 on 12/19/2013. S/N 4EK00960 was replaced with 4EK00952 on 11/11/2014.

EU-ENGINE3 was originally S/N 4EK01543 with a manufacture date of 10/04/1997.

EU-ENGINE4 was originally SN 4EK01546 with a manufacture date of 10/06/1997.

EU-ENGINE5 was originally S/N 4EK01551 with a manufacture date of 10/08/1997.

EU-ENGINE6 was originally S/N CLT00643 with a manufacture date of 10/03/2003.

The facility maintains all the necessary information (monitoring, calculations, engine manufacture information and maintenance activities) to demonstrate compliance with the emission limits of this permit.

There were no visible emissions or obstructions with each engine's stack.

FG-ICENGINES2

I. EMISSION LIMITS

Engine #8

Pollutant	Permit Limit	Time Period/ Operating Scenario	Test Result
2. CO	16.3 lbs/hr	Hour	14.2 lbs/hr
4. NO _x	3.0 lbs/hr	Hour	2.37 lbs/hr
*5. SO ₂	7.5 lbs/hr	Hour	3.57 lbs/hr
6. VOC	1.0 g/bhp-hr	Hour	0.16 g/bhp-hr

Engine #9

Pollutant	Permit Limit	Time Period/ Operating Scenario	Test Result
2. CO	16.3 lbs/hr	Hour	13.7 lbs/hr
4. NO _x	3.0 lbs/hr	Hour	1.9 lbs/hr
*5. SO ₂	7.5 lbs/hr	Hour	3.57 lbs/hr
6. VOC	1.0 g/bhp-hr	Hour	0.15 g/bhp-hr

Stack test results for the above pollutants in both engines #8 and #9 (CO, NO_x, and VOC) was performed on 12/11/19. *Stack result for SO₂ was performed on 01/09/20 and is a combined permit limit and result.

III. PROCESS/OPERATIONAL LIMITS

The facility only burns landfill gas in FG-ICENGINE2, but the gas is not treated for these engines prior to them receiving it. The facility submitted an SO₂ monitoring and curtailment plan to the AQD in 2013 and it was approved to meet the permit emission limits.

The facility updated its FGENGINES Malfunction Abatement/Preventative Maintenance Plan which addresses the following:

- Identification of the equipment and the supervisory personnel responsible for overseeing the inspection, maintenance, and repair.
- Description of the items or conditions to be inspected and frequency of the inspections or repairs.
- Identification of the equipment and operating parameters monitored to detect a malfunction or failure, the normal operating range of these parameters and a description of the method of monitoring or surveillance procedures.
- Identification of the major replacement parts maintained.
- A description of the corrective procedures or operational changes taken in the event of a malfunction or failure to achieve compliance with the applicable emission limits.

The engines are operated at constant power output as to minimize HAP emissions. The engines are equipped to operate in a satisfactory manner as the air-to-fuel ratio automatically adjusts daily based upon LFG quality.

The sulfur monitoring and emission curtailment plan is implemented and maintained through daily monitoring and recordkeeping of the sulfur content and by decreasing the flow and engine load to meet the permit limits.

IV. DESIGN/EQUIPMENT PARAMETER(S)

The engines are operated in a satisfactory manner as the air-to-fuel ratio is automatically adjusts daily based upon LFG quality.

Each engine is equipped with a generator and gauge to monitor and record the hours of operation. Engine #8 generator read 14,257 hours and Engine #9 generator read 40,107 hours at the time of inspection.

Each engine is equipped with a generator and gauge to monitor and record the total daily fuel usage of the engines. The daily landfill gas usage varies between 1,266,000 ft³ and 1,600,000 ft³ each engine.

VI. MONITORING/RECORDKEEPING

Engine No.	Model No.		Serial No.	Manuf. Date

EU-ICENGINE8	CAT G3520C		GZJ00189	7/25/2005
EU-ICENGINE9	CAT G3520C		GZJ00423	9/22/2005

EU-ICENGINE8 was originally S/N GZJ00422 with a manufacture date of 11/17/2009. At the time of the engine replacement GZJ00422 had accumulated 50,448 hours since new. GZJ00422 was replaced with GZJ00189 (with manuf. Date of 7/27/2005) on 10/23/2018.

EU-ICENGINE9 was originally S/N GZJ00423 with a manufacture date of 11/24/2009. GZJ00423 was replaced with GZJ00199 (with manuf. Date of 9/22/2005) on 10/11/2013. GZJ00423 replaced GZJ00199 on 4/22/2015.

The facility monitors the total landfill gas fuel usage of the engines and the hours of operation for each engine. Monthly landfill gas usage over the last year varies between 38,000,000 ft³ and 48,000,000 ft³. The facility monitors and records the hours of each engine with Engine 8 varying between 596 and 740 hours, and Engine 9 varying between 634 and 712 hours per month over the last year.

The facility maintains a log of all maintenance activities conducted according to the malfunction abatement/preventative maintenance plans as stated in Section II. This include spark plug replacement, cylinder head work, and engine tune-up.

The facility determines the monthly SO₂ mass emission calculation for each engine in FG-ICENGINE2. The SO₂ emission calculations are based on the most recent landfill gas sulfur content sampling results and the monthly landfill gas usage of the engines. Emission rates vary between 2.76 and 3.95 lb/hr over the last 12 months. The facility also monitors and records the emissions of CO, NO_x, NMOC, and HCl.

The facility continuously monitors the kilowatt output from each engine. Engine 8 read 1557 kW and Engine 9 read 1525 kW at the time of inspection. Engine 8 has varied between 910,8000 kW/hr and 1,182,000 kW/hr last 12 months, and Engine 9 has varied between 963,900 kW/hr and 1,138,000 kW/hr the last 12 months.

The facility calculates and keep records of the daily gas usage for each engine on a monthly basis using the kilowatt output from each engine. The landfill gas usage for Engine 8 has varied between 1,270,459 and 1,627,828 hp/month over the last 12 months, and the Engine 9 landfill gas usage has varied between 1,344,528 and 1,587,377 hp/month over the last 12 months.

The facility monitors and records the average BTU content of the landfill gas burned in FG-ICEENGINE2 an average BTU rating between 455 and 474 for each engine.

There were no visible emissions or obstructions with each engine's stack.

FG-RICEMACT

III. PROCESS/OPERATIONAL LIMITS

The facility operates FG-ENGINES as to minimize the HAP emissions by manually adjusting the air-to-fuel ratio daily based upon LFG quality. The air-to-fuel ratio is self-adjusting based upon the LFG quality to minimize HAP emissions for FG-ICENGINES. The air-to-fuel ratio for FG-ICENGINES varied between 8.1 and 8.5 at the time of inspection and operate at steady state and via arm controller to minimize time spent idling. There have been no reported exceedances.

IV. DESIGN/EQUIPMENT PARAMETER(S)

The engines are equipped with fuel meters to record the daily fuel usage and volumetric flow rate.

VI. MONITORING/RECORDKEEPING

The engines are equipped with separate fuel meters to record the daily fuel usage and volumetric flow rate.

Conclusion

Based on EGLE-AQD inspection and records review, it appears that Sumpter Energy Associates, LLC is in

compliance with the requirements of the Federal Clean Air Act; Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, Michigan Department of Environment, Great Lakes, and Energy-Air Quality Division (EGLE-AQD) Administrative Rules, and conditions of the facility's Renewable Operating Permit (ROP) MI-ROP-N5984-2019.

NAME Robert Joseph

DATE 03/05/20

SUPERVISOR Sebastianykallemkal