

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

P125668069

FACILITY: DE SAEGHER ENERGY LLC		SRN / ID: P1256
LOCATION: 8068 W BUCHANAN ROAD, MIDDLETON		DISTRICT: Lansing
CITY: MIDDLETON		COUNTY: GRATIOT
CONTACT: Maria Barrios ,		ACTIVITY DATE: 07/11/2023
STAFF: Michelle Luplow	COMPLIANCE STATUS: Compliance	SOURCE CLASS: SM OPT OUT
SUBJECT: Onsite inspection to determine compliance with PTI 94-22.		
RESOLVED COMPLAINTS:		

Inspected by: Michelle Luplow (author, AQD LDO)

Tom Hercula (AQD Permits)

Megan Arduin (AQD Permits)

Grace Knauss (AQD Permits)

Personnel Present: Maria Barrios, SKS Green (maria@sksgreen.com)

Paul Harrah, Plant Manager

Other Personnel: Bart De Saegher, Owner (bart@desaegherdairy.com)

Purpose

Conduct an announced, onsite, partial compliance evaluation (PCE) onsite inspection of De Saegher Energy, LLC by determining compliance with synthetic minor Permit to Install No. 94-22 for a new Renewable Natural Gas plant. This inspection was conducted as part of a full compliance evaluation (FCE).

Facility Background/Regulatory Overview

De Saegher Energy, LLC is a renewable natural gas (RNG) processing facility located adjacent to the De Saegher Dairy Farm. The RNG processes biogas from two anaerobic digesters and one covered lagoon. A flare is onsite to combust any unused biogas from the digesters or off-spec treated gas. Manure is sent daily to a separation building to remove sand and water prior to moving the manure to the digester. One digester is used to process manure from the De Saegher dairy farm, the other digester is used process manure from a dairy farm in North Star, Michigan. De Saegher dairy farm's covered, unheated lagoon also stores digestate (manure that has already been processed in the digester). I was told during the inspection that they have the ability to recover 10% of the biogas generated from this lagoon.

Each digester has its own flow meter and they also plan to install gas monitors to quantify the percent methane in the gas (an indicator of gas quality).

The digester start-up date was June 26, 2023 to begin warming the manure and encourage anaerobic decomposition. As of the date of the inspection, the digesters had not reached the optimum temperature to create biogas at a methane content acceptable for sending to the pipeline. M. Barrios said that the EUGCU is capable of treating gas at any methane concentration; however, she said the gas must contain at least 30% methane in order to be combusted in EUFLARE.

This facility is a synthetic minor for SO₂.

Table 1 contains a list of permitted equipment located at the facility.

Table 1.

EU	Description	Serial #	PTI/ Exemption	Comments
EUBOILER1 (FGBOILERS)	Weil-McLain Model 88 Series 5.845 MMBtu/hr boiler used to heat manure contained within the digesters. Currently Natural gas-fired, has capability of operating on biogas.	CP7858250	94-22	Not operating during inspection Installed June 27, 2023
EUBOILER2 (FGBOILERS)	Weil-McLain Model 88 Series 5.845 MMBtu/hr boiler used to heat manure contained within the digesters. Currently Natural gas-fired, has capability of operating on biogas.	CP7858080	94-22	Operating during inspection. Installed June 27, 2023.
EUFLARE	722 scfm Biogas-fired flare used as backup to the EUGCU and to flare off gas that does not meet spec.	NA	94-22	Not operating during inspection. Installed June 22, 2023
EUGCU	Gas cleaning and upgrading unit including H2S removal vessels, oxygen and water vapor removal, 3-stage	NA	94-22	Not operating during inspection.

	<p>membrane to remove excess CO2.</p> <p>Upgrade the raw anaerobic biogas collected from digesters or lagoon, to meet pipeline specifications.</p>			
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Inspection

On July 11, 2023, Tom Hercula, Megan Arduin, Grace Knauss and myself met with Maria Barrios and Paul Harrah at the De Saegher RNG facility.

