

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

B722052177

FACILITY: ANR Pipeline Co - Woolfolk Compressor Station		SRN / ID: B7220
LOCATION: 11039 150th Ave., BIG RAPIDS		DISTRICT: Grand Rapids
CITY: BIG RAPIDS		COUNTY: MECOSTA
CONTACT: Brad Stermer, Sr. Environmental Specialist		ACTIVITY DATE: 01/14/2020
STAFF: Chris Robinson	COMPLIANCE STATUS: Non Compliance	SOURCE CLASS: MAJOR
SUBJECT: FY '20 on-site inspection to determine the facility's compliance status with MI-ROP-B7220-2017.		
RESOLVED COMPLAINTS:		

On January 14, 2020 AQD staff Chris Robinson (CR) and Scott Evans (SC) conducted a scheduled unannounced on-site inspection of the ANR Pipeline Company Woolfolk Compressor Station (Woolfolk, SRN B7220) to determine the facility's compliance status with respect to Renewable Operating Permit (ROP) MI-ROP-B7220-2017a.

Woolfolk is located at 11039 150th Avenue, in Big Rapids, Michigan. AQD staff met with Mr. Brad Stermer, Sr. Environmental Specialist. Intent of the visit was relayed, and proper identification was provided. Mr. Stermer provided a tour of the facility as well as pertinent information. Engines 2, 5, 7, 9, 14 and 15 were operating during this inspection. No visible emissions or significant odors were observed.

Weather conditions were approximately 35°F cloudy with SSE winds at 5 mph.

A) Facility Description

The ANR Pipeline Company owns and operates facilities throughout Michigan for natural gas transmission and storage. Woolfolk is located near Big Rapids in Austin Township, Mecosta County, in a remote rural area. This facility consists of a Compressor Station and associated naturally occurring underground reservoir used for storing natural gas. The reservoir is comprised of natural porous rock, ideal for storing natural gas. The reservoir is located in the Austin Field (Austin formation), which was discovered in the 1930's.

Woolfolk is used to maintain pipeline pressure to allow for the temporary storage of natural gas and for transporting natural gas, via pipelines, to storage and distribution facilities located throughout Michigan. Woolfolk consists of seventeen natural gas-fired Reciprocating Internal Combustion Engines (RICE), a sorbead gas-liquid separator/dehydrator and auxiliary equipment. During periods of natural gas withdrawal, natural gas flows freely from the Austin Formation into the pipeline, slowly reducing the pressure in the reservoir. When the reservoir pressure drops too low gas cannot move freely requiring one or more of the seventeen engines to compress the natural gas for transport.

As summarized in Table 1 below, the facility operates six (6) two-stroke engines and eleven four-stroke engines. These engines are further characterized as rich burn or lean burn. Rich-burn engines operate near the stoichiometric air-to-fuel ratio (16:1) with exhaust excess oxygen levels less than 4%. Lean-burn engines may operate up to the lean flame extinction limit, with exhaust oxygen levels of 12% or greater. The air to fuel ratios of lean-burn engines range from 20:1 to 50:1 and are typically higher than 24:1. Boiler and emergency generator information is also presented in Table 1.

Table 1: Emission Unit Summary

Emission Unit ID	Description	Type (natural gas-fired only)	Installation Date
EUWL001 - EUWL005	Ingersoll-Rand Compressor Engine Model KVG-103, 1000 hp	4-stroke, rich burn	1949
EUWL006 - EUWL009	Ingersoll-Rand Compressor Engine Model KVG-123, 1320 hp		EUWL006-8 1950 EUWL009 1951
EUWL010 - EUWL013	Cooper-Bessemer Compressor Engine Model GMW-10, 2500 hp	2-stroke lean burn	EUWL010-12 1951 EUWL013 1952
EUWL014 - EUWL015	Ingersoll-Rand Compressor Engines Model 616-KVH, 4500 hp	4-stroke, lean burn	1962
EUWL016	Cooper-Bessemer Compressor Engine Model 16Z-330, 11,000 hp	2-stroke, lean burn	1973
EUWL017	Cooper-Bessemer Compressor Engine Model 12Q145H, 4000 hp	2-stroke, lean burn	1980
EUWLGEN003	Waukesha emergency generator 871 hp	4-stroke, rich burn	2005
EUWLGEN004	Waukesha emergency generator, Model P48GL, 1,174 hp	4-stroke, lean burn	2017
EUWLBOILER001	Cleaver Brooks boiler, 5.82 MMBtu/hr	-	1986
EUWLBOILER002	Cleaver Brooks boiler, 2.93 MMBtu/hr	-	1986
EUWLBOILER003	Kewanee boiler, 3.35 MMBtu/hr	-	1986

