



west virginia department of environmental protection

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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.: G70-A091A
Plant ID No.: 051-00205
Applicant: SWN Production Company, LLC
Facility Name: Fork Ridge Pad
Location: Moundsville, Marshall County
NAICS Code: 211111
Application Type: Modification
Received Date: December 9, 2015
Engineer Assigned: Caraline Griffith
Fee Amount: \$4,000.00
Date Received: \$1,500 (12/10/2015), \$2,500 (1/11/2016)
Complete Date: January 11, 2016
Due Date: February 26, 2016
Applicant Ad Date: December 8, 2015
Newspaper: *The Daily Echo* (Moundsville)
UTM's: Easting: 530.914 km Northing: 4,413.589 km Zone: 17S
Description: Install three (3) 1,380 hp Caterpillar G3516B compressor engines, revise storage tank emissions, and update combustor emissions.

DESCRIPTION OF PROCESS

The following process description was taken from Registration Application G70-A091:

The facility is an oil and natural gas exploration and production facility, responsible for the production of natural gas. Storage of condensate and produced water will also occur on site. Condensate, gas, and water come from the wellheads to the production units, where the first stage of separation occurs. Fluids (condensate and produced water) will be sent to the heater treaters. Flash gases from the heater treaters are captured via natural gas fired engine driven flash gas compressors. Produced water from the heater treaters flows into the 400-bbl produced water tanks. Condensate flows into the low pressure towers. Flash gases from the low pressure towers are routed via hard piping (with 100% capture efficiency) to the inlet of the flash gas compressors to be compressed.

Working, breathing, and flashing vapors from the condensate and produced water tanks will be routed to the vapor combustor with a 100% capture efficiency to be burned with at least 98% combustion efficiency. The vapor combustor has three (3) natural gas fired pilots to ensure a constant flame for combustion.

The natural gas stream from the gas production units is sent to the compressors and then will be routed to the dehydration unit before exiting the facility. In the dehydration process, gas passes through a contactor vessel where water is absorbed by the glycol. The "rich" glycol containing water goes to the glycol dehydrator reboiler where heat is used to boil off the water. Still vent vapors from the dehydration unit will be controlled by an air-cooled condenser. Non-condensables from the still column overheads are routed to the reboiler for combustion. It was conservatively assumed that the reboiler provides 50% destruction efficiency, as the burner on the reboiler is necessary to maintain the temperature and is inherent in the process; therefore, it is appropriate to use 50% efficiency with no monitoring required. The manufacturer guarantees a higher control efficiency. Flash tank off gas will be routed to the vapor combustor with 100% capture efficiency to be burned with at least 98% combustion efficiency.

SITE INSPECTION

A site inspection was conducted by Angela Carey of the DAQ Enforcement Section on August 14, 2015. Ms. Carey stated that the site is completed and ready for operation.

Latitude: 39.87151
Longitude: -80.638514

Directions to the proposed facility are as follows:

From the intersection of SR 250 and CR 2 in Moundsville, travel south on SR 250 for approximately 14.2 miles to the intersection of SR 250 and CR 17 (Fork Ridge Road). Turn right onto CR 17 and travel 3.6 miles to the well pad entrance on the right.



ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Emission increases associated with this modification application consist of the combustion emissions from the three (3) compressor engines (EU-ENG1, EU-ENG2, EU-ENG4).

The following table indicates which methodology was used in the emissions determination:

Emission Unit ID#	Process Equipment	Calculation Methodology
EU-ENG1	1,380 hp Caterpillar G3516B Compressor Engine ¹	Manufacturer's Data, EPA AP-42 Emission Factors
EU-ENG2	1,380 hp Caterpillar G3516B Compressor Engine ¹	Manufacturer's Data, EPA AP-42 Emission Factors
EU-ENG4	1,380 hp Caterpillar G3516B Compressor Engine ¹	Manufacturer's Data, EPA AP-42 Emission Factors

¹ Per Caterpillar, NMNEHC emission factor does not include formaldehyde, therefore, NMNEHC and formaldehyde factors have been added to arrive at total VOC. In addition, per AP-42, all PM from combustion of natural gas (total, condensable, and filterable PM) is presumed < 1 micrometer.

