



Wood Street Generating Station

# Malfunction Abatement & Preventative Maintenance Plan

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# 1 BACKGROUND

The Energy Developments Lansing, LLC (EDL) owns and operates the Wood Street Generating Station. This Malfunction Abatement and Preventative Maintenance Plan (Plan) was prepared in accordance with Section 1 Flexible Group FGICEENGINES-S1 Condition III(2) (page 28 of 67) of the Renewable Operating Permit (ROP) No. MI-ROP-N5991-2013 for Granger Wood Street Landfill. Permit condition outlines the requirements of the Plan:

The plan shall incorporate procedures recommended by the equipment manufacturer as well as incorporating standard industry practices. At a minimum the plan shall include:

- a. Identification of the equipment and, if applicable, air-cleaning device, and the supervisory personnel responsible for overseeing the inspection, maintenance, and repair.
- b. Description of the items or conditions to be inspected and frequency of the inspections or repairs.
- c. Identification of the equipment and, if applicable, air-cleaning device, operating parameters that shall be 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.
- d. Identification of the major replacement parts that shall be maintained in inventory for quick replacement.
- e. A description of the corrective procedures or operational changes that shall be taken in the event of a malfunction or failure to achieve compliance with the applicable emission limits.

If the plan fails to address or inadequately addresses an event that meets the characteristics of a malfunction at the time the plan is initially developed, the owner or operator shall revise the plan within 45 days after such an event occurs and submit the revised plan for approval to the AQD District Supervisor. Should the AQD determine the malfunction abatement/preventative maintenance plan to be inadequate, the AQD District Supervisor may request modification of the plan to address those inadequacies. (R 336.1702(a), R 336.1910, R 336.1911, R 336.1912, R 336.2803, R 336.2804, 40 CFR 52.21(c) & (d))

This Plan has been developed to satisfy the above requirements. As such, it provides procedures and elements of inspection, inspection frequencies, back up equipment inventories and general information used to prevent, detect, and correct malfunctions.

It is important to note that the regulations anticipated that periodic shutdown of the each individual control equipment at a landfill is anticipated. Since periodic malfunctions, unforeseen circumstances or short duration maintenance activities are anticipated by the regulations, EDL believes they have implemented a program consistent with these requirements.

EDL understands that AQD expects EDL to address any temporary break down of a control device or devices. While a plan has been written suggesting parts lists,

inspections, inspection frequencies, etc. to comply with the above paragraph it is anticipated the short duration shutdown events will continue to occur which are beyond EDL's control.

## **2      AFFECTED EQUIPMENT**

EDL plans to operate three internal combustion engines that are covered by this Plan. The engines are used for combusting treated landfill gas to produce electricity. These engines are identified as Emission Units EUICEENGINE1, EUICEENGINE2 and EUICEENGINE3 ROP issued by Michigan Department of Environmental Quality.

### 3 RESPONSIBLE PERSONNEL

All supervisory personnel responsible for overseeing the inspection, maintenance, and repair of the engine plant are listed below:

<u>Name</u>	<u>Title</u>	<u>Phone Number</u>
Todd Davlin	Director of Operations	517-371-9755
Phil Jaworsky	Plant Operator	517-230-9022
Dan Zimmerman	Compliance Officer	517-371-9711
James Alexander	Maintenance Manager	517-819-4264

## 4 MALFUNCTION ABATEMENT AND PREVENTATIVE MAINTENANCE PLAN

The following section of this Plan contains prevention of malfunctions, detection of malfunctions, and correction of malfunctions for each of the engines.

### 4.1 Description of the Equipment

EDL plans to operate three ~~two~~ internal combustion engines (both Caterpillar G3520C) for combusting treated landfill gas to produce electricity. These engines are identified as Emission Units EUICEENGINE1, EUICEENGINE2 and EUICEENGINE3 in Permit No. 357-07.

### 4.2 Equipment Inspection

Table 1 shows the Engine Plant items or conditions that are inspected, the frequency of the inspections, the procedures followed to aid in the prevention of a malfunction, monitoring parameters that are used to detect and aid in the prevention of a malfunction or equipment failure, the normal range of these parameters, and recording / retaining of the monitoring records.

