

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

N800435002

FACILITY: SUMPTER ENERGY ASSOCIATES		SRN / ID: N8004
LOCATION: 36450 29 MILE RD, LENOX TWP		DISTRICT: Southeast Michigan
CITY: LENOX TWP		COUNTY: MACOMB
CONTACT: Emily Zambuto, Manager of Environmental Programs		ACTIVITY DATE: 04/12/2016
STAFF: Rebecca Loftus	COMPLIANCE STATUS: Compliance	SOURCE CLASS: MAJOR
SUBJECT: Annual Inspection; See also N5984, Pine Tree Acres Landfill. These two SRNs make up one stationary source.		
RESOLVED COMPLAINTS:		

On April 12, 2016, I, Rebecca Loftus, from the Department of Environmental Quality (DEQ), Air Quality Division (AQD), conducted an inspection of Sumpter Energy Associates, LLC. (Sumpter Energy) located at Pine Tree Acres Landfill, SRN: N8004, 36450 29 Mile Road, Lenox Township, Macomb County, Michigan. The purpose of this inspection was to determine the facility's compliance with the Federal Clean Air Act, Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act of 1994, PA 451, as amended, Michigan's Air Pollution Control Rules, and Renewable Operating Permit (ROP) No. MI-ROP-N8004-2013.

Upon arrival, I met with Ms. Emily Zambuto, ARIA Manager of Environmental Program, Mr. Jason Neumann, ARIA Regional Manager, and Mr. Vince Dang, Chief Plant Operator.

Below is a summary of my findings during my inspection and file review of Sumpter Energy Associates. Supporting documents and record keeping can be found on the attached CD.

Contacts

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Source Overview

Pine Tree Acres, Inc. (operated by Waste Management of Michigan, Inc.) owns and operates a municipal solid waste landfill, named Pine Tree Acres Landfill (PTA), located at 36600 29 Mile Road, Lenox Township, Macomb County, Michigan. Sumpter Energy Associates (operated by ARIA Energy) owns an electric generating facility that currently consists of nine internal combustion engines. Sumpter Energy receives its fuel, landfill gas (LFG), for nine internal combustion engines from Pine Tree Acres Landfill. The two companies have a contractual agreement in which PTA sells LFG to Sumpter Energy. Together these entities comprise one single stationary source; the SRN for Pine Tree Acres, Inc. is N5984, and the SRN for Sumpter Energy Associates is N8004.

Sumpter Energy has two buildings located adjacent to Waste Management's two enclosed flares and landfill gas treatment systems. Building #1 (PTA Phase I) houses Engines #1

through #7 and Building #2 (PTA Phase II) houses engine #8 and #9. These engines are permitted under ROP number MI-ROP-N8004-2013 and have enforceable limits/conditions in the following flexible groups: FGENGINES, FGICENGINE2, and FGRICEMACT.

In addition to the on-site inspection observations, I reviewed and discuss the following in this report: compliance with ROP conditions, HAP emissions (Formaldehyde), H₂S Concentrations/SO₂ Emissions, Engine Swap-outs, NSPS JJJJ/2015 Stack Test, NESHAP ZZZZ, and the 2015 MAERS report.

Engines #1-7

In the ROP, the listed install date for Engines #1-5 is July 24, 2001, and for Engines #7 and #8 is December 31, 2003. Engines #1 through #7 comprise the Flexible Group: FGENGINES, and have permit limits for NO_x, CO, HCl, and NMOC. In addition to the permit limits, Sumpter Energy must analyze the landfill gas for chlorinated compounds, record operating hours of each engine, record the electrical output from each generator, and record the temperature of the air/fuel mixture at the aftercooler outlet.

