DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
ACTIVITY REPORT: Scheduled Inspection

N730354451

FACILITY: Bluewater Gas Storage Facility		**SRN / ID:** N7303
LOCATION: 333 South Wales Center Road, COLUMBUS		**DISTRICT:** Warren
CITY: COLUMBUS		**COUNTY:** SAINT CLAIR
CONTACT: Jeff Westrick , Station Manager		**ACTIVITY DATE:** 08/10/2020
STAFF: Sebastian Kallumkal	**COMPLIANCE STATUS:** Compliance	**SOURCE CLASS:** SM OPT OUT
SUBJECT: Onsite Inspection		
RESOLVED COMPLAINTS:		

On Monday, August 10, 2020, at about 12:30 PM, Michigan Department of Environment, Great Lakes, Energy-Air Quality Division Staff Sebastian Kallumkal conducted an annual inspection at the Bluewater Gas Storage (BWGS) facility located at 333 South Wales Center Road, Columbus Township, Michigan. The purpose of the inspection was to verify facility's compliance with requirements of Article II, Air Pollution Control, Part 55 of Act 451 of 1994, & Permits To Install (PTI) No. 77-14A.

Previous PTI No. 77-14 was voided upon issuance of PTI No. 77-14A. Consent Order (CO) No. 5 -2005 was terminated upon request and compliance demonstration by the facility.

On July 30, 2020, I requested the facility to submit the records required pursuant to this PTI, in order to limit the time spent inside the facility. These records were emailed to me.

At the facility I met Mr. Jeff Westrick, Station Manager (Ph: 810-367-3404; Fax: 810-367-7048). I introduced myself and stated the purpose of the visit. Due to CoVid 19 Protocol, we both were wearing face masks. I did not enter in the office. He came out to meet me. During the pre-inspection meeting, we discussed the facility operations, the permit conditions and changes at the facility. After the meeting, we had a walkthrough of the facility including the engine room (where all three engines are located), and the glycol dehydration unit/JT system. During the meeting, Jeff told me that they are replacing the existing thermal oxidizer with a new unit of same control efficiency.

In the Supplemental Information submitted to AQD Permit Section for PTI NO. 77-14A, permittee had indicated that they will be installing a new thermal oxidizer that had equal or better control efficiency and that this installation is exempt from permit to install requirements. EGLE-AQD administrative Rule 285(f) exempts "Installation or construction of air pollution control equipment for an existing process or process equipment if the control equipment itself does not actually generate a significant amount of criteria air contaminants as defined in R 336.1119(e) or a meaningful increase in the quantity of the emissions of toxic air contaminants or a meaningful change in the quality and nature of toxic air contaminants". He also mentioned that they had removed the vapor recovery unit (VRU) because they are not getting the needed control efficiency from it. The permittee will submit a permit modification application to remove the permit conditions related to the VRU.

Bluewater Gas Storage is involved in the storage of natural gas received from customers such as Consumers Energy, Vector Pipeline, MichCon, Great Lakes Gas Transmission Company, American Natural Resources, and Duke Energy of Canada during warm season and its withdrawal and transfer into the pipeline during cold months. (Storage: dolomite, 3200' deep, 300' thick, up to 2012 psi) The facility also has 7 oil wells for crude oil production. During late spring through early fall season, the facility receives and stores natural gas in the underground rock formations. Later the storage season, facility needs to use compressor engines to store the gas against the high field pressure. The withdrawal season is from late October through early May. During the initial withdrawal season, the gas into the pipeline is free flow, but later in

the season, the gas usually needs to be pumped out using compressors due to the low field pressure.

Depending on the nature of the rock formations, the withdrawal gas may contain excess moisture than allowed by the federal regulations. In that case, the natural gas would be dehydrated to meet the requirements prior to pushing back into the pipelines. The facility also had discovered that the withdrawal gas contained high concentration of heavy hydrocarbons than that is allowed. In order to reduce the hydrocarbon content, the facility installed a J-T System in January 2006 that takes advantage of the cooling effects of expanding gas (Joule-Thompson effect).

