

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

M379266581

FACILITY: NORTHERN MICHIGAN UNIVERSITY		SRN / ID: M3792
LOCATION: RIPLEY HEATING PLANT, MARQUETTE		DISTRICT: Marquette
CITY: MARQUETTE		COUNTY: MARQUETTE
CONTACT: Tom Kitsos , Associate Director Facilities/Heating Plant		ACTIVITY DATE: 02/01/2023
STAFF: Joe Scanlan	COMPLIANCE STATUS: Compliance	SOURCE CLASS: SM OPT OUT
SUBJECT: Unannounced inspection to determine compliance with PTI 196-16A and all other applicable Air Pollution Control Rules.		
RESOLVED COMPLAINTS:		

REGULATORY AUTHORITY

Under the Authority of Section 5526 of Part 55 of NREPA, the Department of Environment, Great Lakes, and Energy may upon the presentation of their card, and stating the authority and purpose of the investigation, enter and inspect any property at reasonable times for the purpose of investigating either an actual or suspected source of air pollution or ascertaining compliance or noncompliance with NREPA, Rules promulgated thereunder, and the federal Clean Air Act.

FACILITY DESCRIPTION:

Northern Michigan University (NMU) operates the Ripley Heating Plant (FG-FACILITY) as a combined heat and power plant for campus electricity and steam in Marquette.

PROCESS DESCRIPTION

The Ripley Heating Plant consists of three natural gas-fired boilers (EU-OLDBOILER, EU-BOILER4, and EU-BOILER5) with fuel oil backup, and one biomass-fired boiler (EU-RGSBBOILER). These four emission units are combined under FG-POWERHOUSE. NMU also operates miscellaneous exempt residential, heating, and emergency units across campus.

EU-OLDBOILER was installed in 1965 and is a natural gas/fuel oil-fired boiler with a maximum steam production of 70,000 lb/hr. The boiler has a rated heat input capacity of 83.6 MMBtu/hr when firing natural gas and 79.8 MMBtu/hr when firing fuel oil. This unit has been decommissioned and is no longer operable.

EU-BOILER4 was installed in 2006 and is a natural gas/fuel oil-fired boiler with a low-NOx burner and flue gas recirculation and a maximum steam production of 70,000 lb/hr. The boiler has a rated heat input capacity of 83.6 MMBtu/hr when firing natural gas and 79.8 MMBtu/hr when firing fuel oil.

EU-BOILER5 was installed in 2006 and is a natural gas/fuel oil-fired boiler with a low-NOx burner and flue gas recirculation and a maximum steam production of 70,000 lb/hr. The boiler has a rated heat input capacity of 83.6 MMBtu/hr when firing natural gas and 79.8 MMBtu/hr when firing fuel oil.

EU-RGSBBOILER was installed in 2012 and modified in 2017. This reciprocating grate stoker-fired boiler is capable of burning biomass or natural gas. The boiler is a combination water tube/fire tube design. The boiler has a rated heat input capacity of 59.59 MMBtu/hr when firing biomass and 55 MMBtu/hr when firing natural gas. The boiler is equipped with over-fire air combustion, a

multiclone, and dry electrostatic precipitator for the control of particulate matter emissions when combusting biomass. The boiler produces steam for use on campus and to generate electricity. The nominal generator electrical output rating is less than 1 MW. The steam output design capacity is 42,000 pounds per hour.

EU-RGSBOILER was last fired on biomass in 2016 and was modified in 2018 with a low-NOx burner to fire on natural gas. However, the following is a description of the material handling processes that will occur should the facility opt to return to burning biomass in EU-RGSBBOILER:

Biomass means any biomass-based solid fuel that is not a solid waste. This includes, but is not limited to, wood residue and wood products (e.g., trees, tree stumps, tree limbs, bark, lumber, sawdust, sander dust, chips, scraps, slabs, millings, and shavings); animal manure, including litter and other bedding materials; vegetative agricultural and silvicultural materials, such as logging residues (slash), nut and grain hulls and chaff (e.g., almond, walnut, peanut, rice, and wheat), bagasse, orchard pruning's, corn stalks, coffee bean hulls and grounds. This definition of biomass is not intended to suggest that these materials are or are not solid waste.

Both biomass and ash handling occur inside a building. Biomass fuel is delivered by trucks and moved within the building by conveyors. Design throughput is 9 tons per hour. Ash handling (fly ash and bottom ash) using enclosed conveyors and storage in two enclosed roll-off ash bins for off-site disposal.

