

DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
ACTIVITY REPORT: On-site Inspection

B415068499

FACILITY: EAST LANSING WASTEWATER TREATMENT PLANT		SRN / ID: B4150
LOCATION: 1700 TROWBRIDGE, EAST LANSING		DISTRICT: Lansing
CITY: EAST LANSING		COUNTY: INGHAM
CONTACT: Todd Nichols , Superintendent		ACTIVITY DATE: 08/08/2023
STAFF: Michelle Luplow	COMPLIANCE STATUS: Compliance	SOURCE CLASS: MINOR
SUBJECT: Onsite compliance inspection to determine compliance with various exemption rules.		
RESOLVED COMPLAINTS:		

Inspected by: Michelle Luplow (AQD, LDO, author) and Erica Shuff (AQD Central)

Personnel Present: Josh Moore, Assistant Superintendent (jmoore@cityofeastlansing.com)

Todd Nichols, Superintendent (tnichols@cityofeastlansing.com)

Eric Thelen, Assistant Superintendent (ethelen@cityofeastlansing.com)

Purpose

Conduct an unannounced, onsite compliance inspection by determining compliance with exemption Rule 285(2)(m), Rule 282(2)(g), and 282(2)(b)(i) as they apply to the East Lansing Wastewater Treatment Plant (WWTP) (all PTIs for this site had been previously voided). An exemption demonstration for these two rules was submitted in December 2018. This facility was last inspected by the AQD in April 2011.

Facility Background/Regulatory Overview

The East Lansing WWTP treats the City of East Lansing's domestic and industrial wastewater.

Anaerobic digestion of WWTP sludge is a newer process at this facility. Sludge is sent to an anaerobic digester to create sulfur-laden biogas that is treated and then combusted in an engine to power the WWTP. A flare is present onsite to combust the gas when the engine is down.

The "scum" and primary clarifier sludge is blended and thickened to 6% solids and then is pumped to the anaerobic digester where it is processed 10 – 15 days. The digestate is then dewatered and landfilled and the water is sent back into the treatment process. The gas created during the anaerobic process is sent to a round, bubble-like container where it is stored and pressurized. This allows the gas flow to the engine to remain consistent.

According to T. Nichols, the East Lansing WWTP used to have a sludge incinerator that was operated from 1962 – 2004. The sludge incinerator is no longer present onsite. Treatment lagoons were also located at this property, but operations of these also ceased. T. Nichols said the lagoons were filled in and tested prior to building on top of it.

Table 1 contains a list of equipment located onsite. I verified that the facility does not have any wastewater treatment lagoons, sludge incinerators or heat treatment processes.

Table 1. Equipment List

Equipment	Description	Control	PTI/Exemption	Operating?
2 Natural gas-fired boilers used to keep anaerobic digester warm when the CHP engine is down.	Cleaver Brooks, each rated at 2 MMBtu/hr Manufacture date: 2020	NA	Rule 282(2)(b)(i)	Operating
Anaerobic sewage solids digester	900,000-gallon capacity Installed in 2021 Sewage is mixed, heated and maintained at a temperature of 98 – 100°F	Flare – only used as backup to the CHP engine	Rule 285(2)(m)	Operating
Engine (combined heat and power engine, “CHP”)	Capable of burning conditioned anaerobic digester gas and sweet natural gas only. Heat from CHP is used to heat the digester BTU Rating: 5.08 MM Btu/hr Installed November 2021	H2S removal conditioning system	Rule 285(2)(g)	Operating
Flare	Rated at 4.5 MMBtu/hr max rated heat input capacity. Capable of combusting untreated anaerobic digester gas when CHP is offline. Installed November 2021	NA	Rule 282(2)(g)	Not operating

Inspection

This was an unannounced, onsite compliance inspection. On August 8, 2023, Erica Shuff and I met with Eric Thelen (Assistant Superintendent), Josh Moore (Assistant Superintendent) and Todd Nichols (Superintendent).