Renewable Natural Gas is created via the following process: gas from the 2 digesters and lagoon is sent to a “blending skid” where it is mixed prior to sending the gas through carbon vessels for H2S removal. The H2S removal system consists of 2 for lead and 2 for lag. After H2S removal the gas is sent through an oxygen removal system (with an aim of no more than 5 ppm oxygen), and then through moisture removal. The gas is then compressed to heat it up prior to entering the CO2 removal membranes. The gas is then compressed (electric compression) again to

EUGCU

EUGCU is a gas cleaning and upgrading unit used to treat the biogas generated by the anaerobic digesters and lagoon. It includes H2S removal vessels, oxygen and water vapor removal, and a 3-stage membrane to remove excess CO2 prior to sending the gas to the pipeline as renewable natural gas.

During the inspection, EUGCU had not yet been brought online. M. Barrios said that they were currently working on mechanical fixes to the system. Once the fixes are complete, they plan to conduct a dry run using nitrogen to ensure it is functioning properly.

Material Limits, Design/Equipment Parameters & Monitoring/Recordkeeping

The H2S concentration in the gas exiting the H2S removal vessels of the EUGCU shall not exceed 16 ppmv and a device to monitor the H2S concentration at the outlet of the primary H2S removal vessels is required to be installed, calibrated, maintained and operated in a satisfactory manner.

At the time of the inspection, the H2S monitor had been installed, however, M. Barrios said the monitor had not yet been commissioned. Biogas is currently not being sent through EUGCU because the methane content from anaerobic digestion is not yet sufficient to warrant treatment. Future inspections during full operation of the facility will be warranted to determine compliance with the H2S concentration limit, as well as ensuring that device is being maintained, operated and calibrated in a satisfactory manner.

Process/Operational Restrictions, Monitoring/Recordkeeping & Reporting

No later than 180 days after completion of installation of the EUGCU, De Saegher is required to submit to the AQD a Malfunction Abatement Plan (MAP). As of the date of inspection the EUGCU installation had not been completed. M. Barrios said they plan to commission and start up the EUGCU in August 2023. De Saegher is required to notify the AQD in writing of the completion of installation within 30 days of completion of said installation.

Records related to or as required by the MAP are required to be kept. This condition will apply once De Saegher has a completed and AQD-approved MAP.

No later than 180 days after permit issuance, De Saegher is required to submit, implement, and maintain a Nuisance Minimization Plan for odors, as described in Appendix A of PTI 94-22. The permit was issued July 12, 2022, and therefore a plan was due by January 9, 2023. As of the date of inspection, the Nuisance Minimization Plan for odors had not been submitted. M. Barrios said they would submit a Nuisance Minimization Plan by September 29, 2023. The AQD has received no odors complaints for this site and during this inspection AQD confirmed the processes are not yet operational, therefore the AQD finds a date of September 29, 2023 acceptable for submittal of a Nuisance Minimization Plan for odors.

Design/Equipment Parameters

As with the MAP and the Nuisance Minimization Plan for odors, De Saegher is also required to submit to the AQD a Best Management Practices Plan within 180 days of completion of installation of the equipment. As of the date of inspection, the EUGCU installation had not been completed. Notification of the completion of EUGCU's installation is required within 30 days of completion of said installation.

EUFLARE

EUFLARE is a biogas flare used for backup to the EUGCU as well as combustion of RNG that does not meet facility specifications (off-spec gas). The flare was not operating during the inspection. Although the unit was installed June 22, 2023, at the time of inspection, they were still working through troubleshooting issues that they found during trial operations. Trial operations are being conducted using pipeline quality natural gas, rather than the biogas generated onsite.

Emission Limits & Monitoring/Recordkeeping

SO₂ is limited to 39.7 tons per 12-month rolling time period, as determined at the end of each calendar month, and De Saegher is required to keep monthly and 12-month rolling SO₂ mass emissions to determine compliance with this limit. Calculations are required to be based on the volume of gas being sent to the flare and the H₂S content of the biogas and using the equations in Appendix B of PTI 94-22.