Bulk deliveries of biomass are received inside the enclosed fuel storage building via covered trucks. The building has a Hydraulic Live Bottom Fuel Bunker Scrape System (approximately 29,000 cubic feet of storage space) that brings fuel to a cross transfer vibrating conveyor, feeding to a drag chain conveyor and an overs conveyor. The overs conveyor removes oversize biomass to an oversize bin. The drag chain conveyor delivers fuel from the bunker unit to the two metering/storage bins with a combined capacity of 4,000 lbs. of fuel. The discharge rate to the bins is about 9 tons per hour. Fuel is fed into the inclined stepped grate from the bins via four stainless steel fuel stoking screw conveyors.

REGULATORY SUMMARY

PTI 196-16 was issued on May 5, 2016. The purpose of PTI 196-16 was to combine PTI 126-05 and PTI 29-11 into one synthetic minor permit and maintain facility opt out limits for NOx and SO2. PTI 196-16 was modified to include a new gas burner on the existing biomass-fired boiler and resulted in issuance of PTI 196-16A on November 20, 2017. The facility continues to operate under PTI 196-16A.

The facility has Title V opt out limits for both NOx and SO2 and has limitations for biomass, distillate oil, and steam production which will keep them below major source thresholds. They are an ROP opt out, and emissions from the facility are less than PSD major source thresholds. The potential emissions from installation of the gas burner in EU-RGSBBOILER are less than significance levels, therefore PTI 196-16A did not undergo PSD review.

In 2018, the gas burner was installed on EU-RGSBBOILER primarily because natural gas is an inexpensive fuel to burn. The facility has preserved the ability to switch back to biomass if economic conditions warrant. Pursuant to 40 CFR 63.11225(g), the facility must submit notification for a fuel switch that changes the applicable boiler subcategory under 40 CFR Part 63

Subpart JJJJJ (Area Source Boiler MACT). The facility submitted this notification to EGLE AQD on July 24, 2018. EU-RGSBBOILER historically operated on biomass; however, on July 12, 2018, NMU switched fuel to natural gas. EU-RGSBBOILER continues to fire on natural gas.

The fuel change resulted in the boiler meeting the definition of a gas-fired boiler, which are not subject to the Area Source Boiler MACT. Because of this, EU-RGSBBOILER currently does not have applicable requirements under 40 CFR Part 63 Subpart JJJJJ while operating as a gas-fired boiler. Pursuant to 40 CFR Part 63 Subpart JJJJJ, SC V.2 and SC VII.1 of FG-POWERHOUSE, NMU will provide notification and perform compliance demonstrations if EU-RGSBBOILER returns to operate on biomass.

The facility is in an area which is in attainment for all criteria pollutants.

EMISSIONS

Major pollutants from the facility are particulate matter (PM), nitrogen oxides (NO_x), carbon monoxide (CO), and sulfur dioxide (SO₂). PM is a concern mostly when EU-RGSBBOILER is burning biomass; the boiler is equipped with a multiclone and dry electrostatic precipitator (ESP) to control PM emissions.

Biomass and fuel oil produce the highest emissions of NO_x and SO₂ respectively, therefore, the worst-case emissions scenario would be a natural gas curtailment situation with both biomass and fuel oil would be necessary. Since no biomass is being used currently, during normal operations where there is not a gas curtailment situation, all boilers in the facility are operating on natural gas. This results in much greater reduced facility emissions of PM, NO_x, and SO₂.

The facility complies with the synthetic minor limits for NO_x and SO₂ with the following conditions:

Annual steam production is limited to 451,000,000 lbs per year;

Annual biomass usage is limited to 42,000 tons per year;

Annual fuel oil usage is limited to 212,800 gallons per year;

And sulfur content of all oil is 0.50% by weight.

Compliance with the limits in PTI 196-16A is demonstrated through fuel usage monitoring and recordkeeping. Additionally, the applicant is required to calculate both monthly and rolling 12-month time period records to show compliance with the emission limits in the permit.

EMISSIONS REPORTING

The facility reported the following emissions to MAERS for 2021:

Source Reported Emissions 2021 (tons)	
Ammonia	0.11

CO	18.99
Lead	0.00011
NOx	22.62
PM10	1.72
PM2.5	1.72
SO2	0.14
VOC	1.24

Emission factors for all combustion units, except the biomass boiler, are based on the U.S. Environmental Protection Agency (EPA) AP-42 Compilation of Air Emission Factors (AP-42).

