

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

P119368070

FACILITY: DOUBLE EAGLE RNG, LLC		SRN / ID: P1193
LOCATION: 5742 SOUTH PENDELL ROAD, MIDDLETON		DISTRICT: Lansing
CITY: MIDDLETON		COUNTY: GRATIOT
CONTACT: Patrick Troy , Senior Project Manager & Team Lead		ACTIVITY DATE: 07/11/2023
STAFF: Michelle Luplow	COMPLIANCE STATUS: Non Compliance	SOURCE CLASS: MINOR
SUBJECT: Onsite, announced inspection to determine compliance with PTI 50-21.		
RESOLVED COMPLAINTS:		

Inspected by: Michelle Luplow (author, AQD LDO)

Tom Hercula (AQD Permits)

Megan Arduin (AQD Permits)

Grace Knauss (AQD Permits)

Personnel Present: Pat Troy, Senior Project Manager & Team Lead, Rev LNG, LLC (ptroy@REVLNG.com)

Pat Smeaton, Operator

Purpose

Conduct an announced, onsite inspection of Double Eagle RNG, LLC to determine compliance with Permit to Install No. 50-21 for a new Renewable Natural Gas plant.

Facility Background/Regulatory Overview

Double Eagle RNG, LLC is a renewable natural gas (RNG) processing facility located adjacent to the Double Eagle Dairy. The RNG processes biogas from one anaerobic digester. A flare is onsite to combust any unused biogas from the digesters; off-spec treated gas is recycled back into the anaerobic digester.

Manure is sent daily to a separation building to remove sand and water prior to moving the manure to the digester. The manure is then pumped from the separation building, through a series of underground pipes, to the anaerobic digester. The digestate (manure that has already been processed in the digester) from the anaerobic digester is then stored in a lagoon at the Double Eagle dairy farm. Gas from the lagoon is not recovered.

The anaerobic digester is maintained at 100.4°F for optimum anaerobic decomposition of the manure. The digestate stays in the digester for approximately 21 days.

At the time of inspection, Double Eagle had recently begun heating and feeding the digester; however, the methane content of the biogas had not yet reached 30%, which is the percentage of methane they aim for to begin treatment of the gas. During the inspection, the methane content was at 29%.

This facility is classified as a true minor for criteria pollutants and HAPs at this time.

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

Table 1.

EU	Description	Model# / Serial #	PTI/ Exemption	Comments
EUFLARE	John Zink Biogas Flare used as backup to the EUGCU. Maximum gas flow rate of 310 scfm.	4' x 20' ZEF/ BF-9328143	50-21	Not operating during inspection. Installed March 3, 2023
EUGCU	Gas cleaning and upgrading unit including activated carbon pre-treatment and a 3-stage membrane used to treat the anaerobic digester gas to meet pipeline specifications.	NA	50-21	Not operating during inspection.
Exempt Boiler	5 MMBtu/hr Natural gas-fired Veissmann Vitocrossal 300 boiler. Used to maintain heat in the anaerobic digester.	CA3B 5.0 / NA	Rule 282(2)(b)(i)	Operating

Inspection

On July 11, 2023, at approximately 8:30 a.m., Tom Hercula, Megan Arduin, Grace Knauss and myself met with Pat Troy and Pat Smeaton at the Double Eagle RNG facility.

I was informed after the inspection that Double Eagle uses ferric chloride as a binding agent for H₂S in the anaerobic digester. This process is used in an effort to ensure H₂S is controlled as much as possible prior to the gas entering the EUGCU or EUFLARE.

EUGCU

EUGCU is a gas cleaning and upgrading unit used to treat the biogas generated by the anaerobic digester. It includes preconditioning (removal of water from the gas), H₂S removal carbon vessels and a 3-stage membrane

to remove excess CO₂ prior to sending the gas to the pipeline as renewable natural gas, or the post-3-stage treated gas can be sent back to the digester if it is off-spec. The CO₂ removed from the gas is vented to ambient air as tail gas.

During the inspection, EUGCU had not yet been brought online.

Material Limits, Design/Equipment Parameters & Monitoring/Recordkeeping

The H₂S concentration in the gas exiting the H₂S removal vessels of the EUGCU shall not exceed 10 ppmv and a device to monitor the H₂S concentration at the outlet of the activated carbon filters on a continuous basis is required to be installed, calibrated, maintained and operated in a satisfactory manner. Satisfactory manner includes operating and maintaining the EUGCU in accordance with the approved MAP.