In the Joule-Thompson system, as the high-pressure gas is withdrawn from the reservoir across a Joule-Thompson valve, the pressure is reduced to 150 PSI. The gas is cooled due to Joule-Thompson effect. The cooling of the gas causes the hydrocarbons to condense and the hydrocarbons are removed from the gas stream. This cooling also causes the water vapor to condense. To prevent the condensed water from freezing, glycol is injected into the gas stream before the J-T Valve to absorb the moisture. After the J-T Valve, the natural gas, and the liquids (which hydrocarbons/water/glycol mixture) goes to a J-T Vessel separator.

The cold gas from the J-T Vessel separator is passed through a gas to gas heat exchanger (a heat exchanger with warm gas flowing from the underground storage reservoir on one side, and cold flowing gas from the J-T Vessel Separator on the other side) to pre-cool the stored gas. From the heat exchanger, the natural gas goes to pipeline

The glycol/NGL/water mixture from the J-T vessel goes to a J-T liquid separator. This tank is heated to about 100^{o}F to separate the hydrocarbons (NGL) and water/glycol. The top part NGL (similar to crude oil) goes to NGL tank and the bottom part, glycol/water, goes to a withdrawal gas reboiler unit to drive off excess moisture and then to flash tank.

The glycol from the flash tank is filtered using charcoal filter and recycled. Any NGL collected goes to NGL tank. The vapors from the reboiler go to reboiler still column and then to thermal oxidizer. Vapors from the flash tank also goes to the thermal oxidizer to be incinerated. The NGLs are sent to an aboveground storage tank, mixed with crude oil and eventually sold to various oil refining entities.

The facility is also permitted to extract crude oil from the ground. Facility had drilled six oil horizontal wells. Facility recently drilled another vertical well which currently produces oil. Natural gas and brine also come with the crude oil during extraction. This natural gas that comes up with the crude is not virgin gas; instead, it is part of the same gas the facility stores underground. This mixture is separated using a heater treater and an oil-water separator. The natural gas either put back to the underground if it is during storage season or will be dehydrated and put into the pipelines for transportation if it is during withdrawal season. The brine is put back to the underground and crude oil is stored in storage tanks and is transported out for processing.

The facility had provided information (correspondence from USEPA) to indicate that this facility is not subject to federal standards for Performance for Equipment Leaks of VOC from Onshore Natural Gas Processing Plants, as specified in 40 CFR, Part 60, Subpart KKK. The facility does not extract virgin natural gas while extracting crude oil. Instead, the facility extracts pipeline quality gas which was injected into the underground rock formations.

Inspection

At the time of the inspection, the facility was in the storage season. The EG-GEN, EU-COMPNORTH, EU-145BHPENG, the JT System, the Glycol Dehy-system heaters, heater treater,

etc. were not operating at this time because no gas was being withdrawn. I observed that the old thermal oxidizer (TO) in the glycol dehydration system (WGDEHY) was being replaced with new TO System. The Dehy unit is shutdown since March 2020. The new TO will be commissioned in mid-September 2020. When asked about the performance test, he indicated that they would do a performance test to verify the control efficiency of the TO. I observed that the VRU was removed from operation.

He told me that only EU-COMP-EAST and EU-COMP-WEST is used during this summer. During the weekend, they used EAST engine and at the time of my inspection, WEST engine was operating. I did not observe any visible emissions from the stack.

Compliance

EU-145BHPENG:

In 2009, facility installed a Caterpillar, 2008 model (Mfg Date: 7/2/2008), natural gas fired, 4-stroke, rich burn, 145 HP, reciprocating internal combustion engine which runs a compressor to inject producer gas back into the field and to boost the withdrawal gas pressure to add to the pipeline. This RICE is exempt from PTI pursuant to Rule 285(2)(g). However, the engine is subject to 40 CFR 63, Subpart ZZZZ which requires this RICE to comply with 40 CFR 60, Subpart JJJJ-NSPS for Spark Ignition RICEs. NSPS-Subpart JJJJ (40 CFR 60.6244) requires performance test within 10% of 100 percent peak (or the highest achievable) load for EU-145BHPENG. This engine was not operating at the time of the inspection.