COMPLIANCE HISTORY

The Ripley Heating Plant at NMU has not had any recent compliance issues.

INSPECTION

On February 1, 2023, AQD District Staff (Joe Scanlan) arrived at the Ripley Heating Plant on the campus of Northern Michigan University (NMU). Staff met with Associate Director of the heating plant Tom Kitsos. During the opening conference, there was a brief discussion about the permit and emissions. We then proceeded to tour the heating plant and discuss operations. During the exit conference, we discussed the records I would be requesting as a follow-up to the site visit.

FG-FACILITY

Emission Limits

Pollutant	Limit	Time Period / Operating Scenario	12-Month Rolling Emissions from Jan 2022 through Dec 2022
SC I.1 NOx	99.9 tons per year	12-month rolling time period as determined at the end of each calendar month	11.00 tons/year Monthly NOx emissions range from 0.62 tons to 1.43 tons, with the colder months having the higher values.

Pollutant	Limit	Time Period / Operating Scenario	12-Month Rolling Emissions from Jan 2022 through Dec 2022
SC I.2 SO2	99.9 tons per year	12-month rolling time period as determined at the end of each calendar month	0.22 tons/year Monthly SO2 emissions range from 0.01 tons to 0.03 tons.

Material Limits

Material	Limit	Time Period/ Operating Scenario
SC II.1 Distillate oil sulfur content	0.50 % by weight	Instantaneous

Sulfur content of #2 fuel oil is verified on shipping manifests provided by the facility for the last delivery of fuel oil in 2016. Sulfur content is verified at 15 PPM sulfur.

Process/Operational Restrictions

NA

Design/Equipment Parameters

NA

Testing/Sampling

NA

Monitoring/Recordkeeping

SC VI.1 All required calculations shall be completed in a format acceptable to the AQD District Supervisor and made available by the last day of the calendar month, for the previous calendar month, unless otherwise specified in any recordkeeping, reporting or notification special condition.

The facility completes and maintains emission and fuel calculations in an acceptable format.

SC VI.2 The permittee shall keep, in a satisfactory manner, monthly and rolling 12-month fuel use (natural gas, biomass, and fuel oil) and distillate oil sulfur content for FG-FACILITY.

No Biomass is currently being burned at FG-FACILITY.

Monthly natural gas use varied between 17 and 43 MMscf/month from January 2022 through December 2022 for FG-FACILITY. 12-month rolling natural gas usage was at 324 MMscf as of December 2022 for FG-FACILITY.

EU-BOILER4 and EU-BOILER5 both used 148 gallons of fuel oil each during the month of April in 2022, with no fuel oil burned in either unit in the previous 12 months, or any months after. Therefore, current 12-month rolling fuel oil use for FG-FACILITY stands at 296 gallons for EU-BOILER4 and EU-BOILER5 combined as of December 2022.

Sulfur content of #2 fuel oil is verified on shipping manifests provided by the facility for the last delivery of fuel oil in 2016. A total of 21,700 gallons was delivered at that time in three shipments. Sulfur content is verified at 15 PPM sulfur, or 0.0015%.

All records are attached to the hard copy of this report and on file in the district office.

SC VI.3 The permittee shall keep, in a satisfactory manner, monthly and 12-month rolling time period NO_x and SO₂ emission calculation records for FG-FACILITY, as required by SC I.1, I.2 and Appendix A. All records shall be kept on file for a period of at least five years and made available to the Department upon request. Calculations shall be performed in accordance with the procedures contained in Appendix A.

All calculations are performed in accordance with the procedures in Appendix A of PTI 196-16A and calculation records for monthly and 12-month rolling NO_x and SO₂ emissions for FG-FACILITY are on file in the facility and available. Emission factors for all combustion units are based on the U.S. Environmental Protection Agency (EPA) AP-42 Compilation of Air Emission Factors (AP-42).

FG-POWERHOUSE

Emission Limits

Pollutant	Limit	Time Period / Operating Scenario	Equipment
SC I.1 VE	20% Opacity	6-minute average, except one 6-minute average per hour of not more than 27 percent when firing fuel oil	EU-BOILER4 EU-BOILER5
SC I.2 VE	10% opacity	6-minute average, except one 6-minute average per hour of not more than 20 percent except	EU-RGSBBOILER, when combusting biomass