At the time of the inspection, the H₂S monitor had been installed, and is located between the carbon filters and the 3-stage membrane. 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.

The volumetric feed rate for the tail gas vented from EUGCU is limited to a maximum of 230 scfm at all times. A device to monitor and record the volumetric flow rate of the digester biogas vented from EUGCU is required to be installed, calibrated, maintained and operated in a satisfactory manner. P. Troy stated that the SCADA, a computer monitoring system, is used for this purpose, as well as to monitor and record other onsite meter data.

Process/Operational Restrictions, Monitoring/Recordkeeping & Reporting

No later than 90 days after completion of installation of the EUGCU, Double Eagle is required to submit to the AQD a Malfunction Abatement Plan (MAP). A MAP addressing both EUGCU and EUFLARE was submitted to the AQD on July 28, 2023.

Records related to or as required by the MAP are required to be kept. At the time of inspection, the EUGCU was not commissioned and therefore maintenance activities according to the MAP have not yet been implemented.

No later than 90 days after permit issuance, Double Eagle is required to submit, implement, and maintain a Nuisance Minimization Plan for odors, as described in Appendix A of PTI 50-21. The permit was issued August 9, 2021, and therefore a plan was due by November 8, 2021. The Nuisance Minimization Plan for odors was submitted late: AQD received the plan on 5/11/23, and a revised plan was submitted to AQD on 6/20/23. The AQD has received no odor complaints for this site and during this inspection AQD confirmed the treatment processes are not yet operational.

Stack/Vent Restrictions

The EUGCU vent is required to be oriented vertically upwards and at a height of at least 8.5 feet about ground level. The AQD Nikon Forestry Pro II Rangefinder was available to confirm the height of this vent, however, the AQD was limited in its capacity to do so because of the location of the vent. Rather than read the height of the vent itself, I used the rangefinder to determine the height of the container that the vent stack is affixed to and got a reading of 9.6'. The stack height of the vent is higher than the height of container and therefore we determined that the vent height is greater than 9.6' and in compliance with the stack height minimum.

EUFLARE

EUFLARE is a biogas flare used for backup to the EUGCU and only combusts biogas directly from the anaerobic digester. The flare was not operating during the inspection. Installation was completed on March 3, 2023. Based on records provided by P. Troy on August 18, 2023, startup of the flare occurred on July 18, 2023. Records were provided from July 18, 2023 through August 15, 2023.

Emission Limits, Design/Equipment Parameters & Monitoring/Recordkeeping

SO₂ is limited to 30.3 tons per 12-month rolling time period, as determined at the end of each calendar month, and Double Eagle 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 total volume of gas being sent to the flare, the H₂S content of the biogas and using the equations in Appendix B of PTI 50-21. Total volume of gas is required to be tracked on a monthly and 12-month rolling basis.

A volumetric flow rate meter is required to be monitored and recorded on a continuous basis. A device to monitor this flow rate is required to be installed, calibrated, maintained and operated in a satisfactory manner. There is a flow meter on the gas line to the flare, which P. Smeaton said can be monitored from the device itself or through their SCADA computer monitoring system. There was no flow to the flare during the inspection.

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); however, since that date, the flare began operating on July 18, 2023. Records were provided and indicate that July 2023 SO₂ emissions were at 0.15 tons and August 2023 SO₂ emissions were at 0.013 tons, for a rolling total of 0.163 tons between July and August 2023.

Double Eagle is meeting their SO₂ emission limit at this time.

While it appears Double Eagle is meeting their EUFLARE Emission Limits at this time, AQD believes additional work will be necessary to correct their spreadsheets: 1) a daily average scfm flow to the flare is recorded, rather than a total scfm to the flare. This needs to be corrected to total scfm to the flare; 2) Monthly and 12-month rolling total flare volumes need to be added and tracked; 3) SO₂ monthly tons appears to include SO₂ emissions from the sweet natural gas-fired boiler. This needs to be corrected to only include those emissions from the flare itself; 4) SO₂ emissions should be calculated according to Appendix B of the permit; however, it appears the company has chosen to calculate SO₂ emissions based on a variation of the Appendix B calculation. This needs to be corrected to be calculated according to Appendix B.