As of the date of inspection, EUFLARE had not been operated (at the time of inspection biogas was not and had not been sent to EUGCU or EUFLARE); therefore, there are no SO₂ emissions to calculate and record at this time.

Material Limits, Design/Equipment Parameters & Monitoring/Recordkeeping

The H₂S concentration in the biogas sent to the flare (from the digester, covered lagoon or EUGCU) is limited to 4,500 ppmv per operating day and the biogas sent to the flare is limited to 106 MMscf per 12-month rolling period, as determined at the end of each calendar month. De Saegher is required to install, calibrate, maintain, and operate a device to monitor and record the volume of biogas combusted in EUFLARE and the H₂S content of the biogas sent to the flare for use in determining compliance with these two Material Limits. During the inspection, M. Barrios pointed out that the biogas to the flare is monitored at 2 locations: at the blending skid and at the flare. An H₂S monitor is installed at the flare and, although not required, De Saegher plans to install a methane meter at the flare as well.

Because the flare has not been operated on biogas there are no flow rate or H₂S concentration records to provide at this time.

De Saegher is permitted to burn only biogas or natural gas in EUFLARE. M. Barrios said that they have the capability of combusting natural gas and biogas in the flare. M. Barrios said that the EUFLARE pilot flame operates on natural gas only.

Design/Equipment Parameters

The maximum design flow rate of EUFLARE shall not exceed 800 scfm. There is no nameplate on the flare and I requested documentation from the manufacturer that establishes the maximum flow rate on the flare. M. Barrios provided this documentation (attached) which states that the maximum biogas flow rate to the flare is 722 scfm and the maximum off-spec gas flow rate to the flare is 436 scfm. Future records reviews on the flow rates to the flare will confirm these manufacturer-specified flow rates.

Process/Operational Restrictions & Monitoring/Recordkeeping

No later than 180 days after completion of installation of the EUFLARE, De Saegher is required to submit to the AQD a Malfunction Abatement Plan (MAP). EUFLARE installation was completed June 22, 2023 and therefore the MAP is required to be submitted no later than January 18, 2024.

Records related to or as required by the MAP are required to be kept. This condition will apply once De Saegher has a completed an AQD-approved MAP.

No later than 90 days after permit issuance, De Saegher is required to submit, implement, and maintain a Nuisance Minimization Plan for odors, as described in Appendix A of PTI 94-22. The permit was issued July 12, 2022, and therefore a plan was due by January 9, 2023. As of the date of inspection, the Nuisance Minimization Plan for odors had not been submitted. M. Barrios said they would submit a Nuisance Minimization Plan by September 29, 2023. The AQD has received no odors complaints for this site and during this inspection AQD confirmed the processes are not yet operational, therefore the AQD finds a date of September 29, 2023 acceptable for submittal of a Nuisance Minimization Plan for odors.

Reporting

Within 30 days after completion of the installation of EUFLARE, De Saegher was required to submit notification of completion of the installation. This notification was submitted to the AQD on July 5, 2023 for an installation completion date of June 22, 2023.

Stack/Vent Restrictions

Exhaust gases from EUFLARE are required to be unobstructed vertically upwards and at a minimum height above ground of 25 feet. I used AQD's Nikon Forestry Pro II Rangefinder on the flare and determined that the stack height was in compliance with the stack height restriction at 28.5 feet.

FGBOILERS

FGBOILERS covers emissions units EUBOILER1 and EUBOILER2. Both boilers are rated at 5.84 MMBtu/hr (as confirmed via the boilers' nameplates during the inspection) and are used to heat the digesters. The boilers have the capability of operating using both natural gas or biogas (post-H₂S treatment). M. Barrios said they currently do not have the capability to fire the boilers on the biogas. She said they need to install an additional skid on each boiler (with a blower, moisture removal, etc) to allow themselves to do so.

EUBOILER2 was operating during the inspection, EUBOILER1 was not. They currently only run on natural gas.