40 CFR 60.4243 states that for this non-certified SI engine must comply with the emission standards specified in 40 CFR 60.4233 (e), by keeping a maintenance plan and records of conducted maintenance and must, to the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions. In addition, permittee must conduct an initial performance test to demonstrate compliance.

40 CFR 60.4233(e) states that a SI ICE with a maximum engine power greater than or equal to 75 KW (100 HP) (except gasoline and rich burn engines that use LPG) must comply with the emission standards in Table 1 of NSPS Subpart JJJJ performance test to demonstrate compliance. Table 1 has limits for NOx, CO, VOC in g/Hp-hr and ppmvd at 15%O2.

On August 13, 2013, facility conducted the required initial performance tests to demonstrate compliance with NOx, CO and NMHC (as C3H8) limits. The test plan for the performance test was received by AQD on July 15, 2013 and was approved on August 1, 2013. AQD received the test report on September 23, 2013. See the "Emissions Compliance Study"-"Report Submittal Date: September 16, 2013)" for details.

Facility performs maintenance on this engine such as change spark plugs, oil samples and changes, compression checks, monitor catalyst temperatures. They only run this unit in the spring (Feb – April) for a few hours, so minimal maintenance has been performed based on hours of operation lately. They provided records of the maintenance conducted.

Permits To Install (PTI) No. 77-14A

This permit includes Emergency Generator (EU-GEN), Withdrawal Gas Dehydration Unit (EU-WGDEHY), EU-DRAINTANK and FGENGINES (EU-COMPNORTH, EU-COMPWEST, EU-COMPEAST-three internal combustion engines which drive compressors). The permit also includes FG-FACILITY table which sets facility wide limits for NOx, CO, VOC and individual and aggregate hazardous air pollutants (HAPs). This facility is an area source (synthetic minor) for

hazardous air pollutants (HAP). The VOC/HAP emissions from these five engines at the facility are controlled by individual catalytic oxidation system.

EU-GEN

8.5 MMBtu/hr heat input Caterpillar G3516 natural gas-fired engine driving an emergency generator. VOC and CO emissions are controlled with a catalytic oxidation system.

This engine is limited to operate less than 500 hours per year based on 12-month rolling time period. From the 2019 annual emission report via MAERS, EU-GEN was operated 52 hours; and from the submitted records, EU-GEN was operated 23 hours during January to June 2020. The fuel is limited to pipeline quality natural gas. The facility is only using pipeline quality natural gas to fuel EU-GEN.

This engine is required to be operated with catalytic oxidation system installed and operated satisfactorily which includes cleaning the catalyst panels according to procedures in Appendix A of PTI No. 77-14A or an approved plan. EU-GEN is equipped with catalytic oxidation system and submitted the catalyst bed cleaning and maintenance records (oil analyses).

Stack dimensions were not verified at the time of the inspection, but stack dimensions appear to be in compliance with the requirements of Special Conditions VIII.1.

This condition requires the permittee to comply with all provisions of National Emission Standards for Hazardous Air Pollutants, 40 CFR Part 63, Subpart ZZZZ, as they apply to EU-GEN. See discussion under 40 CFR 63, Subpart ZZZZ- NESHAP for Reciprocating Internal Combustion Engines.

EU-WGDEHY

Withdrawal Gas dehydration unit which contains a 3.26 MMBTU/Hr glycol reboiler burner which is associated with SV-REBOILER. Emissions from the reboiled glycol are controlled by a thermal oxidizer which is associated with SV-THERMOXIDIZER.

Due to the presence of high hydrocarbon content, the EU-WGDEHY does not use the glycol contact towers. Instead it is using the JT system as described previously. Glycol is sprayed into the gas stream to absorb moisture prior to entering the JT system. The wet glycol is reclaimed and reused; organic liquids are collected and sold; and gases are incinerated using a thermal oxidizer.

This facility does not use the organic gases from the flash tank as fuel for the reboiler because "gases are too wet". The vapors from the flash tank and reboiler are incinerated in the thermal oxidizer.

