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

N800426334

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|---|---|---|
| **FACILITY:** SUMPTER ENERGY ASSOCIATES | | **SRN / ID:** N8004 |
| **LOCATION:** 36450 29 MILE RD, LENOX TWP | | **DISTRICT:** Southeast Michigan |
| **CITY:** LENOX TWP | | **COUNTY:** MACOMB |
| **CONTACT:** Jason Neumann , Regional Manager | | **ACTIVITY DATE:** 08/06/2014 |
| **STAFF:** Rebecca Loftus | **COMPLIANCE STATUS:** Compliance | **SOURCE CLASS:** MAJOR |
| **SUBJECT:** Annual Compliance Inspection; Also see SRN: N5984 | | |
| **RESOLVED COMPLAINTS:** | | |

On August 6, 2014, I, Rebecca Loftus, from the Department of Environmental Quality (DEQ), Air Quality Division (AQD), conducted an inspection Sumpter Energy Associates, LLC. (Sumpter Energy) at Pine Tree Acres Landfill, SRN: N8004, located at 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, Mr. Jason Neumann, Plant Manager, escorted me through the facility. While on-site Mr. Neumann would not provide me with access to any of the required record keeping; he stated that for any records, I would have to make a request in writing.

**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, located at 36600 29 Mile Road, Lenox Township, Michigan. Sumpter Energy (operated by Landfill Energy Systems) owns an electric generating facility that utilizes landfill gas as fuel; located at 36450 29 Mile Road, Lenox Township, Michigan.

On February 11, 2008, an agreement was made between the AQD, the management of Pine Tree Acres, Inc., and the management of Sumpter Energy , which allowed the two entities to have separate ROPs (SRN; N5984 and SRN: N8004). Together these entities comprise one single stationary source.

Sumpter Energy has two buildings located adjacent to Waste Management's two enclosed flares and landfill gas treatment system. 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

In addition to the on-site inspection, AQD staff reviewed the following: compliance with ROP conditions, HAP emissions (including Formaldehyde), $H_2S$ Concentrations/$SO_2$ Emissions, Engine Swap Outs, NSPS JJJJ, NESHAP ZZZZ, 2013 MAERS, and the 2013 Stack Tests.

**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 the last inspection, post-it notes are at each control panels for Engines #1 through #7. Mr. Neumann previously explained that 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) | Aftercooler Temp °F |
|---|---|---|---|
| EU-ENGINE1 | 13,111 (139281-126170) | 800 | 145.5 |
| EU-ENGINE2 | 5,432 (139494-134062) | 800 | 152.5 |
| EU-ENGINE3 | 24,479 (138091-113612) | 800 | 140.5 |
| EU-ENGINE4 | 138,297 (16457+121840) | 800 | 154.5 |
| EU-ENGINE5 | 15,241 (139352-124111) | 800 | 160 |
| EU-ENGINE6 | 13,929 (91123-77194) | 800 | 139.5 |
| EU-ENGINE7 | 91367 | 800 | 139.5 |

At the time of the inspection, Mr. Neumann stated that all record requests needed to be made in writing. On August 11, 2014, the AQD requested records from January 2014 through June 2014. Ms. Emily Zambuto provided the requested records via email on August 21, 2014 (see attached emails and data).

Previously the $NO_x$, CO, HCl, and NMOC emissions were calculated using emission factors collected during a 2002 stack test on Engines #1 through #5; for Engines #6 and #7 emission factors were calculated using the worst case scenario from Engines #1 through #5. When ROP-MI-N8004-2013 was issued, a condition was added to the permit which required Sumpter Energy to verify these emission rates through a more current stack test. See the stack testing section below for the results of that test.

The following were the report emissions for Engines #1 through #7:

**FG-ENGINES (Engines #1-7)**
**Emission Ranges**

| Pollutant | Permit Limit | Jan-June 2014 |
|---|---|---|
| $NO_x$ | 35.2 lbs/hr | 25.9-26.8 |
| $NO_x$ | 154.2 tons | 111.07-112.19 |
| CO | 51.1 lbs/hr | 26.9-27.9 |
| CO | 223.8 tons | 115.32-116.48 |
| HCl | 0.7 lbs/hr | 0.04 |
| HCl | 3.0 tons | 1.27-1.30 |
| NMOC | 8.8 lbs/hr | 3.4-3.5 |
| NMOC | 38.5 tons | 14.53-14.65 |

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

Sumpter Energy also 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 and records for details).

From January 2014 through June 2014, each engine operated between 600-730 hours per month with the exception of Engine #4 in February at 239 hours. The total engine output ranged between 3,623,550 and 4,013,100 KWH.