EUWLBOILER004	Kewanee boiler, 0.004 MMBtu/hr	--	Manufactured on 12/18/1979
EUWLFURN002	Broch Furnace (Austin Dehydrator), 5.00 MMBtu/hr	Dry bed dehydration furnace	12/14/2017

B) Regulatory Requirements

Mecosta County is currently designated by the USEPA as attainment/unclassified for all criteria pollutants. Woolfolk is subject to Title 40 CFR Part 70, because the potential to emit (PTE) of Nitrogen Oxides (NOx) and VOCs exceed 100 tons per year (tpy). The PTE of any single Hazardous Air Pollutant (HAP) (formaldehyde and Acetaldehyde) regulated by the federal Clean Air Act, Section 112, is equal to or more than 10 tpy and the PTE of all HAPs combined is equal to or more than 25 tpy.

Woolfolk is considered a "synthetic minor" source in regard to the Prevention of Significant Deterioration (PSD) regulations of 40 CFR 52.21 because the stationary source accepted legally enforceable permit conditions limiting the potential to emit of NOx to less than 250 tpy for compressor engine Model 12Q145H (EGWL017), which was installed in 1980. The remaining processes at the facility are currently not subject to PSD regulations because the process equipment was constructed/installed prior to June 19, 1978, the promulgation date of the PSD regulations or did not exceed PSD threshold. Future modifications to the process equipment at the facility may be subject to PSD requirements.

Reciprocating compressor engines EUWL001 through EUWL015 were installed prior to August 15, 1967. As a result, this equipment is considered "grandfathered" and exempt from New Source Review (NSR) permitting requirements. Although Compressor Engine 16 was installed in 1973, this engine was exempt under an existing permit exemption rule at the time it was installed. The sorbead dehydrator equipment, initially installed prior to August 15, 1967, removes moisture from natural gas extracted from the Austin Field. Therefore, the facility refers to this equipment as the Austin dehydrator. The dehydrator consists of 6 dry bed adsorption towers and a Broch furnace for drying the sorbeads. The Broch furnace was replaced in 2017 under exemption Rule 282(b)(i) for boilers rated at no more than 50,000,000 Btu/hr and burns only sweet natural gas. The project did not trigger PSD because it didn't exceed the 250 tpy PSD threshold.

Engines 1-9 are subject to Rule 336.1818, based on size, and considered "Large NOx SIP Call Engines". A Large NOx SIP Call Engine is an engine that emits more than 1 ton of oxides of nitrogen per average ozone control period day in 1995. These engines are also subject to the Maximum Achievable Control Technology (MACT) Standards for RICE promulgated in 40 CFR Part 63, Subparts A and ZZZZ. Emergency generators EUWLGEN003 and EUWLGEN004 are subject to the RICE MACT promulgated under 40 CFR Part 63 Subparts A and ZZZZ.

Woolfolk operates five (5) natural gas-fired emission units subject to the National Emission Standard for HAPs for boilers/process heaters promulgated in 40 CFR Part 63, Subparts A and DDDDD. This includes boilers EUWBOILER001, EUWBOILER002, EUWBOILER003 and EUWBOILER004 and process heater EUWLFURN002.

C) Regulatory Analysis

1) MI-ROP-B7220-2017a

All engines are equipped with continuous monitoring systems (CMS) and are monitored and operated from the control room. Monitoring data and records are kept in the control room for a minimum of 5 years. All emission units on-site and discussed further below are natural gas-fired only. The facility continuously monitors and records fuel consumption and operating hours (Attachment A) for every engine. The operating status of each engine, as observed during this inspection, is detailed in Table 2 below.