Material Limits, Design/Equipment Parameters & Monitoring/Recordkeeping

The boilers are permitted to use natural gas or biogas that has been processed via the H₂S removal vessels (gas that is no more than 16 ppmv H₂S). De Saegher is required to keep daily records for all times when the boilers are operated using biogas, as well as daily records of the H₂S content of the biogas exiting the H₂S removal vessels.

Because these boilers are not yet capable of combusting biogas there are records to generated for biogas usage, nor the H₂S content of the biogas used in these boilers.

Compliance Statement

De Saegher Energy appears to be in compliance with PTI 94-22 at this time, pending submittal of the Nuisance Minimization Plans for odors under EUFLARE AND EUGCU.

NAME Michelle Lyplow

DATE 9/18/23

SUPERVISOR RB

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Glenpool, OK 74033
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Parnel Biogas Inc. Landfill Gas Flares meet the stringent operating requirements set forth by the major landfill operators. The flare combustion chamber is designed to provide the necessary residence time to completely combust the landfill gas. The control system is designed to operate one or two gas blowers and will operate the flare in manual and automatic in a trouble free and safe manner.

Process Specifications

Digester Gas Flow rate (max Flare)	
Landfill Gas Flow rate Flare (min Flare)	
Blower Surge Point	
Off-Spec Gas Flow Rate (Max)	722 scfm
Flare exit velocity (not to exceed)	50 scfm
	27scfm
	436scfm
<u>Gas Composition (Digester Gas):</u>	60.0 ft/sec
Methane	
CO2, O2, N2, inerts	
H2S	60%
Heat Release (max)	40%
Inlet Pressure to flare	4000ppm
	25.29 MMBtu/hr
<u>Gas Composition (Off-Spec Gas):</u>	10" WC (approx)
Methane	
CO2, O2, N2, inerts	
Heat Release (max)	97%
Inlet Pressure to flare	3%
	23.09 MMBtu/hr
Blower motor Horsepower	3 psi (Max)
Site Elevation	20 hp @ +1"wc
Design wind load per ASCE 7-93	775 msl approx.
Noise level at 3ft.	110mph
Design ambient air temperature	< 85dba
Pilot Gas Requirements (Natural Gas)	-30F to 120F
Electrical Area Classification	22scfh @ 20psig

Non-hazardous

NOTE: The inlet pressure to the flare must be regulated by others to 3 psig maximum. Only one stream can enter the flare at one time

Expected Flow/Emissions from the specs above:

N2 73.5 % vol.

O2 13.6 % vol.

CO2 6.0 % vol.

H2O 6.9 % vol.

NO2 0.068 lbs/MMBTU (per published EPA 60.18 section 13.5 Industrial Flares)

CO 0.31 lbs/MMBTU (per published EPA 60.18 section 13.5 Industrial Flares)

Destruction efficiency at design flow with landfill gas methane content of 40% to 60%---98% overall destruction of total hydrocarbons.

Guaranteed to meet E.P.A. emission standards for landfill gas utility type flares. Designed in accordance of EPA established criteria for open flares 40 CFR 60.18

THIS INFORMATION IS PROPRIETARY TO PARNEL BIOGAS INC.

Unitized Utility Flare Stack and Skid

One (1) Skid-mounted 6" x 25' Flare stack constructed of A-53 sch.40 pipe, with 8" x 5' 304L Stainless Steel tip. Parnel Biogas Inc. 316 ss flame retention ring, 30" x 4' 304L ss 7ga. Windshield to help retain flame at the tip and provide retention time for efficient combustion. Three thermocouples. Flare has a sloped base floor with ½" drain connection, ignition transformer enclosure mounted and wired, pilot gas train mounted to flare stack.

Blower/Control skid ASTM A-36 structural members and will be sized for (1) One 722 scfm Landfill Gas blower, one control rack with master control panel, VFD panel, control transformer and disconnect. 6" 304 ss blower inlet piping from KO pot outlet to blower inlets and 304ss piping from blower outlet and piping to skid edge, flanged expansion joints, One (1) Blower manual valve with gear operator located at the blower inlet.