Fugitive emissions for the facility are based on calculation methodologies presented in the 2009 American Petroleum Institute Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry. The factors presented in the API Compendium are for methane emissions. Therefore, the fugitive VOC and HAP emissions were calculated using a representative gas analysis and the weight percent of each respective pollutant.

The following table indicates the control device efficiencies that are required for this facility:

Emission Unit	Pollutant	Control Device	Control Efficiency
EU-ENG1	Carbon Monoxide	CAT	70.00 %
EU-ENG2	Carbon Monoxide	CAT	70.00 %
EU-ENG4	Carbon Monoxide	CAT	70.00%

Unit ID	Unit Description	Pollutant	lb/hr	TPY
EU-ENG1	Caterpillar G3516B	NOx	3.04	13.32
		CO	2.68	11.74
		VOC	2.08	9.11
		SO2	0.01	0.03
		PM	0.10	0.44
		Formaldehyde	0.37	1.60
		Total HAPs	0.54	2.37
EU-ENG2	Caterpillar G3516B	NOx	3.04	13.32
		CO	2.68	11.74
		VOC	2.08	9.11
		SO2	0.01	0.03

		PM	0.10	0.44
		Formaldehyde	0.37	1.60
		Total HAPs	0.54	2.37
EU-ENG4	Caterpillar G3516B	NOx	3.04	13.32
		CO	2.68	11.74
		VOC	2.08	9.11
		SO2	0.01	0.03
		PM	0.10	0.44
		Formaldehyde	0.37	1.60
		Total HAPs	0.54	2.37

The Vapor Combustor (APC-COMB-TKLD) emissions increased slightly as follows:
 From 27.99 VOC (TPY) to 29.70 VOC (TPY); From 2.18 HAPs (TPY) to 2.29 HAPs (TPY).
 These increases to the vapor combustor are due to 100% of the captured vapors from the five (5) Produced Water Tanks and the five (5) Condensate Tanks being routed directly to the combustor, thus decreasing the immediate tank emissions to zero.

The total facility PTE for the Fork Ridge Pad is shown in the following table:

Pollutant	Facility Wide PTE G70-A091 (tons/year)	Facility Wide PTE G70-A091A (tons/year)	Change in PTE (tons/year)
Nitrogen Oxides	29.85	64.95	+35.10
Carbon Monoxide	51.27	79.52	+28.25
Volatile Organic Compounds	92.45	85.90	-6.55
Particulate Matter-10/2.5	1.23	4.19	+2.96
Sulfur Dioxide	0.04	0.11	+0.07
Formaldehyde	0.35	4.94	+4.59
Total HAPs	8.38	12.66	+4.28
Carbon Dioxide Equivalent	23,947	37,807	+13,860

REGULATORY APPLICABILITY

The following rules apply to the modification:

45CSR13 (Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation)

45CSR13 applies to this source due to the fact that Fork Ridge Pad is defined as a "stationary source" under 45CSR13 Section 2.24.b, which states that an owner or operator discharges or has the potential to discharge more than six (6) pounds per hour and ten (10) tons per year, or has the potential to discharge more than 144 pounds per calendar day of any regulated air pollutant. For Ridge Pad's nitrogen oxides (NO_x), carbon monoxide (CO) and volatile organic compounds (VOC) emissions exceed 45CSR13 permit thresholds. SWN has published the required Class I legal advertisement notifying the public of their permit application on December 8, 2015, and paid the appropriate application fee (modification).

45CSR22 (Air Quality Management Fee Program)

This facility is a minor source and not subject to 45CSR30. SWN is required to keep their Certificate to Operate current. SWN paid the \$500 modification fee, the \$1000 NSPS fee, and the \$2500 NESHAPs fee, resulting in a total fee of \$4000.

40CFR60 Subpart JJJJ (Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (SI ICE))

40CFR60.4230 states that a source that commenced construction after June 12, 2006 whose SI ICE was greater than 500 hp and was manufactured on or after July 1, 2007 is subject to this rule. Since the three (3) new engines (EU-ENG1, EU-ENG2, and EU-ENG4) meet these requirements (are new engines manufactured after July 1, 2007 and are over 500 hp (1,380 hp each)), they are subject to this rule.