Pollutant	Limit	Time Period / Operating Scenario	Equipment
		for periods of startup and shutdown	
SC I.3 PM10	3.0 pph	Hourly	EU-RGSBBOILER, when combusting biomass
SC I.4 PM2.5	2.7 pph	Hourly	EU-RGSBBOILER, when combusting biomass
SC I.5 PM	0.03 lb/MMBtu (not applicable during periods of startup or shutdown)	Hourly	EU-RGSBBOILER, when combusting biomass
SC I.6 NOx	14.9 pph	30-day rolling average as determined each day the boiler operates	EU-RGSBBOILER
SC I.7 CO	7.2 pph	Hourly	EU-RGSBBOILER, when combusting biomass
SC I.8 VOC	0.039 lb/MMBtu	Hourly	EU-RGSBBOILER, when combusting biomass

Because SC I.2, I.3, I.4, I.5, I.7, I.8 are strictly for EU-RGSBBOILER when burning biomass, these Special Conditions will not be thoroughly addressed in this inspection report. The boiler is currently only able to fire on natural gas and is not capable of burning biomass at this time.

EU-BOILER5 was on stand-by at the time of inspection. EU-RGSBBOILER and EU-BOILER4 were operating on natural gas at the time of inspection. No visible emissions were observed.

The following operating parameters were observed for EU-BOILER4:

- Steam flow 18,692 lbs/hr
- Drum Pressure 82.1 PSI
- Natural gas flow rate 19,465 SCFH
- Fuel oil flow rate 0 GPH

The following operating parameters were observed for EU-RGSBBOILER:

- Steam flow 41,187 lbs/hr

- Drum Pressure 400 PSI
- Natural gas flow rate 47,814 SCFH
- Biomass feed rate 0 lbs/hr

SC I.1 EU-BOILER4 and EU-BOILER5 shall not exceed visible emissions of 20% opacity over a 6-minute average, except one 6-minute average per hour of not more than 27% when firing fuel oil.

EU-BOILER4 was operating at the time of inspection. No visible emissions were observed.

SC I.6 NOx emission limit of 14.9 pph for EU-RGSBBOILER based on a 30-day rolling average as determined each day the boiler operates.

The 14.9 pph NOx emission limit listed in FG-POWERHOUSE Special Condition I.6 applies to EU-RGSBBOILER and was established at the time that the boiler was originally fueled on biomass; however, as it is written this limit is applicable no matter what fuel is being burned. The facility is not keeping a 30-day rolling average of NOx emissions. The potential to emit NOx for EU-RGSBBOILER while operating on natural gas in its current configuration is 2.7 pph. It is recommended that the facility amend this condition to specify that this limit applies only when combusting biomass.

PTI No. 196-16A does not require recording daily NOx emissions to comply with this limit. The testing/monitoring method for this limit referenced in Table I of FG-POWERHOUSE of PTI 196-16A is stack testing performed upon request, as specified by Special Condition V.1. The natural gas burner is rated at 53 MMBtu/hour and potential mass emissions on natural gas are very low.

Material Limits

Material	Limit	Time Period / Operating Scenario	Equipment	Reported as of December 31, 202
SC I.1 Steam production	443,000,000 pounds per year	12 month rolling time period, as determined at the end of each calendar month	FG-POWERHOUSE	273,598,120 lbs
SC I.2 Biomass	42,000 tons per year	12 month rolling time period, as determined at the end of each calendar month	EU-RGSBBOILER	0 tons – biomass was last burned in 2016
SC I.3 Distillate oil	212,800 gallons per year	12 month rolling time period, as determined at the	EU-OLDBOILER EU-BOILER4 EU- BOILER5	296 gallons

		end of each calendar month		
SC I.4 Distillate oil sulfur content	0.50 % by weight	Instantaneous	EU-BOILER4 EU- BOILER5	Fuel oil certified at 15ppm, or 0.0015%

Process/Operational Restrictions

SC III.1 NA (biomass only)

SC III.2 The facility shall not operate EU-RGSBBOILER simultaneously with more than two of the following three boilers: EU-OLDBOILER, EU-BOILER4, EU-BOILER5.

EU-OLDBOILER has been decommissioned, so this condition is no longer applicable.

SC III.3 The facility shall not operate EU-RGSBBOILER on biomass unless a preventative maintenance/malfunction abatement plan (PM/MAP) has been submitted to the AQD District Supervisor and is implemented and maintained.

The facility has a PM/MAP on file and a copy of the plan is on file in the district office as well.

SC III.4 The facility shall not operate EU-RGSBBOILER on biomass unless a Fuel Procurement and Monitoring Plan (FPMP) for biomass fuel has been submitted and approved by the AQD District Supervisor. The facility has a FPMP on file and a copy of the plan is on file in the district office as well.