Material Limits, Design/Equipment Parameters & Monitoring/Recordkeeping

The H₂S concentration in the biogas sent to the flare is limited to 500 ppmv per operating day for 325 days per 12-month rolling period, and 5,000 ppmv per operating day for 40 days per 12-month rolling time period. Double Eagle is required to install, calibrate, maintain, and operate a device to continuously monitor and record the H₂S content of the biogas sent to the flare, and keep daily records of the H₂S content of the digester biogas routed to the flare for each day that the flare is operated.

The records indicate that the 5,000 ppmv H₂S concentration limit was exceeded July 18 – July 20, 2023 when the biogas was routed to the flare:

- July 18, 2023: 6,711.16 ppm
- July 19, 2023: 5,971.13 ppm
- July 20, 2023: 5,155.35 ppm

The exceedance of the 5,000-ppm limit is a violation of Material Limit SC II.2. A violation notice will be issued to address this issue.

During July and August 2023 Double Eagle recorded a total of 10 days where the biogas H₂S content was greater than 500 ppmv. They are required to track these days on a monthly and 12-month rolling basis; however the records are not set up to do this currently. I have notified Double Eagle of the need to correct their spreadsheets to include monthly and 12-month rolling records for days operated over 500 ppmv.

P. Smeaton showed us there is an H₂S monitor on the digester which will provide biogas H₂S data for the flare when gas is diverted from the EUGCU to the flare.

De Saegher is permitted to burn only anaerobic digester biogas in EUFLARE. While onsite we confirmed that the only line going to the flare is directly from the digester.

The volumetric feed rate for EUFLARE is required to be maintained at a maximum of 900 scfm at all times. P. Troy provided manufacturer documentation that the maximum biogas flow rate the flare is designed for is 310 scfm. He provided a statement that its design capacity is 400 scfm. Continuous flare flow rate data indicate that the maximum flow rate the flare operated at was not more than 265 scfm between July and August 2023.

Process/Operational Restrictions & Monitoring/Recordkeeping

The flare shall not be operated for more than 4,860 hours per 12-month rolling time period. A log of monthly and 12-month rolling EUFLARE operating hours is required to be kept. As of the date of the inspection, the flare had not yet been operated; however, since that time, records have been provided for July and August 2023. Double Eagle keeps daily records of the hours operated on the flare. Between July 18 and August 15, 2023 the flare operated all days except for August 9 – August 15, resulting in 295 hours of operation.

While records indicate compliance with the operating hour limits, Double Eagle will need to correct their recordkeeping to include monthly and 12-month rolling operating hour records. Currently only daily operating hour records are tracked.

No later than 90 days after completion of installation of EUFLARE, Double Eagle is required to submit to the AQD a Malfunction Abatement Plan (MAP). The flare was installed on March 3, 2023 and a MAP was submitted on July 28, 2023, albeit late.

No later than 90 days after permit issuance, Double Eagle is required to submit, implement, and maintain a Nuisance Minimization Plan for odors, as described in Appendix A of PTI 50-21. The permit was issued August 9, 2021, and therefore a plan was due by November 8, 2021. The Nuisance Minimization Plan for odors was submitted late: AQD received the plan on 5/11/23, and a revised plan was submitted to AQD on 6/20/23. The AQD has received no odor complaints for this site and during this inspection AQD confirmed the treatment processes are not yet operational.

Stack/Vent Restrictions

Exhaust gases from EUFLARE are required to be unobstructed vertically upwards and at a minimum height above ground of 20 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 21.1 feet.

Compliance Statement

Double Eagle RNG, LLC appears to be in noncompliance with PTI 50-21 at this time. A violation notice will be sent to address the Material Limit exceedances.