As observed at previous inspections, post-it notes are at each control panels for Engines #1 through #7. Mr. Neumann previously explained the notes are used because the recording devices have a set lifetime and have to be replaced; notes are also used to recalculate engine hours when engine swap-outs occur. The following parameters were recorded at the time of my inspection:

Engine No.	Hours of operation	Output (KW)
EU-ENGINE1	27,604	800
EU-ENGINE2	12,174	790-800
EU-ENGINE3	38,883	800
EU-ENGINE4	152,628	790-800
EU-ENGINE5	29,709	800
EU-ENGINE6	28,401	800
EU-ENGINE7	105,859	800

During my inspection, the total flow to PTA Phase I was 2,247 scfm with a gas temperature of 76°F. The plant was producing 5500KW and the house load was 77KW.

During my inspection, Mr. Dang and Ms. Zambuto provided me with the following records for Engines #1-7 (see attached CD):

- Emissions data: NO_x, CO, HCl, NMOC
- End of Month Reports which include the operating hours of each engine, the electrical output from each generator, the temperature of the air/fuel mixture at the aftercooler outlet, and the daily engine parameter readings.
- The 2016 chlorinated compound content sampling and analysis of landfill gas
- Maintenance activities logs (reviewed on-site and provided electronically)

Upon review of the records, I noted the following for engines #1-7:

**FG-ENGINES (#1-7) Reported Emissions
(Based on 12-month rolling data)**

Pollutant	Permit Limit	April 2015 – March 2016**
NO _x	35.2 lbs/hr	11.7
NO _x	154.2 tons	49.75
CO	51.1 lbs/hr	39.1
CO	223.8 tons	166.34
HCl	0.7 lbs/hr	0.16
HCl	3.0 tons	1.92
NMOC*	8.8 lbs/hr	3.5
NMOC*	38.5 tons	14.85

*Note that the reported NMOC does not include formaldehyde emissions. See section below for more information on formaldehyde.

**The records provided appear to be utilizing the emission factors established for Engines #1-#7 during the 2014 stack test.

As required in their permit, Sumpter Energy provided records showing the monthly operating hours of each engine, the electrical output from each generator, the temperature of the air/fuel mixture at the aftercooler outlet, and the daily engine parameter readings (see attached CD).

Based on the data provided, from September 2015 through March 2016, each engine operated between 568 - 741 hours per month. The total engine output ranged between 3,753,230 and 4,191,211 KWH (91-101% gross capacity). The Btu rating of the LFG ranged from 472 - 518.

The aftercooler readings are recorded daily, except during holidays and plant shut downs. The upper limits established during the original stack test ranged from 163-173°F (note aftercooler readings were not recorded during the April 2014 performance testing). The records from September 2015 through April 2016 indicate temperatures for each engine are below this established maximum range; with the highest temperatures, ~158 °F, observed in September 2015. During my inspection, Mr. Dang showed me how the after cooler readings are taken and explained staff use a handheld Infrared Thermometer gun to obtain the readings. During my inspection, the aftercooler reading for Engine #1 was 126 °F.

Sumpter provided the daily readings for each engine in the January, February, and March End of Month Reports (see attached CD). The data provided appears to be consistent with the data enter in monthly data spreadsheets.

Sumpter Energy provided a copy of the chlorinated compound content sampling and analysis of landfill gas conducted on February 16, 2016 (see attached CD). According to the report, the HCl emission factor was in compliance with permit limit of 0.7 lb/hr. The results indicate HCl emissions were 1.18 lb/MMscf or 0.16 lb/hr (calculated using a flow rate of 2,240 scfm for Engines #1-7). The test results are similar to last year's results.

The maintenance actives are recorded by hand and entered into the computer tracking system. Dr. Dang provided copies of word documents, one for each engine, which have recorded maintenance actives from 2007 to present (see attached CD)

Based on the records provided, at this time, Sumpter Energy appears to be in compliance with the conditions listed under FGENGINES.