The aftercooler readings are recorded Monday through Friday except during holidays and plant shut downs. The upper limits established during the most recent stack test range from 163-173°F. The records from 2014 indicate temperatures are below this established maximum range.
The 2014 daily readings of Phase I were documented Monday through Friday. These hand written sheets provide the engines parameter data as well as the plant power output. Upon review of these logs, the data appears to be consistent with the data enter in the weekly and monthly data spreadsheets.

The AQD received the results of Sumpter Energy's latest chlorinated compound content sampling and analysis of landfill gas on April 25, 2014 (see letter in file). In their letter, Sumpter Energy reported a HCl emission factor of 2.28 lbs/MMscf and a mass emission rate of 0.27 lbs/hr for the facility based on a fuel usage rate of 284 scfm per engine. This is consistent with previous years.

**Engines #8 and #9**
In the ROP, Engines #8 and #9 comprise the Flexible Group: FGICENGINE2, and have permit limits for $NO_x$, CO, $SO_2$, 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 $H_2S$ 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 $H_2S$ 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 | 1201 | 1999-1203 |
| Generator Total Real Power | 1555 | 1583 |
| Engine Load Factor (%) | 98-100 | 95-101 |
| Actual Engine Ignition Timing (Deg.) | 28 | 28 |
| Inlet Manifold Air Pressure ABS (psi) | 48.8 | 48.4 |
| Inlet Air Temperature (°F) | 130 | 134 |
| Engine Oil Temp (°F) | 192 | 199 |
| Engine Coolant Temp (°F) | 221 | 223 |
| Actual Oxygen (sensor out) | --- | --- |
| Air to Fuel Ratio | 8 | 7.9-8.0 |
| Fuel Valve % | 50 | 51 |
| Gas Fuel Flow (scfm) | 578 | 574 |
| Fuel Quality (Btu) | 458 | 452 |
| Gas Differential Pressure (psi) | 4 | 4 |
| Air Flow (scfm) | 4662 | 4545 |
| Fuel Temp (°F) | 88 | 90 |
| Engine Droop % | 5 | 5 |
| Throttle Actuator Position % | 56-57 | 76 |
| Engine Hours | 32918 | 63256-56248 = 7008 |

| **Recorded by other Devices** | **Engine 8** | **Engine 9** |
|---|---|---|
| Engine Output (Kw) | 1598 | 1594-1618 |
| Plant Output (Kw) | 3180 | 3128 |
| Plant Fuel (scfm) | 1105 | 1127 |
| Gen. Voltage | 4311 | 4315 |
| Gen. Kw | 1578 | 1502 |
| CH4 % | 50.4 | 50.4 |
| CO2 % | 40.38 | 40.38 |
| O2 % | 0.72 | 0.72 |
| Unit Base Load Set Point | 1600 | 1600 |

| | | |
|---|---|---|
| Frequency (Hz) | 59.9 | 60 |
| Power Factor | 0.96 | 0.96 |
| Battery | 25.5 | 25.5 |
| Cylinder Temperature Range (oF) | 1000-1100 | 1000-1100 |

Sumpter Energy updated their malfunction abatement/preventative maintenance plan for their engines in May 2013 (see document in file).

Ms. Zambuto provided the "End of Month" reports which include the daily observations, daily engine parameter logs, and monthly data for each engine (see attached CD).

From January to June 2014 Engine # 8 operated between 644 and 730 hours per month, Engine # 9 operated between 667 and 739 hours per month. For Engines #8 and #9, the total power output ranged between 972,393 and 1,123,450 KWH, and 1,017,276 and 1,145,552 KWH, respectively. Both engines consumed between 38,335,639 and 44,589,987 scf of landfill gas; the landfill gas rating ranged from 460-479 Btu/scf.

Below are summaries of the data provided by Sumpter Energy, for January to June 2014:

| Pollutant | Units | Permit Limit | Engine #8 Jan-June 2014 | Engine #9 Jan-June 2014 |
|---|---|---|---|---|
| CO | g/bhp-hr | 3.3 | 2.51 | 3.20 |
| CO | lbs/hr | 16.3 | 11.58-12.02 | 14.79-15.27 |
| CO | lbs/month | --- | 7505-8598 | 10,010-11,272 |
| NOx | g/bhp-hr | 0.6 | 0.46 | 0.51 |
| NOx | lbs/hr | 3.0 | 2.12-2.20 | 2.36-2.43 |
| NOx | lbs/month | --- | 1375-1589 | 1595-1796 |
| VOC* | g/bhp-hr | 1.0 | 0.14 | 0.16 |
| VOC* | lbs/month | --- | 418-483 | 500-563 |

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

**FGICENGINE2 (Engines #8 and #9) Emissions**

| Pollutant | Units | Permit Limit | Jan-June 2014 |
|---|---|---|---|
| CO | tons/year | --- | 105.62 |
| NOx | tons/year | --- | 18.44 |
| VOC* | tons/year | --- | 6.02 |
| SO2 | tons/year | --- | 28.50 |
| SO2 | lbs/hr | 7.5 | 3.9-6.0 |
| H2S** | ppm | 600 | 456-604 |

*Note that the reported VOC does not include formaldehyde emissions and is reported as NMOC. See section below for more information on formaldehyde.
**See monthly/weekly data readings in file.