**Table 1**  
**List of Engine Plant Prevention / Detection Items**

Item or Conditions to Be Inspected	Frequency of Inspection /Monitoring	Procedures to be Followed to Aid in the Prevention of Malfunctions
Engine Air Cleaner Element	*Performance based assessment	Check Sensor (difference in pressure) Replace when necessary
Engine Oil	*Performance based assessment	Establish baseline, use oil chemistry and performance as a guide (Change when necessary)
Engine Oil Sample	Establish Baseline for each engine (Performance/oil sample)	Once baseline is established verify frequency with oil chemistry sampling results
Engine Oil Level	Weekly	Check float & secondary auto-fill
Engine Oil Temperature	Weekly	Check temperature gauge
Oil Filter Differential Pressure	Weekly	Check Electronic Technician (ET) software
Engine Oil Filter	Establish Baseline for each engine (Performance/oil sample)	Check pressure differential, change engine oil filter as needed
Fuel Metering Valve	Performance based assessment	Check codes, clean sensor

<b>Item or Conditions to Be Inspected</b>	<b>Frequency of Inspection /Monitoring</b>	<b>Procedures to be Followed to Aid in the Prevention of Malfunctions</b>
Throttle Control Valve (Check electronic valves)	Performance based assessment	Check ET software
Cooling System Coolant Level	Weekly	Check sight glass for level and color
Cooling System Coolant Temperature	Weekly	Check ET software
Cooling System Coolant Pressure	Weekly	Check ET software
Differential Pressure Crankcase Vent	Weekly	Check pressure, control vacuum (walk around)
Generator Load	Weekly	Check load conditions (Kilowatts)
Walk-Around Inspection	Weekly	Check for any unusual conditions, leaks, broken gauges, pinched wires/tubing etc.
Battery Electrolyte Level	*Every 6 months of service	Check battery electrolyte level
Belts (Radiator)	*Every 12 months	Inspect/Adjust/Replace
Engine Valve	Performance based assessment	Adjust as needed
Radiator	Performance based assessment	Check inlet & outlet temperatures, clean/wash exterior surfaces as needed
Water Pump	Performance based assessment	Inspect for leaks during walk-around inspection
Generator	*Performance based assessment (assess at approximately 8,000 hours of use)	Visually inspect system for loose wires/fittings, vibration damage etc.
Ignition System Spark Plugs	Performance based assessment	Inspect/Replace
Turbocharger	*Performance based assessment (assess at approximately 8,000 hours of use)	Establish baseline to use as a guide (Change when necessary)
Overhaul - Top End	*Performance based assessment (assess at approximately 50,000 hours of use)	Top end overhaul is performed on site and is based on performance assessment
Overhaul - In-Frame	Performance based assessment	In-Frame overhaul is performed on site and is based on performance assessment
Overhaul - Major	*Performance based assessment (assess at approximately 100,000 hours of use)	Engine is removed and replaced with identical/like kind unit and is based on performance assessment



*\*Engine performance supersedes frequency of maintenance activities. Approximate values used in this table **should only be used as a guideline** in evaluation of each parameter to be inspected, maintained and replaced.*

*Based on facility records and EDL personnel, a preventative maintenance program is conducted. Routine maintenance is conducted on the engines in accordance with manufacturer and company specifications which include replacing engine spark plugs, oil, and lubrication. Maintenance is also conducted on an as needed basis. In addition, a "top-end" overhaul, which includes replacing/cleaning cylinder heads, turbochargers and valves, is conducted on each engine. This is typically completed on site.*

*A "Major" overhaul includes all of the work of a topend overhaul plus disassembling all of the bearings, seals, gaskets, and components that wear and may even include replacing the crankshaft. When an engine is due for a major overhaul, it is swapped out with another engine. When the engine is swapped, it is removed from the facility and either replaced with an engine with a different serial number and manufacture date or the same unit is brought back after being rebuilt and will have the same serial number and manufacture date. Swapping engines in this manner is an industry standard for maintaining the engines.*

### **4.3 Replacement Parts**

To facilitate quick replacement, the spare or replacement parts necessary for proper engine operation and routine maintenance will be located on site at each generation facility or at EDL's central maintenance facility (major components or specialty parts will be ordered as needed). Inventory may vary from time to time.

### **4.4 Corrective Procedures**

The corrective procedures or operational changes shall be undertaken in the event of a malfunction or failure of the generation facility. EDL will expeditiously implement the appropriate procedures to correct the event. Repair records will be maintained in an operations log.

## **5 Implementation of and Updates to Plan**

### ***5.1 Implementation of the Plan***

If the plan fails to address or inadequately addresses an event that meets the characteristics of a malfunction at the time the plan is initially developed, the owner or operator shall revise the plan within 45 days after such an event occurs and submit the revised plan for approval to the AQD District Supervisor. Should the AQD determine the malfunction abatement/preventative maintenance plan to be inadequate, the AQD District Supervisor may request modification of the plan to address those inadequacies.

### ***5.2 Updates to the Plan***

This Plan will be updated within 60 days of replacing or expanding the components of the Engine Plant with components not described herein. If no components of the Engine Plant are replaced or expanded with components described herein, the Plan will be updated at least once every 5 years or as needed.