

LFGTE Facility Malfunction Abatement Plan



**CITY OF MIDLAND
GAS TO ENERGY GENERATION FACILITY
MALFUNCTION ABATEMENT &
PREVENTATIVE MAINTENANCE PLAN**

PERMIT TO INSTALL NUMBER 45-10B

Prepared for

City of Midland
Utilities Department
4311 East Ashman Street
Midland, Michigan 48640

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1. BACKGROUND

This Malfunction Abatement and Preventative Maintenance Plan (Plan) was prepared in accordance with Condition III.2 of Permit Number 45-10B for the City of Midland, Waste Water Treatment Plant. The condition reads as follows:

At least 60 days prior to start-up of any engine in FGICENGINES, the permittee shall submit to the AQD District Supervisor, for review and approval, a malfunction abatement/preventative maintenance plan for FGICENGINES. After approval of the malfunction abatement/preventative maintenance plan by the AQD District Supervisor, the permittee shall not operate FGICENGINES unless the malfunction abatement/preventative maintenance plan, or an alternate plan approved by the AQD District Supervisor, is implemented and maintained. 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) and (d))**

SECTION 1

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 each individual control equipment at a landfill is anticipated. Since periodic malfunctions, unforeseen circumstances or short duration maintenance activities are anticipated by the regulations, City of Midland believes they have implemented a program consistent with these requirements.

City of Midland understands that AQD expects the City of Midland 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 City of Midland's control.

2. GENERAL INFORMATION

2.1 RELATED DOCUMENTS

The following documents will be available for reference at the City of Midland Gas to Energy Generating Facility:

- Start-up, Commissioning, and Training Plan for the City of Midland Integrated Utility Improvement Project – Landfill Gas to Energy Project, prepared by Green Companies, Inc., dated November 19, 2010.
- Control Strategy for the City of Midland Integrated Utility Improvement Project – Landfill Gas to Energy Project, prepared by Green Companies, Inc., dated December 10, 2010.
- Preventative Maintenance Plan for the City of Midland Integrated Utility Improvement Project – Landfill Gas to Energy Project, prepared by Green Companies, Inc., dated December 30, 2010.
- Startup, Shutdown, and Malfunction Plan for the Landfill Gas Collection and Control System at the City of Midland Landfill, prepared by CTI and Associates, Inc., dated July 2010.

2.2 EMERGENCY CONTACT – 24 HOURS

The Waste Water Treatment Plant (WWTP) is operated 24 hours a day. The Gas to Energy Generating Facility is monitored continuously through the WWTP SCADA system and alarms are communicated through the existing Wonderware software. When an alarm is activated or attention is required the WWTP Operator will follow a protocol to notify the appropriate on-call individual.

2.3 RESPONSIBLE PERSONNEL

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

<u>Name</u>	<u>Title</u>	<u>PhoneNumber</u>
Scott O’Laughlin	Landfill Superintendent (GCCS/GTE)	989-837-6989
Kraig Myers	Heavy Motor Eqpt. Mechanic (GCCS/GTE)	989-837-6988
Joshua Johnson	Heavy Motor Eqpt. Mechanic (GCCS/GTE)	989-837-6988
Thomas Haven	Elec/Mech 2 (GTE/GCCS Operations)	989-837-6988

3. AFFECTED EQUIPMENT

The City of Midland plans to operate two internal combustion engines that are covered by this Plan. The engines are used for combusting treated landfill gas and wastewater treatment plant (WWTP) digester gas to produce electricity. These engines are identified as Emission Units EUCENGINE 1 and EUCENGINE2 in Permit No. 45-10B issued by the Michigan Department of Environmental Quality Air Quality Division.

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 EQUIPMENT

The City of Midland has plans to operate two internal combustion engines (both Caterpillar G3520C) for combusting treated landfill gas and WWTP digester gas to produce electricity. These engines are identified as Emission Units EUCENGINE1 and EUCENGINE2 in Permit No. 45-10B. In addition to these engines, the facility includes an engine heat recovery system, engine cooling system, and electrical generation equipment.

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)	Check pressure differential change Engine oil filter as needed
Fuel Metering Valve	Performance based assessment	Check Codes, Clean Sensor

SECTION 4

Item or Conditions to Be Inspected	Frequency of Inspection /Monitoring	Procedures to be Followed to Aid in the Prevention of Malfunctions
Throttle Control Valve (Check Elec. 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 Wire/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 temps, 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 lose 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)	Overhaul
Overhaul – In-Frame	Performance based assessment	Overhaul
Overhaul - Major	*Performance based Assessment (assess at Approximately 100,000 hours of use)	Overhaul

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.*

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 the generation facility, the compressor facility, or at WWTP central maintenance area (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. City of Midland will expeditiously implement the appropriate procedures to correct the event. Repair records will be maintained in an operations log.

5. IMPLEMENTATION OF AND UPDATE TO PLAN

5.1 IMPLEMENTATION OF 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 UPDATE 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.

5.3 REVISION HISTORY

Date	Rev	Description
01/01/11	00	Issue Document
02/09/11	01	Revise Section 2 to clarify the 24 Hour Emergency Notification Process.
05/22/2018	02	Revise Section 2 to include updates to supervisory and staff involved with maintenance and inspections. Revise references to current PTI 45-10B. Administrative updates.