Engines #8 and #9

In the ROP, Engines #8 and #9 comprise the Flexible Group: FGICENGINE2, and have permit limits for NO_x, CO, SO₂, and VOC. In addition to the permit limits, Sumpter Energy must provide a malfunction abatement/preventative maintenance plan to the AQD, maintain a log of all maintenance activities, monitor and record operating hours of each engine, record the daily fuel usage, monitor and record emissions and operating conditions, record the electrical output from each generator, and monitor and record the H₂S concentrations of the landfill gas (see the ROP for condition details). These Engines are also subject to 40 CFR, Part 60, Subpart JJJJ, the Standards of Performance for Stationary Spark Ignition Internal Combustion Engines. For more information on H₂S and NSPS JJJJ, please see the corresponding sections of this report.

During my inspection, I recorded the following engine parameters from the Electronic Technician Computer System for Engines #8 and #9:

Ranges of Engine Parameters Observed During Inspection

From the Electronic Technician Computer System	Engine 8	Engine 9
Engine Speed	1200	1201
Generator Total Real Power	1547	1498
Engine Load Factor (%)	95-97	92-97
Actual Engine Ignition Timing (Deg.)	28	28
Inlet Manifold Air Pressure ABS (psi)	50	48.6
Inlet Air Temperature (°F)	132	132
Engine Oil Temp (°F)	190	199
Engine Coolant Temp (°F)	217	221
Air to Fuel Ratio	8.7	8.7
Fuel Valve %	48	49
Gas Fuel Flow (scfm)	545	534
Fuel Quality (Btu)	488	512
Gas Differential Pressure (psi)	4	4
Air Flow (scfm)	4756	4628
Fuel Temp (°F)	72	73
Engine Droop %	5	5
Throttle Actuator Position %	62.37	50.42
Engine Hours	47283	8410*

*Swap-out occurred in 2014; Is now back to the original engine #9

Recorded by other Devices	Engine 8	Engine 9
Engine Output (Kw)	1582	1530
Plant Output (Kw)	~3200 (in house load 60kw)	~3200 (in house load 60kw)
Plant Fuel (scfm)	990-1000	990-1000
CH4 %	53.9	53.9
CO2 %	41.14	41.14
O2 %	1.02	1.02
Unit Base Load Set Point	1568	1536
Frequency (Hz)	60	60
Power Factor	0.96	0.96
Battery	26	26
Cylinder Temperature Range (°F)	1094-1166	1100-1161

The Air to Fuel Ratio is higher than and the Fuel Temperature is lower than the recorded parameters observed during the 2015 inspection; the remaining parameters are similar to previous observations.

During my inspection, Mr. Dang and Ms. Zambuto provided me with the following records for Engines #8-9 (see attached CD):

- Emissions data: NO_x, CO, HCl, NMOC
- End of Month Reports which include daily observations, daily engine parameter logs, and monthly data for each engine
- Maintenance activities logs (reviewed on-site and provided electronically)

Upon review of the records, I noted the following for engines #8 and #9: From September 2015 through March 2016, Engine # 8 operated between 687 and 738 hours per month, Engine # 9 operated between 691 and 739 hours per month. For Engines #8 and #9, the total power output ranged between 1,076,234 and 1,152,943 KWH. Both engines consumed between 41,164,027 and 46,499,286 scf of landfill gas; the landfill gas btu rating ranged from 460-494 Btu/scf.

FGICENGINE2 (#8 and #9) Reported Emission Ranges

Pollutant	Units	Permit Limit	Engine #8 September 2015 – March 2016	Engine #9 September 2015 – March 2016
CO	g/bhp-hr	3.3	2.73	2.75 (2015) 2.55 (2016)
CO	lbs/hr	16.3	13.12-13.16	12.16-13.21
CO	lbs/month	---	9035-9679	8489-9707
NO _x	g/bhp-hr	0.6	0.35 (2015) 0.44 (2016)	0.39 (2015) 0.41 (2016)
NO _x	lbs/hr	3.0	1.68-2.12	1.86-1.97
NO _x	lbs/month	---	1199-1540	1331-1444
VOC*	g/bhp-hr	1.0	0.16 (2015) 0.18 (2016)	0.16 (2015) 0.15 (2016)
VOC*	lbs/month	---	536-615	496-564

*Note that the reported VOC does not include formaldehyde emissions and is reported as NMOC. See section below for more information on formaldehyde.