Emission Limits

Conditions 1.1a and 1.1b limits the NOx and VOC emissions to 5.14 tons per year and 2.57 tons per year based on 12-month rolling time period respectively. The records show that the total NOx emissions from this process is 0.4 tons based on a 12-month rolling period as of March 2020.and the VOC emissions are 0.21 tons based on a 12-month rolling period as of March 2020. respectively. Facility provided electronic records of the emission calculations.

Material Usage Limits

The records show that the natural gas processed through the dehydration system was 14243 MMCF as March 2020 (12-month rolling) which is in compliance with the limit of 81,900 MMSCF based on a 12-month rolling period.

The natural gas fuel used in Glycol reboiler burner was 1.0 MMscf as of March 2020, (12-month rolling) which is in compliance with the annual limit of 28.0 MMscf based on a 12-month rolling time period.

The natural gas fuel used in thermal oxidizer is 6.0 MMscf as of March 2020, which is in compliance with the annual limit of 35.2 MMscf calculated based on a 12-month rolling time period.

Process/Operational Limits

The records show that glycol re-circulation rate for FGWGDEHY is below the permit limit of 26 gallons per minute. That capacity of the recirculation pump is set at 13 gpm. The normally the recirculation rate is between 3-7 gpm. The facility submitted of the records of the recirculation rates.

The PTI requires the facility to submit a malfunction abatement plan (MAP) for the operation of the thermal oxidizer. The most recent approvable MAP was received on February 11, 2020.

Design/Equipment Parameters

The facility has installed the flash tank, thermal oxidizer (TO) and the vapor recovery unit. The satisfactory operation of the TO requires it to have a minimum 95% (by weight) destruction efficiency and maintaining a minimum temperature of 1600 +/- 50^{o}F and minimum retention time of 0.75 seconds. (See discussion under SC V.2). The VRU was not used for a couple of years and is removed. The thermal oxidizer is being replaced. (see pre-inspection meeting discussion).

The facility has installed devices to continuously monitor and record temperature of the TO and monitor the natural gas usage in the glycol reboiler burner and thermal oxidizer.

Testing/Sampling

The facility is required to conduct natural gas analysis during withdrawal season. Recent sampling was performed on December 23, 2019. The submitted records include the gas analysis results and GlyCalc report. The analytical results and the report are attached. For review.

The facility is required to verify VOC destruction efficiency from the thermal oxidizer by testing at the owner's expense, in accordance with Department requirements, within 180 days of the permit issuance date. The permit was issued on August 22, 2019. AQD-TPU received the test plan on October 15, 2019 and approved on November 15, 2019. The testing was conducted on December 17, 2019 and the report was received on January 29, 2020. The report showed that the TO achieved 95% DE at 1400^{o}F.

The facility requested approval from AQD, pursuant to SC IV.2, to operate the TO, at 1400^{o}F instead of 1600 +/- 50^{o}F. AQD approved the request because the TO achieved 95% DE at the lower temperature.

Regarding the December 17, 2019, TO destruction efficiency test, Matt Karl, EGLE-AQD/TPU staff noted that high moisture content and small inlet diameter made the moisture content determination and flow traverse for the inlet difficult. Flow was determined from a single

centroid point in the inlet. The inlet moisture was determined using moisture saturation point. AQD/TPU approved these changes in the methods.

Monitoring/Recordkeeping

The facility monitors the glycol recirculation rate and the natural gas processing rate, on a continuous basis. Mr. Westrick informed me that they calibrate the monitors as required. They provided the records for 2018 and 2019 calibration checks for all temperature monitors. See attached.

Facility calculates NOx, VOC and BTEX emission rates from the EU-WGDEHY as necessary. It uses GRI-GLYCalc to calculate the VOC and BTEX emissions. It keeps adequate records of natural gas processing rate, wet gas composition, natural gas fuel usage, glycol recirculation rate, thermal oxidizer exhaust gas temperature, documentation for the vapor recovery unit, etc. as required by conditions VI.4.