Table 2: Engine Status

Engine No.	Operating Status	Engine No.	Operating Status
1	Unavailable	8	Available
2	Running	9	Running
3	Available	14	Running
4	Available	15	Running
5	Running	16	Available
6	Available	17	Available
7	Running	--	--

During this inspection, stack heights and diameters were not explicitly measured. However, visual inspections appeared to reflect the measurements specified in the ROP. The facility is currently preparing the 2019 annual certification and semi-annual reports which are due March 15, 2020. Required 2018 and 2019 reports/certifications have been submitted as required and on time.

a) EUWL017 (Engine 17)

Engine 17 was not operating during this inspection. NOx testing is required to be completed at least once within the five-year ROP cycle. Testing has not yet taken place since the last ROP Renewal. Testing was last conducted on May 11, 2017 (Activity Report CA_B722039866).

Engine 17 is typically operated at approximately 90% speed and torque, however, during the May 11, 2017, test the engine was operated at nearly 100%. Test data indicated that Engine 17 operated with an emission rate of less than 9.7 g/bhp-hr which calculates out to a lb/hr emission limit of 85.7 for a 4,000HP engine. Monthly records for January 2019 through December 2019 indicate that the highest NOx emission rate was 23.5 lb/hr in January (4,305 mmscf of fuel consumed and 204 hours of operation). The following records were provided and are included in **Attachment A**:

- Monthly engine fuel consumption
- Monthly engine hours of operation
- Calculations of hourly NOx emissions average over each month with an emissions factor based on the previous stack test.

b) FG-RICE-818-WLENGINES (Engines 1-9)

Engines 1-9 are subject to Rule 818 and the NESHAP RICE MACT (40 CFR Part 63, Subparts A and ZZZZ) requirements. No visible emissions or odors were observed. Engines 1-9 are subject to a 76%, or greater, formaldehyde reduction limit per the RICE MACT. The facility meets this limit by operating the engines with a properly maintained Non-Selective Catalytic Reduction (NSCR) unit. Each unit has a pressure and temperature sensor installed as required.

The facility continuously monitors and records atmospheric pressure and NSCR inlet pressure and temperature and maintains the catalyst so that the pressure drop across the catalyst does not change by more than 2" w.c. at 100% load plus or minus 10% from the pressure drop across the catalyst measured during the initial performance test and a catalyst inlet temperature of greater than or equal to 750°F and less than or equal to 1,250°F (40 CFR Part 63.6600). NSCR units are tested as required when replaced and differential pressure is continuously monitored to determine if maintenance or replacement is necessary. The catalysts for engine 4 and 8 were replaced in March of 2018 (Activity Report CA_B722043770) due to elevated differential pressures.

The facility prefers to use multiple engines at reduced workloads rather than a single engine at maximum load for reliability and flexibility purposes. These levels of operation, for which conventional MACT differential pressure monitoring might not be appropriate, are covered by their EPA-approved alternative monitoring supplement for load conditions less than 90%. These hours are tracked and totaled each semi-annual operating period. If an engine experiences a MACT excursion, then (per their MACT plan) it is shut down, catalyst replaced and re-tested.

Table 3: Engine Operating Conditions

Engine No.	Catalyst Operating Parameters		DP Limits (based on most recent Stack Test, "w.c.)	
	Inlet Temp (F)	DP ("w.c.)	Min DP	Max DP
1	--	--	3.52	7.52
2	940.8	4.08	2.99	6.99
3	--	--	2.07	6.07
4	--	--	3.4	7.4
5	947.1	2.98	2.93	6.93
6	--	--	1.47	5.47
7	974.3	2.81	1.35	5.35
8	--	--	0.95	4.95
9	1,050.4	2.65	1.28	5.28

Engines 1-9 are considered Large NOx SIP Call Engines subject to the NOx emission limits specified in Rule 818. Rule 818 (3) allows a facility to comply with emission rates specified in Rule 818(3)(b) or the emission limits specified in a Compliance Plan developed by the facility. Woolfolk chose to use a Compliance plan (Dated April 25, 2006), which was approved by the AQD on January 23, 2007. This Compliance Plan established the 20.5 g/bhp-hr emission rate specified in SC I.2 which is the basis for the lb/hr limits specified in SC I.3 and I.4. The facility does not have an approved Parametric Monitoring Program at this time. Therefore, the facility demonstrates compliance with the emission limit by conducting annual performance testing as allowed in SCVI.6.