**Formaldehyde and HAP emissions**

As of 2014, Sumpter Energy does not have formaldehyde limits in their permit. 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 report, 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 |

**$H_2S$ Concentrations/$SO_2$ Emissions**

Previously in 2010 and 2011, the landfill gas $H_2S$ concentration ranged from 147 ppm to 443.7 ppm. From April 2012 through August 2012, $H_2S$ concentrations were above the 600 ppm limit established in the ROP and the $SO_2$ emission limit of 7.5 lb/hr was also exceeded in April and May. Sumpter Energy indicated that higher $H_2S$ 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 $H_2S$ 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 $H_2S$ concentration, they will provide the $SO_2$ calculations.
3. Sumpter Energy will curtail operations during high concentrations of $H_2S$ in the gas stream (i.e. limit the hours the engines operate).

Based on the data provided, the averages for $H_2S$ and $SO_2$ continue to trend higher:

| Sumpter Energy Monthly Summaries for $H_2S$ and $SO_2$ | | | |
|---|---|---|---|
| Month | Average $H_2S$ Concentration (ppm) | $SO_2$ Emissions (lb/hr) | $SO_2$ Emissions (tons/year) |
| January 2012 | 208.8* | 2.1 | 9.54 |
| February 2012 | 208.8* | 2.2 | 9.28 |
| March 2012 | 208.8* | 2.2 | 9.11 |
| April 2012 | 768.3 | 8.5 | 11.62 |
| May 2012 | 741.1 | 8.3 | 14.12 |
| June 2012 | 660.9 | 7.1 | 16.12 |
| July 2012 | 671.7 | 6.9 | 17.68 |
| August 2012 | 666.7 | 6.9 | 19.33 |
| September 2012 | 380.6 | 4.0 | 19.87 |
| October 2012 | 494.6 | 5.2 | 21.03 |
| November 2012 | 500.0 | 5.4 | 22.27 |
| December 2012 | 549.7 | 4.9 | 23.33 |
| January 2013 | 471.6 | 4.8 | 24.35 |
| February 2013 | 529.1 | 5.1 | 25.31 |
| March 2013 | 559.0 | NA | NA |
| April 2013 | 490.7 | 4.5 | 25.00 |
| May 2013 | 511.0 | 5.3 | 23.91 |
| June 2013 | 522.0 | 5.2 | 23.22 |
| July 2013 | 550.5 | 4.8 | 22.44 |
| August 2013 | 535.3 | 5.6 | 21.95 |
| September 2013 | 545.7 | 5.3 | 22.41 |
| October 2013 | 529.1 | 4.7 | 22.22 |
| November 2013 | 500.4 | 4.6 | 21.93 |
| December 2013 | 478.8 | 4.7 | 21.86 |
| January 2014 | 485.7 | 4.5 | 21.73 |
| February 2014 | 406.8 | 3.9 | 21.31 |
| March 2014 | 455.1 | 4.3 | 20.97 |
| April 2014 | 603.7 | 6.0 | 21.52 |
| May 2014 | 546.6 | 5.3 | 21.51 |
| June 2014 | 543.0 | 5.6 | 21.65 |
| July 2014 | 579.9 | 5.9 | 22.04 |

The AQD continues to receive and review the monthly; see the file for daily/weekly/monthly H2S readings. The average H2S concentration is approaching 600ppm. As previously stated, if the increasing trend in observed values continues, the AQD recommends that Sumpter Energy apply for a permit modification and/or install sulfur removal treatment system for the gas stream sent to engines #8 and #9.

**Engine Swap Outs/Maintenance**

See the attached Inventory of Engines provided by Sumpter Energy. Since the last AQD inspection, it appears that Engines #1, #2, and #9 were replaced (2013).

The AQD is currently evaluating engine swap-outs and the applicability of Rule 201, NSPS JJJJ, and NESHAP ZZZZ. The AQD landfill work group and AQD management are continuing discussions on how to approach this industry-wide concern.