The stack/vent dimensions were not verified. However, the stack appears to be in compliance with the requirements of special conditions VIII.1 and 2.

FG-ENGINES

Natural gas fired 4 stroke lean burn reciprocating internal combustion engines driving Compressors. Controlled with catalytic oxidation systems
(Unit 1- EUCOMPNORTH, Unit 3-EUCOMPWEST, Unit 4-EUCOMPEAST)

Emission Limits:

The conditions 1.1 through 1.9 include emission limits for NOx, CO and Formaldehyde, from the three engines. The stack tests show that these engines are in compliance with the emission limits.

<u>Process/Operational Limits & Material Usage Limits:</u>

Mr. Westrick informed me that they are burning pipeline quality natural gas in FG-ENGINES. The records show that the natural gas fuel usage for EU-COMPEAST and EU-COMPWEST together are 138.62 MMSCF in 2019 and 51.30 MMSCF in 2020. These are in compliance with the permit limit of 323 MMSCF based on a 12-month rolling period.

Design/Equipment Parameters

This condition requires that the FGENGINES shall not be operated unless the catalytic oxidation system on each engine is installed, maintained and operated in a satisfactory manner. Satisfactory operation includes cleaning of the catalyst panels. Each of the engines is installed with a catalytic oxidation system.

Mr. Westrick told me that currently the catalysts are being sent out to be cleaned on an annual basis. The engines are also maintained (oil analysis every month, adjust burner settings, valve settings, compressor checks, etc.) annually. Records for catalyst cleanings conducted on 6/8/2018 and 2/12/2019 for EUCOMPNORTH, EUCOMPWEST, and EUCOMPEAST were submitted. The records are attached for review. He informed me that they follow the requirements in the SC IV.1 for the catalyst maintenance.

Currently, the facility is using East and West Engines routinely. East Engine was operated during the previous weekend. Only West Engine was operating at the time of the inspection.

The following readings were taken from Unit 3-EUCOMPWEST. They are monitoring the catalyst inlet temperature and exhaust gas temperature.

	Unit 3-EU-COMPWEST
Speed =	**896 rpm**
Left Catalyst (Pre-Cat Temp)	**984 ^{o}F**
Right Catalyst (Pre-Cat. Temp)	**902 ^{o}F**
Differential Pressure	**1.5" WC**
Torque =	**95%**
BHP	**3164 (Set=4735)**
Fuel Flow	**22,814 MSCFH**
Exhaust gas temperature	**825^{o}F**

Testing/Sampling

The facility is required to test each engine in FGENGINES for NOx and CO every 12 months. Most recent annual NOx and CO test for each engine, pursuant to PTI No. 77-14A and 40 CFR 63, Subpart ZZZZ was done on September 10, 2019. Test plan was received on July 8, 2019 and approved on August 22, 2019. The report was received on October 23, 2019. The 2020 stack test plan was received on July 16, 2020 and is under review. The projected test date is September 15, 2020.

The five-year stack tests for NOx, CO, and formaldehyde were conducted September 19-20, 2018. The plan was received on July 11, 2018 and approved on September 15, 2018. Test report was received on November 13, 2018. The reports show compliance with emission limits

Monitoring/Recordkeeping

SC VI.1 requires facility to keep records of each measurement of NOx for each engine and keep on file for five years. The facility is keeping the emission measurement records.

SC VI.2 requires the facility to monitor the natural gas usage for EUCOMPEAST and EUCOMPWEST on a monthly basis. The facility is monitoring and keeping records as required.

SC VI.3 requires the facility to keep records of all maintenance on each catalytic system and keep records for five years. The facility is keeping necessary records. See attached.

Stack/Vent Restrictions

Stack dimensions were not verified at the time of the inspection, but stack dimensions appear to be in compliance with the requirements of Special Conditions VIII.1, 2 and 3.

Other Requirements:

SC IX.1 requires that all engines in FGENGINES comply with applicable requirements of 40 CFR 63, Subpart ZZZZ-NESHAP for RICE. See discussion under 40 CFR 63, Subpart ZZZZ- NESHAP for Reciprocating Internal Combustion Engines.