Special Condition III.2 requires the permittee to comply with the emission rate limitations listed in Rule 818(3)(b). Rule 818(3) allows a facility to use either a Compliance Plan or an emission rate limitation specified in 818(3)(b). As discussed above Woolfolk chose to use a Compliance Plan not an emission rate limitation specified in Rule 818(3)(b). This condition is incorrect and should be revised to specify compliance with the facility's Compliance Plan. CR will discuss this with the facility and request that they submit a modification to revise/update the entire ROP Rule 818 Table as necessary.

Engines 2-9 were tested for NOx emissions during the 2019 Ozone Season. Engine 1 ran for approximately 904 hours in May-July 2019, going offline in July due to mechanical issues. Due to these issues the facility has not been able to conduct testing as required. Failure to test engine 1 is a violation of SC VI.6.a of the ROP and Rule 818(4)(a)(ii)(A).

Per Special Condition I.2 each engine (1-9) is subject to a NOx emission limit of 20.5 g/brake hp-hr. (45.19 lb/hr for engines 1-5 & 59.66 lb/hr for engines 6-9).

$$(20.50 \text{ grams/brake HP Hour} \times (1\text{lb}/453.59237 \text{ grams})) \times 1,000 \text{ HP} = 45.19 \text{ lbs/hr}$$

$$(20.50 \text{ grams/brake HP Hour} \times (1\text{lb}/453.59237 \text{ grams})) \times 1,320 \text{ HP} = 59.66 \text{ lbs/hr}$$

Based on the 2019 test reports, engines 1-9 are compliant with the 20.50 g/bhp emission limit. The most recent test results are summarized in **Table 4** below. The underlying applicable requirement (UAR) provided in the Emission Limits Table Special Condition I.3 and I.4 are incorrect (R336.1213(2)(c)) and should be R336.1213(2). This UAR will be corrected in the next ROP Renewal.

Table 4: Most Recent NOx Testing Results

Engine No.	Limit (g/bhp-hr)	Date of Testing	% Load	
			Emission Rate (g/bhp-hr)	% Load
1	20.50 / engine	9/12/2018	8.7	96.6
2		7/25/2019	13.5	92.8
3		9/25/2019	9.8	95.2
4		8/27/2019	11.4	93.2
5		9/24/2019	11.2	92.9
6		9/17/2019	8.2	93.5
7		7/24/2019	6.3	93.0
8		7/24/2019	11.2	93.9
9		9/17/2019	8.3	92.6

The 2019 Monthly NOx emission calculations were provided and are included in **Attachment A** and summarized in **Table 5**.

Table 5: 2019 Calculated NOx Emissions (lbs/hr)

2019 Monthly Maximum Calculated NOx Emissions (lbs/hr)								
Engine No.								
1	2	3	4	5	6	7	8	9
14.8	18.3	17.8	16.4	18.1	12.9	12.1	19.2	14.4
March	Sept.	Jan.	Dec.	Feb.	March	Sept.	Sept.	Dec.
*45.19 lb/hr limit (May 1 – Sept. 30)					*59.66 lb/hr limit (May 1 – Sept. 30)			

* The ROP NOx emission limits specified in the table for engines 1-5 (SC I.3) and engines 6-9 (SC I.4) does not specify whether the limit is for the group of engines or individual engines. These limits are meant to be on a per engine basis. A note clarifying this will be added to the next ROP renewal. These limits only apply during the Ozone Season (May 1 – September 30) of each year.

c) FGWLENGINES (Engines 10-16)

Engine 16 is equipped with 6 compressors with hydraulic loaders. The hydraulic loaders allow the operator to load all 6 compressors simultaneously or independently as needed. The facility continuously monitors and records engine operating hours and natural gas consumption. These records along with printouts of the CMS data for all of the engines operating during this inspection were provided and are included in **Attachment A**.

d) FGLIMITED-RICEMACT (Emergency Generators)