**FGICENGINE2 (#8 and #9) Emissions
(Based on 12-month rolling data)**

Pollutant	Units	Permit Limit	August 2015
CO	tons/year	---	108.99
NOx	tons/year	---	15.41
VOC	tons/year	---	6.48
SO2	tons/year	---	27.08
SO2	lbs/hr	7.5	6.2*
H2S	ppm	600	638

*In September and October 2015 the SO2 was calculated at 7.2 lbs/hr.

The last updated to the malfunction abatement/preventative maintenance plan for the engines was received in May 2013 (see document in file).

Based on the records provided, at this time, Sumpter Energy appears to be in compliance with the conditions listed under FGICENGINE2.

Formaldehyde and HAP emissions

To date, Sumpter Energy does not have formaldehyde limits in their permit for Engines #1-9. The AQD landfill work group and AQD management are continuing discussions on how to approach the industry-wide concern of formaldehyde emissions.

As noted in my previous inspection reports, on December 7, 2012, Derenzo and Associates calculated the following source-wide PTE for HAPs. These calculations were based on updated emission factors provided by Caterpillar Inc., and included the eight engines operated at Pine Tree Acres, Inc., two enclosed flares, and nine engines operated at Sumpter Energy.

HCl: 9.2 TPY
 Formaldehyde (HCHO): 115.2 TPY
 Other Landfill gas HAPS: 6.9 TYP
 Total HAPs: 131.3 TPY

Using the Caterpillar emission factors of 0.80 lbs/hr for the CAT 3516 Engines and 2.07 lbs/hr for the CAT 3520C Engines, and operating hours provided by Sumpter Energy, AQD staff calculated the following emissions for formaldehyde:

Formaldehyde Emissions Based on Sumpter Energy's Operating Hours reported in MAERS

Year	Engines #1-7 (Tons)	Engines #1-9 (Tons)
2010	24.03	29.74
2011	23.86	41.18
2012	23.73	41.56
2013	23.88	40.98
2014	23.85	41.57
2015	23.83	41.16

H₂S Concentrations/SO₂ Emissions History and Current Data

History: Previously in 2010 and 2011, the landfill gas H₂S concentration ranged from 147 ppm to 443.7 ppm. From April 2012 through August 2012, H₂S concentrations were above the 600 ppm limit established in the ROP and the SO₂ emission limit of 7.5 lb/hr was also exceeded in April and May. Sumpter Energy indicated that higher H₂S concentrations are due to the biosolids received by Pine Tree Acres Landfill. Note: Waste Management removes sulfur from their gas stream before using it as fuel in their engines; Sumpter Energy's Engines #1 through #7 received gas with sulfur removed, however Engines #8 and #9 do not. 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.

On November 15, 2012, the AQD issued a Violation Notice Letter to Sumpter Energy. Sumpter Energy responded on November 30, 2012, and January 4, 2013, and agreed to the following compliance plan objectives (see letters in file for full details):

1. Sumpter Energy will conduct monthly sulfur monitoring through December 2013, and as necessary, to show compliance with the permit limit of H₂S concentrations below 600 ppm.
2. Sumpter Energy will submit the sulfur monitoring results to the AQD Southeast Michigan District Office within 7 days of the monitoring event. In addition to the H₂S concentration, they will provide the SO₂ calculations.
3. Sumpter Energy will curtail operations during high concentrations of H₂S in the gas stream (i.e. limit the hours the engines operate).

On September 9, 2015, Ms. Zambuto provided an updated copy of the excel file containing the engine curtailment plan which is based on H₂S and fuel flow (see copy in file).