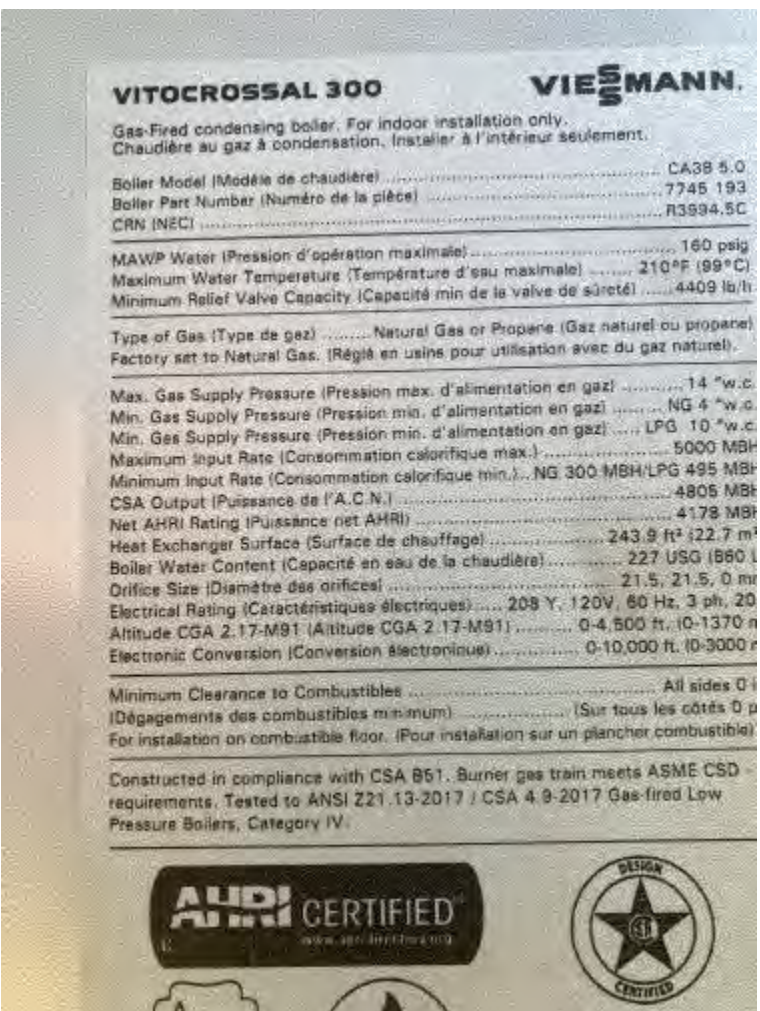


Image 1(Boiler Specs) : Nameplate on natural gas-fired exempt boiler.



Image 2(Flare Nameplate) : John Zink biogas flare nameplate



Image 3(Flare) : John Zink biogas flare.



Image 4(Site) : Photo of anaerobic digester (right) and EUGCU (left & center).

NAME Michelle Luplow

DATE 9/21/23

SUPERVISOR RB

VI. DESIGN BASIS

Type:	Digester Gas	
Composition:	<u>Design Condition</u>	<u>Range</u>
	65% CH ₄	50 to 65% CH ₄
	35% CO ₂	35 to 50% CO ₂
	<1% air, inert gas	<5% air, inert gas
Lower Heating Value:	592 BTU/SCF	455 to 592 BTU/SCF
Molecular Weight:	26	26 to 30
Temperature:	100 °F	60 to 100 °F
Gas Flow (maximum):	310 SCFM	310 to 400 SCFM
(minimum):	35 SCFM (with continuous pilot operating)	
Heat Release* (maximum):	11,000,000 BTU/hr	
* lower heating value basis		

 **DANGER**

Flame flashback may occur if the gas stream contains an amount of oxygen within the explosive limit.

NOTICE

Methane concentrations less than 30% may require the addition of enrichment fuel for stable combustion.

Process Design

Smokeless Capacity:	100%
Destruction Efficiency:	98% (minimum)
Flare Inlet Pressure:	5" H ₂ O (maximum after arrester)
Ambient Pressure:	14.2 psia
Site Elevation:	837' above sea level

Mechanical Design

Wind Speed Classification:	115 mph
Seismic Classification:	site class D
Ambient Temperature:	-25 to 115 °F
Electrical Area Classification:	non-hazardous (Flare Control Panel) Class 1, Division 2, Group D (within 5' of gas containing components)

NOTICE

Heat trace and insulation are recommended as freeze protection for any susceptible components.