“CHP” Engine and Gas Conditioning System

The conditioning system is used for removal of water droplets, particles larger than 3 microns, H₂S, siloxane, and water vapor from the gas stream exiting the anaerobic digester. Gas is sent to 1 H₂S removal tank, is compressed, dewatered, and the sent through siloxane removal. The treated gas is then combusted in the combined heat and power engine or “CHP” engine.

The CHP is used to power the entire WWTP as well as heat the anaerobic digester. Currently East Lansing WWTP does not make enough biogas for the CHP to operate 100% on biogas; therefore, they supplement with natural gas at a 60%:40% ratio (natural gas to treated biogas). The flow to the engine during the inspection was 8 scfm. Because the CHP is rated at less than 10 MMBtu/hr (5.08 MMBtu/hr) it is exempt from permitting under exemption Rule 285(2)(g).

E. Thelen provided manufacturer information indicating that the engine should not be operating on gas that is equal to or greater than 200 mg H₂S/10 kwh. To ensure the conditioning system is installed and operating properly and thus ensuring the gas is “clean” enough to operate in the CHP engine, East Lansing WWTP uses the manufacturer’s Operation and Maintenance (O & M) Manual as a guide. They currently use Draeger tubes to test the H₂S in the gas stream pre- and post-treatment. The Draeger tube increments are from 0.5 – 150 ppm and 100 – 2000 ppm.

The gas is tested twice per month (pre- and post-H₂S removal). The first round of testing occurred on August 18 and August 30, 2023 (see attached results). Currently, they are working to determine at what point breakthrough of the H₂S removal media will occur and use this timing to conduct more robust testing schedules to ensure the media is changed out prior to breakthrough.

He said that because they have a siloxane removal system the H₂S should be kept below 10 ppmv, otherwise the siloxane removal media will be impacted. The H₂S removal media is a proprietary iron hydroxide-based media with alkalizing compounds, binding substances and porosity inducing substances.

Flare

The flare is used to combust untreated anaerobic digester gas when the CHP is offline. The flare was not operating during the inspection.

Sour gas-burning equipment is exempt from Rule 201 (obtaining a PTI) if the actual sulfur dioxide emissions do not exceed 1 pound per hour (Rule 282(2)(g)). EGLE has an outreach document for Anaerobic Digesters, which contains calculations for determining whether sour gas-burning equipment is exempt from a PTI. E. Thelen provided all flare operating parameters for these calculations. Based on the following calculations, it appears that the flare is meeting Rule 282(2)(g) at this time.

Flare Heat Input Capacity: 4,500,000 Btu/hr

Heat Content of Biogas: 500 Btu/scf

H₂S Concentration (pre-treatment 8/18/23 and 8/30/23 test results): 20 ppm

Biogas Emission Rate: (4,500,000 Btu/hr / 500 btu/scfm) = 9,000 scf/hr

H2S Emission Rate: $9,000 \text{ scf/hr} * (20 \text{ ppm}/1,000,000) * 0.088 \text{ H}_2\text{S}/ \text{scf H}_2\text{S} = 0.01584 \text{ lb H}_2\text{S/hr}$

SO2 Emission Rate (lb/hr): $0.01584 * 1.88 \text{ lb SO}_2/\text{lb H}_2\text{S} = 0.0297 \text{ lb SO}_2/\text{hr}$

Compliance Statement

The East Lansing Wastewater Treatment Plant appears to be in compliance with Rule 282(2)(g), Rule 285(2)(m), Rule 285(2)(g), and Rule 285(2)(b)(f) at this time.



Image 1(Gas Storage) : Photo credit: Erica Shuff. Digester gas storage "bubble"



Image 2(Anaerobic Digester) : Photo credit: Erica Shuff. Anaerobic digester.



Image 3(Flare) : Photo Credit: Erica Shuff. Open flare for burning sour gas



Image 4(CHP Engine) : Photo credit: Erica Shuff. Structure in middle of photo is the CHP engine.

NAME Michelle Luptow

DATE 9/26/23

SUPERVISOR RB