Emergency generator no. 3, located adjacent to Engine 17 and emergency generator no. 4, were not operating during this inspection. These generators are subject to 40 CFR Part 63, Subparts A and ZZZZ. All requirements appear to be properly addressed and implemented. Required hour meter and operating logs were readily accessible on the control panels. Metered hours through the date of this inspection was 474.3 hours for generator 3 and 103 hours for generator 4. Generator logs for 2019 were provided by the facility (**Attachment B**). Based on these logs Generator 3 ran 12.7 hours for emergency use and 14.1 hours for maintenance and Generator 4 ran 13.8 hours for emergency use and 9.4 hours for maintenance. Generators at this facility typically do not operate for more than 500 hours per year. Therefore, the facility has opted to utilize an oil analysis program in order to extend the oil change requirement. The facility inspects air cleaners every 1,000 hours of operation or annually and all hoses and belts every 500 hours of operation or annually as required. The most recent oil analysis and maintenance records are included in **Attachment B**.

e) FGWL-BOILERMACT

The facility operates four (4) boilers (EUWBOILER001, EUWBOILER002, EUWBOILER003 and EUWBOILER004) and one process heater (EUWLFURN002) subject to the NESHAP BOILER MACT 5(D) requirements.

The facility originally indicated five (5) subject natural gas (only)-fired boilers, but the Energy Assessment covered only three (3) boilers because it was based on the facility's heat input for the affected sources (5 small units up to about 6 MMBtu/hr), the Assessment is only required to cover 50% of the heat input capacity (and 8 on-site hours of activity.) By analyzing the three (3) largest units, this 50% requirement was met. An Energy Assessment for EUWLFURN002 was not required for this boiler because it's considered a "new" unit. An initial tune-up was conducted in 2018. The facility is required to complete a

tune-up every five (5) years for boilers/process heaters less than or equal to 5mbtu/hr and every two (2) years for boilers greater than 5mbtu/hr and less than 10mbtu/hr. All required Energy Assessments and tune-ups have been completed and submitted as required. The facility appears to be current and up to date with all boiler MACT 5(D) requirements. Energy Assessments, notifications and tune-up reports were received by the AQD as requested and included in **Attachment C**. Submission dates are provided in **Table 2** below.

Table 2: 5(d) Submittal/Completion Dates

Boiler ID	Date of Energy Assessment	Date of Initial Notification (Received by AQD)		Required Tune-up Frequency (years)	Date of Initial Tune-up	Date of most recent Tune-up
EUWLBOILER001 (Station #2)	4/17/2015	5/30/2013	11/2/2015	2	9/14/2015	9/24/2019
EUWLBOILER002 (Breakroom - Small)	4/17/2015	5/30/2013	11/2/2015	5	9/14/2015	9/23/2019
EUWLBOILER003 (Breakroom - Big one)	4/17/2015	5/30/2013	11/2/2015	5	9/14/2015	9/23/2019
EUWLBOILER004 (Station #4 - Cleaver Brooks)	**NA	5/30/2013		5	9/11/2017	9/23/2019
*EUWLBOILER005	***NA	5/30/2013		5	--	--
EUWLFURN002 (Sorbead Dehy)	***NA	1/5/2018		2	NA	3/21/2019

NA = Not Applicable

*Boiler was determined to be for comfort heat only and not subject to 5(D) Requirements.

** Not Required. See Boiler MACT discussion.

*** Installed in 2017. Energy assessments and initial tune-ups are not required for "new" units.

2) MAERS

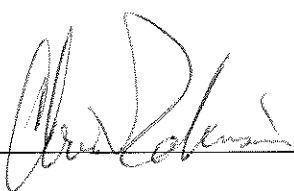
MAERS information submitted by the facility was reviewed on February 26, 2019 for the 2018 reporting season. The 2018 MAERS report is included in **Attachment D**. Emission Units EUWLFURN002 which did not operate in 2018, and EUWLBOILER004 have not yet been added to MAERS. CR will work with the facility to ensure that these are added during the 2020 reporting season.

D) Conclusion

Woolfolk did not conduct annual NOx testing for engine 1 during the 2019 Ozone Control period. This is a violation of FG-RICE-818-WLENGINES SC VI.6.a of the ROP and Rule 818(4)(ii)(A). A violation Notice will be issued.

Attachments

- A - Compressor Engine Records
- B - Generator Records
- C - Boiler Records
- D - 2018 MAERS Report

NAME 

DATE 1/27/2020

SUPERVISOR 