Utilities

Pilot Gas (intermittent):	22 SCFH of propane at 10 psig 50 SCFH of natural gas at 15 psig
Electricity:	120 V, single phase, 60 Hz for control components

Site: Double Eagle (PTI 50-21)

Date	Month	H2S Content of Flared Gas (ppm)	# Days H2S > 500 ppm	Average SCFM for Boiler Fuel	Total Boiler Flow Per Day (MMSCF/Day)	Average SCFM Gas To Flare	Daily Flare Operating Hours	Total Flare Flow Per Day (MMSCF/Day)	Total Volume of Biogas Burned Monthly (MMSCF)	SO2 Emission Factor (lb/10 ⁶ SCF)**	Daily SO2 Emissions (ton/day)	Monthly SO2 Emissions (tons/mo.)*
07/18/2023	July	6,711.16	10	21.43	0.03	169.91	6.00	0.0612	1.29	1115.80	0.034	0.149
07/19/2023		5,971.13		16.26	0.02	94.93	7.50	0.0427		992.80	0.021	
07/20/2023		5,155.35		17.88	0.03	95.78	15.75	0.0905		857.10	0.039	
07/21/2023		3,654.55		18.70	0.03	115.58	17.50	0.1214		607.60	0.037	
07/22/2023		633.23		17.30	0.02	99.55	17.50	0.1045		105.30	0.006	
07/23/2023		384.40		18.75	0.03	127.45	19.75	0.1510		63.90	0.005	
07/24/2023		368.98		17.30	0.02	80.91	18.25	0.0886		61.50	0.003	
07/25/2023		205.86		18.09	0.03	140.13	12.00	0.1009		34.20	0.002	
07/26/2023		69.06		16.46	0.02	144.82	12.75	0.1108		11.50	0.001	
07/27/2023		130.42		16.05	0.02	99.80	15.75	0.0943		21.70	0.001	
07/28/2023		73.28		16.85	0.02	132.87	11.75	0.0937		12.20	0.001	
07/29/2023		37.24		18.74	0.03	134.12	10.75	0.0865		6.20	0.000	
07/30/2023		37.60		18.17	0.03	97.58	14.00	0.0820		6.30	0.000	
07/31/2023		20.03		15.05	0.02	122.25	8.25	0.0605		3.30	0.000	
08/01/2023	August	60.26	10	19.76	0.03	116.84	15.00	0.1052	0.663	10.00	0.001	0.013
08/02/2023		32.50		17.56	0.03	98.63	10.50	0.0621		5.40	0.000	
08/03/2023		257.98		17.40	0.03	106.19	13.75	0.0876		42.90	0.002	
08/04/2023		1,300.05		17.67	0.03	96.43	13.75	0.0796		216.10	0.009	
08/05/2023		65.62		17.95	0.03	85.86	12.75	0.0657		11.00	0.000	
08/06/2023		30.27		18.75	0.03	76.00	14.25	0.0650		5.00	0.000	
08/07/2023		60.11		11.48	0.02	85.49	14.75	0.0757		10.00	0.000	
08/08/2023		122.02		11.23	0.02	143.91	7.75	0.0669		20.30	0.001	
08/09/2023		93.13		5.74	0.01	0.00	0.00	0.0000		15.50	0.000	
08/10/2023		93.13		5.74	0.01	0.00	0.00	0.0000		15.50	0.000	
08/11/2023		2,263.39		12.39	0.02	0.00	0.00	0.0000		376.30	0.000	
08/12/2023		2,497.50		16.42	0.02	0.00	0.00	0.0000		415.20	0.000	
08/13/2023		2,497.50		16.62	0.02	0.00	0.00	0.0000		415.20	0.000	
08/14/2023		632.05		19.30	0.03	156.72	1.00	0.0094		105.10	0.000	
08/15/2023		34.61		14.94	0.02	189.45	4.00	0.0455		5.80	0.000	

Boiler emissions shown for SO2 emissions calculation.

*Emission factor for SO2 = 49.9 lb/10⁶ scf biogas (AP-42 Table 13.5-2 for flares). For boilers, EF = 0.6 lb/10⁶ scf. Monthly SO2 emissions calculated with the following equation: [total volume of biogas burned (in MMSCF)*EF/2000] + [boiler fuel used (in MMSCF) * EF /2000]

**SO2 EF calculated with: H2S gas concentration in ppmv * 64.06 lb/lb-mol / 385.3 scf/lb-mol