Design/Equipment Parameters

SC IV.1 NA (biomass only)

SC IV.2 The facility shall not operate EU-BOILER4, EU-BOILER5, or combust natural gas in EU-RGSBBOILER unless each low-NOx burner and flue gas recirculation system is installed, maintained, and operated in a satisfactory manner.

All boilers have low-NOx burners and flue gas recirculation systems installed, maintained, and operated in a satisfactory manner. Gas recirculation systems were in operation at the time of inspection.

Testing/Sampling

SC V.1 NA (biomass only—last successful compliance test while EU-RGSBBOILER was operating on biomass was conducted June 3, 2014)

SC V.2 If the facility operates EU-RGSBBOILER as a gas-fired boiler, then returns to operation on biomass, a compliance demonstration on biomass is required within 180 days after firing biomass, if 3 years have passed since the last demonstration.

Because the last compliance test while EU-RGSBBOILER was operating on biomass was conducted June 3, 2014, the facility will need to re-test if the boiler returns to operation on biomass.

SC V.3 The facility shall keep records for each delivery or shipment of the fuel oil, indicating the sulfur content by percent weight or ppm, or that the fuel oil complies with Low Sulfur standards for ULSD of 15 ppm.

The facility has provided fuel delivery manifests for the latest shipments of fuel oil certifying the low sulfur standard of 15 ppm.

Monitoring/Recordkeeping

SC VI.1 The facility shall install, calibrate, maintain, and operate in a satisfactory manner a device to monitor and record the visible emissions when combusting biomass in EU-RGSBBOILER on a continuous basis.

The facility has a COMs installed for when burning biomass in EU-RGSBBOILER.

SC VI.2 The facility shall maintain records of all information necessary for all notifications and reports as specified in these special conditions as well as that information necessary to demonstrate compliance with the emission limits of this permit.

The facility has provided all necessary records to demonstrate compliance with the emission limits of PTI 196-16A in an acceptable format.

SC VI.3 The facility shall keep, in a satisfactory manner, fuel oil supplier certification for each delivery of fuel oil. The certification shall include the name of the fuel oil supplier and a statement from the fuel oil supplier that the fuel oil complies with the specifications under the definition of distillate oil in 40 CFR 60.41c.

Delivery manifests of fuel oil are kept in a satisfactory manner and include all necessary information.

SC VI.4 The facility shall install, calibrate, maintain and operate in a satisfactory manner, a device to monitor the natural gas and fuel oil usage for EU-BOILER4 and EUBOILER5, and natural gas usage for EU-RGSBBOILER when combusting natural gas, on a continuous basis.

The facility has fuel monitoring devices installed and maintained for all operating boilers.

Reporting

SC VII.1 The facility shall submit notification if a fuel switch occurs that changes the applicable subcategory of EU-RGSBBOILER according to 40 CFR 63.11200.

The facility submitted this notification to EGLE AQD on July 24, 2018. EU-RGSBBOILER historically operated on biomass; however, on July 12, 2018, NMU switched fuel to natural gas. EU-RGSBBOILER continues to fire on natural gas.

Stack/Vent Restrictions

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Stack & Vent ID	Minimum Height Above Ground (feet)	Verified with Range Finder during inspection
1. SV- EU-RGSBBOILER	85	Yes +/- 2'
2. SV-BLRS4&5	150	Yes +/- 2'

A 3-point measurement was conducted to verify stack heights from the parking area off Wright Street. Targets on the stacks were from the base to the top of the stack. Stack diameters were not verified but appeared to be within the maximum dimensions.

CONCLUSION

The facility appears to be in compliance with PTI 196-16A. It should be noted that the facility has decommissioned EU-OLDBOILER by disconnecting the natural gas and fuel oil lines. This was verified during the inspection. Additionally, the facility uses a different nomenclature to describe all the boilers: EU-OLDBOILER is referred to as BOILER #2; EU-BOILER4 is actually referred to as BOILER #3; EU-BOILER5 is referred to as BOILER #4; and EU-RGSBBOILER is referred to as BOILER #5. It was discussed with Tom Kitsos that it would be preferable to modify PTI 196-16A to remove EU-OLDBOILER from the permit, correct the nomenclature in the permit used to describe the boilers to better match the descriptions the facility uses, and modify the "Time Period/Operating Scenario" language of SC I.6 of FG-POWERHOUSE.

NAME


DATE 03-29-2023

SUPERVISOR