FG-FACILITY

Emission Limits:

SC I.1 through I.5 limit the annual emission rates for NOx, CO, VOC, Individual HAP and Total HAPs to 97.3 TPY, 52 TPY, 48 TPY, less than 10 TPY, less 25 TPY, respectively based on a 12-

month rolling period. The records show that 12-month rolling period emissions for NOx, CO, VOC, Individual HAP and Total HAPs are 12.8 tons, 2.5 tons, 6.1 tons, 0.6 tons, and 1.5 tons respectively as of June 2020.

Material Limits:

SC II.1 limits facility wide natural gas usage to 1,048 MMscf based on a 12-month rolling period. The records show that the facility wide fuel usage is 146 MMscf as of June 2020.

Monitoring/Recordkeeping:

SC VI. 1 & 2 requires the facility to keep monthly and 12-month rolling time period emission rate calculations for NOx, CO, VOC, single HAP and Total HAP and complete the calculations by the 30th of the calendar month. The facility is keeping adequate records and preparing calculations as necessary. They emailed the electronic records.

SC VI.3 requires the facility to keep monthly and 12-month rolling time period fuel usage for each emission unit in FGFACILITY. The facility is keeping adequate fuel usage records.

SC IXI.1 requires the facility to comply with all applicable provisions of federal New Source Performance Standards for New Stationary Sources as specified in 40 CFR 60, Subparts A, Dc and JJJJ. The facility is monitoring fuel gas usage, conducted the initial testing for NSPS RICE engine, etc. The facility appears to be compliance with the applicable NSPS requirements.

40 CFR 63, Subpart ZZZZ- NESHAP for Reciprocating Internal Combustion Engines

40 CFR 63.6590(a) (iii)-For stationary RICE located at an area source of HAP emissions, a stationary RICE is existing if you commenced construction or reconstruction of the stationary RICE before June 12, 2006. FG-ENGINES (EU-COMPNORTH, EU-COMPWEST, and EU-COMPEAST) and EU-GEN were installed prior to 2006 and are considered existing sources.

RICE MACT for existing RICEs (> 500 hp, 4-Stroke Lean Burn, Non-emergency, (operates more than 24 hrs/year) at area sources requires installation of an oxidation catalyst to reduce HAP emissions from the stationary RICE, install a CPMS to continuously monitor catalyst inlet temperature according to the requirements in 40 CFR 63.6625(b), or install equipment to automatically shut down the engine if the catalyst inlet temperature exceeds 1350 °F, conduct initial performance test or other initial compliance demonstration according to 40 CFR 63.6630 (e) within 180 days after the compliance date (October 29, 2013). The RICE MACT also requires to demonstrate continuous compliance pursuant to 40 CFR 63.6640 and keep records as required in 40 CFR 63.6655.

EU-COMPNORTH, EU-GEN, EU-COMPWEST and EU-COMPEAST are subject to National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines (RICE), 40 CFR 63, Subpart ZZZZ (RICE MACT) located at an area source of HAP emissions. The compliance date for the facility was October 19, 2013. The MACT standards require initial testing for these engines which was done during August 13-15, 2013 and test report was received on September 23, 2014. Follow up annual tests, for EU-COMPNORTH, EU-COMPWEST and EU-COMPEAST are conducted, as required.

EU-145BHENG is subject to 40 CFR 63, Subpart ZZZZ which requires this RICE to comply with 40 CFR 60, Subpart JJJJ-NSPS for Spark Ignition RICEs. Complying with NSPS requirement is deemed compliance with MACT requirements.

The records submitted by the facility can be found at S:/Air Quality Division/STAFF/KALLUMKAL/2020 Inspections/N7303 Blue Water Gas Storage.

Conclusion: Based on the records review and the inspection, facility appears to be in compliance with the applicable air quality regulations. Please review attached records for details. MIEGLE-AQD does not have delegated authority to enforce RICE MACT for area sources. Therefore, compliance with RICE MACT was not verified.

NAME Sebastian Kallenkal DATE September 11, 2020 SUPERVISOR Joyce