One (1) 6" tee 150# flanged inlet with 1/2" drain connection

One (1) Parnel Biogas Inc. proprietary high efficiency pilot assembly. The Pilot is constructed of 304L stainless steel with a 310 stainless steel tip.

Three (3) 310ss Heavy Duty Thermocouples Two (2) main flame and One (1) pilot temp

One (1) 6" Groth Flame Arrestor w/Alum body and SS Cell

One (1) Structural steel skid 8'-6" x 20' approx. with decking and galvanized.

One (1) Stainless steel Knock-out pot

Stainless steel skid process piping

One (1) Multistage Centrifugal Style Landfill gas blowers

Two (2) 6" Pneumatic fail close valve.

One (1) Gear driven manual valve with Buna seats at blower inlet

One (1) 6" Aluminum Check valves at blower outlets

One (1) 6" Gear driven manual valve with Buna seats at KO pot Inlet.

CONTROL SYSTEM OPERATION (Generic)

The following is a brief outline of the control system operation:

System start-up (in the automatic mode) the pilot gas solenoid valve is opened to allow propane gas to the pilot assembly the igniter is pulsed to light the pilot tip. Once the pilot is detected, a signal is sent to the PLC to initiate the main flame light off sequence. Once the main flame is proved, the pilot is shut down to limit propane usage. If pilot re-ignition or main flame prove does not occur within a specified period of time the flare would shut down.

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SKID-MOUNTED CONTROL SYSTEM COMPONENTS:

One (1) Rain / Sun Shield

NEMA 4 Master control cabinet sized to operate flare, including 10" HMI touchscreen with Ethernet and USB capabilities, Allen Bradley PLC, Nanodac digital chart recorder, wired and programmed, 24v power supply, panel heater, interior panel light, 120v surge protection, Ethernet Switch, System to operate in manual and automatic modes.

One (1) NEMA 4 lockable blower control panel sized for One VFD, blower control circuit breakers, 480v line reactor, one Square D ATV630 5hp VFD's with secondary load side protection, symcom 460 motor protection, 460v surge protection.

One (1) Siemens Vacuum transmitter

One (1) 60amp Disconnect

One (1) 480v/110v step down transformer

One (1) 15amp convenience outlet

One (1) 100 watt skid light with manual and photocell control (shipped loose)

One (1) Thermal Instruments gas flowmeter

Vacuum and temperature gauges at blower inlet, and blower outlets blower outlet

FLAME ARRESTOR

One (1) 6" Groth Flame arrestor aluminum construction with stainless steel element, high temperature shutdown.

FAIL-CLOSE VALVE

Two (2) 6" Pneumatic fail close butterfly valve, spring return. Valve has carbon steel body, 316ss disk, nitrile seals, pneumatic actuator, 3-way Asco solenoid valve.

LANDFILL GAS BLOWER

One (1) Multistage Centrifugal Landfill Gas blowers with a design flow rate of 722 scfm @ a minimum of .5" wc inlet suction and 10" wc discharge pressure each Each blower shall have stainless steel inlet and outlet heads, a non-segmented, one piece stainless steel casing, and 319 cast aluminum impellers. Each impeller shall be mounted on a stainless steel shaft, supported by two ball bearings, grease lubricated. Each blower shall be mounted on a tubular and plate steel frame,

KNOCK OUT POT

One (1) 3' x 6' 304L stainless steel knock out pot with 6" inlet and 6" outlet. Removable lid, liquid level sight glass with 304ss isolation valves, level switch for high liquid level alarm and shutdown, two sample ports for remote pressure drop measurement and a integral stainless steel demister pad, lifting eye on lid. Pipe spool and valve, 2" drain valve

THERMAL INSTRUMENTS FLOWMETER

One (1) Thermal Instruments flow meter ½" OD, 304ss, 1/2" NPT mounting connection, and electronics installed. The thermal meters have digital displays for instantaneous flow and totalization are not susceptible to ambient temperatures or dirty working environments. This Flowmeter retains its accuracy over the full range of flow rates. Flow meter mounted at 4 o'clock in discharge manifold so condensation drains away from heated element.