Summary of H₂S and SO₂ Data, January 2012 through March 2016

Month	Weight Average H ₂ S Concentration (ppm)	Highest Recorded H ₂ S Concentration (ppm)	SO ₂ Emissions (lb/hr)	SO ₂ Emissions (tons/year)
Jan 2012	208.8*	---	2.1	9.54
Feb 2012	208.8*	---	2.2	9.28
Mar 2012	208.8*	---	2.2	9.11
*Sumpter was only sampling quarterly for these months.				
Apr 2012	768.3	---	8.5	11.62
May 2012	741.1	---	8.3	14.12
Jun 2012	660.9	---	7.1	16.12
Jul 2012	671.7	---	6.9	17.68
Aug 2012	666.7	---	6.9	19.33
Sep 2012	380.6	---	4.0	19.87
Oct 2012	494.6	---	5.2	21.03
Nov 2012	500	---	5.4	22.27

Month	Weight Average H ₂ S Concentration (ppm)	Highest Recorded H ₂ S Concentration (ppm)	SO ₂ Emissions (lb/hr)	SO ₂ Emissions (tons/year)
Dec 2012	549.7	---	4.9	23.33
Jan 2013	471.6	---	4.8	24.35
Feb 2013	529.1	---	5.1	25.31
Mar 2013	559	---	NA	NA
Apr 2013	490.7	---	4.5	25.00
May 2013	511	---	5.3	23.91
Jun 2013	522	---	5.2	23.22
Jul 2013	550.5	---	4.8	22.44
Aug 2013	535.3	---	5.6	21.95
Sep 2013	545.7	---	5.3	22.41
Oct 2013	529.1	---	4.7	22.22
Nov 2013	500.4	---	4.6	21.93
Dec 2013	478.8	---	4.7	21.86
Jan 2014	491	504	4.5	21.73
Feb 2014	472	499	3.9	21.31
Mar 2014	523	551	4.3	20.97
Apr 2014	561	604	6.0	21.52
May 2014	555	584	5.3	21.51
Jun 2014	570	591	5.6	21.65
Jul 2014	526	580	5.9	22.04
Aug 2014	558	625	5.6	22.30
Sep 2014	626	633	6.0	22.58
Oct 2014	592	693	5.4	22.85
Nov 2014	539	584	5.3	23.10
Dec 2014	525	582	5.2	23.29
Jan 2015	517	547	5.2	23.55
Feb 2015	534	563	5.5	23.91
Mar 2015	529	545	5.2	23.98
Apr 2015	557	586	3.6	23.26
May 2015	585	589	5.7	23.37
Jun 2015	562	592	5.3	23.17
Jul 2015	671	743	6.3	23.54
Aug 2015	640.57	765	6.4	23.84
Sept 2015	721.0	765	7.2	24.25
Oct 2015	696.0	727	7.2	24.93
Nov 2015	683.0	716	6.8	25.48

Month	Weight Average H ₂ S Concentration (ppm)	Highest Recorded H ₂ S Concentration (ppm)	SO ₂ Emissions (lb/hr)	SO ₂ Emissions (tons/year)
Jan 2016	645.0	686	6.2	26.47
Feb 2016	615.0	630	6.1	26.72
Mar 2016	638.0	669	6.2	27.08

From January 2014 forward, Sumpter recalculated the monthly average using all data points collected in the month (weekly/daily readings, not just the first of the month). The AQD continues to receive and review the monthly reports for H₂S and SO₂; see the file for daily/weekly/monthly readings. From September 2015 through March 2016, the recorded H₂S concentrations were above 600ppm.