In addition to the swap-outs, Engine #4 and Engine #7 both had "Major Overhaul" maintenance activities performed in February/March 2014. Sumpter Energy also provided a print out of all maintenance activities for the engines (see the attached reports).

**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 applicably 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).

**NESHAP ZZZZ**

Before 2012, Sumpter Energy was considered a minor source of HAPs. With formeldahyde 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 an annual compliance report on February 28, 2014 (see NESHAP file for report details). The report gives the monthly usage of landfill gas, gives the fuel Btu values, and indicated that no deviations occurred in 2013.

## 2013 MAERS

The following table lists emission information as reported to the Michigan Air Emissions Reporting System (MAERS) in the 2013 submittal.

**TOTAL STATIONARY SOURCE EMISSIONS**

| Pollutant | Tons per Year |
|---|---|
| Carbon Monoxide (CO) | 206.57 |
| Nitrogen Oxides ($NO_x$) | 127.88 |
| Particulate Matter (PM) | 8.0 |
| Sulfur Dioxide ($SO_2$) | 44.38 |
| Volatile Organic Compounds (VOCs) | 20.41 |

Note: Formaldehyde emissions were not reported as part of the Total VOCs or HAPs in 2013.

## Stack Testing

On January 14, 2014, the AQD received the test results report for verification of carbon monoxide, nitrogen oxides, and volatile organic compound concentrations and emission rates from two CAT G3520C IC Engines identified as EUENGINE8 and EUENGINE9. The testing was conducted on December 3, 2013. According to the test report Engine #8 had the following emission rates: NOx was 0.46 g/bhp-hr and 2.19 lbs/hr, CO was 2.51 g/bhp-hr and 11.9 lbs/hr, VOC was 0.14 g/bhp-hr. Engine #9 had the following emission rates: NOx was 0.51 g/bhp-hr and 2.41 lbs/hr, CO was 3.20 g/bhp-hr and 15.1 lbs/hr, VOC was 0.16 g/bhp-hr. Both engines appear to be in compliance with the permit limits: NOx 0.60 g/bhp-hr and 3.0 lbs/hr, CO 3.3 g/bhp-hr and 16.3 lbs/hr, VOC was 1.0 g/bhp-hr.

On June 13, 2014 the AQD received the test results report for the verification of carbon monoxide, nitrogen oxides and non-methane hydrocarbon emission rates for Engines 1-7. According to the report, the emission rates during the test were in compliance with permit limits (see report for details).

Summary of Emission Rates

| | CO Emission Rates | | NOx Emission Rates | | NMOC Emission Rates | |
|---|---|---|---|---|---|---|
| **Emission Unit** | **(lb/hr)** | **(b/bhp-hr)** | **(lb/hr)** | **(b/bhp-hr)** | **(lb/hr)** | **(b/bhp-hr)** |
| EUENGINE1 | 5.6 | 2.3 | 2.3 | 1.0 | 0.4 | 0.2 |
| EUENGINE2 | 6.3 | 2.6 | 1.8 | 0.8 | 0.4 | 0.2 |
| EUENGINE3 | 5.1 | 2.1 | 1.7 | 0.7 | 0.5 | 0.2 |
| EUENGINE4 | 5.1 | 2.2 | 1.3 | 0.5 | 0.4 | 0.2 |
| EUENGINE5 | 5.2 | 2.2 | 1.3 | 0.5 | 0.5 | 0.2 |
| EUENGINE6 | 5.2 | 2.2 | 1.5 | 0.6 | 0.4 | 0.2 |
| EUENGINE7 | 5.1 | 2.1 | 1.4 | 0.6 | 0.4 | 0.2 |
| **Total/Average** | 37.6 | 2.2 | 11.1 | 0.7 | 3.0 | 0.2 |
| **Emission Limit** | 51.1 | --- | 35.2 | --- | 8.8 | --- |

**Compliance Conclusions**

Upon review of the records, Sumpter Energy appears to in compliance with the Federal Clean Air Act, Michigan's Air Pollution Control Rules, and the conditions of ROP No. MI-ROP-N8004-2013.

At this time Sumpter Energy appears to be following the Compliance Schedule outlined in Appendix 2 of the ROP and in their response to the previous violation notice. However, the AQD has noted that the H2S concentrations averages are trending higher and appear to be approach the permit limit of 600ppm.

AQD staff are awaiting guidance from management and the Landfill Workgroup on compliance related to formaldehyde emissions, engine swap-outs, Rule 201 applicability, and NSPS JJJJ applicability. These will be re-evaluated at during future AQD inspections.

NAME Rebecca Fitts DATE 9/10/14 SUPERVISOR CJE