Currently, Sumpter Energy is de-rating their engines (decreasing flow and engine load) to stay in compliance with the SO₂ limits established in the ROP. I discuss this with Mr. Dang and Ms. Zambuto during my inspection and explained my concerns as the AQD does not see this as a long term solution to the increasing H₂S concentrations on-site. Ms. Zambuto explained that Sumpter Energy will be submitting an application to install an additional CAT 3520 Engine and they plan to propose sulfur removal treatment for the LFG. They will work with Waste Management to remove sulfur from the landfill gas for the new engine and engines #8 and #9; by using the sulfur removal treatment system, Sumpter will no longer have to de-rate engines #8 and #9 and increases in H₂S concentrations/SO₂ emissions would no longer be a concern.

Engine Swap Outs

During my inspection, Mr. Dang explained no engine swap-outs had occurred since my last inspection and none are planned for 2016.

NSPS JJJJ

In 2009 Sumpter Energy applied for a permit for Engines #8 and #9. Based on installation and manufacturer dates, these engines are subject to 40 CFR Part 60, Subpart JJJJ, the Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (NSPS JJJJ). The AQD is still evaluating the applicability of NSPS JJJJ for Engines #1 through #7 swap-outs.

On August 27, 2010, Sumpter Energy submitted their Initial Notification for NSPS and the required Engine Malfunction Abatement Plan was updated with their ROP renewal in 2013 (see file for plans).

On February 1, 2016, the AQD received the test results report for verification of CO, NO_x, and VOC concentrations and emission rates from Engines #8 and #9. The test report gave the following emission rates for Engine #8: CO was 12.9 lbs/hr and 2.73 g/bhp-hr, NO_x was 2.08 lbs/hr and 0.44 g/bhp-hr, VOC 0.83 lbs/hr and 0.18 g/bhp-hr. For Engine #9: CO was 12.1 lbs/hr and 2.55 g/bhp-hr, NO_x was 1.93 lbs/hr and 0.41 g/bhp-hr, VOC 0.72 lbs/hr and 0.15 g/bhp-hr. Based on the reported emissions, Engines #8 and #9 tested below their permit limits as well as NSPS JJJJ.

NESHAP ZZZZ

With formaldehyde emissions, Sumpter Energy/PTA is now a major source of HAPs and therefore is subject to 40 CFR Part 63, Subpart ZZZZ, the Nation Emission Standard for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (NESHAP ZZZZ).

On February 1, 2013, Sumpter Energy submitted the Initial Notification for NESHAP ZZZZ; the notification was received late (more than 180 days from start-up).

Sumpter Energy submitted their last NESHAP ZZZZ annual compliance report on January 27, 2016 (see NESHAP file for report details). The report states the following: Phase I consists of seven CAT 3516 RICE and Phase II consists of two CAT 3520 RICE. Sumpter Energy only combusted LFG in these engines. The Yearly landfill gas (LFG) fuel usage for Phase I was 1,007,478,958 scf and for Phase II was 508,972,011 scf. The total heat input for LFG was reported at 832,566 MMBtu. Sumpter certified there were no deviations from the operating limits and no problems with the fuel meters.

MAERS

For 2015, PTA reported the following emissions:

Pollutant	Tons
CO	268.75
NOx	68.90
PM10	7.58
SO2	46.71
VOC	21.44

Note: Formaldehyde emissions from the engines were not included in the reported VOC emissions.

The 2015 MAERS data appears to be consistent with the records provided during my inspection.

Compliance Conclusions

Based on information gathered during the inspection and the records reviewed, Sumpter Energy appears to be in compliance with the Federal Clean Air Act, Michigan's Air Pollution Control Rules, and the conditions of ROP No. MI-ROP-N8004-2013.

For details on the Pine Tree Acres Inspection, see the report for SRN: N5984.

UPDATE

The AQD received a PTI application from Sumpter Energy Associates in Lansing on June 20, 2016, and in the field office on July 1, 2016. Field staff will review the PTI application and provide comments to Lansing Permit Staff.

NAME Rebecca Jeffers

DATE 4/29/16
Updated 7/15/16

SUPERVISOR CJE