Because these engines will not be certified by the manufacturer, SWN will be required to perform an initial performance test within 180 days from startup, and subsequent testing every 8,760 hours or 3 years, whichever comes first.

40CFR63 Subpart ZZZZ (National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines)

Subpart ZZZZ establishes national emission limitations and operating limitations for HAPs emitted from stationary RICE located at major and area sources of HAP emissions. This subpart also establishes requirements to demonstrate initial and continuous compliance with the emission limitations and operating limitations. The engines at the Fork Ridge Pad are subject to the area source requirements for non-emergency spark ignition engines.

The applicability requirements for 'new' four stroke lean burn (4SLB) stationary engines that are greater than or equal to 500 hp located at an area source of HAPs (EU-ENG1, EU-ENG2, EU-ENG4), SWN will be required to meet the requirements of 40CFR60 Subpart JJJJ.

Because these engines will not be certified by the manufacturer, SWN will be required to perform an initial performance test within 180 days from startup, and subsequent testing every 8,760 hours or 3 years, whichever comes first.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

The majority of non-criteria regulated pollutants fall under the definition of HAPs which, with some revision since, were 188 compounds identified under Section 112(b) of the Clean Air Act (CAA) as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects. The following table lists each HAP's carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)):

HAPs	Type	Known/Suspected Carcinogen	Classification
Formaldehyde	VOC	Yes	Category B1 - Probable Human Carcinogen
Benzene	VOC	Yes	Category A - Known Human Carcinogen
Ethylbenzene	VOC	No	Inadequate Data
Toluene	VOC	No	Inadequate Data
Xylenes	VOC	No	Inadequate Data

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health effects may be associated with a wide range of ambient concentrations and exposure times and are influenced by source-specific characteristics such as emission rates and local meteorological conditions. Health impacts are also dependent on multiple factors that affect variability in humans such as genetics, age, health status (e.g., the presence of pre-existing disease) and lifestyle. As stated previously, *there are no federal or state ambient air quality standards for these specific chemicals*. For a complete discussion of the known health effects of each compound refer to the IRIS database located at www.epa.gov/iris.

AIR QUALITY IMPACT ANALYSIS

Modeling was not required of this source due to the fact that the facility is not subject to 45CSR14 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants) as seen in the table listed in the Regulatory Discussion Section.

SOURCE AGGREGATION

“Building, structure, facility, or installation” is defined as all the pollutant emitting activities which belong to the same industrial grouping, are located on one or more contiguous and adjacent properties, and are under the control of the same person.

The Fork Ridge Pad is located in Marshall County and will be operated by SWN, who is partial owner and operator. Several different entities are involved in the production, gathering, and transmission of gas. The Operators are the parties who drill and operate the wells. The Shippers are the owners of the gas who may or may not be the same entity as the Operator. There are also parties who own and operate the gathering system pipelines and compression station, called Gatherers. In addition, there are parties that own and operate the gas processing plants.

1. The Fork Ridge Pad will operate under SIC code 1311 (Crude Petroleum and Natural Gas Extraction). There are surrounding wells and compressor stations operated by SWN that share the same two-digit major SIC code of 13 for oil and gas exploration and production. Therefore, the Fork Ridge Pad does share the same SIC code as the wells and surrounding compressor stations.
2. “Contiguous or Adjacent” determinations are made on a case by case basis. These determinations are proximity based, and it is important to focus on this and whether or not it meets the common sense notion of a plant. The terms “contiguous” or “adjacent” are not defined by USEPA. Contiguous has a dictionary definition of being in actual contact; touching along a boundary or at a point. Adjacent has a dictionary definition of not distant; nearby; having a common endpoint or border.

There are no SWN facilities that are contiguous or adjacent with the Fork Ridge Pad. Additionally, there are no co-located facilities with the Fork Ridge Pad.

3. There are other wells and compressor stations that are under common control of SWN.

Because the facilities are not considered to be on contiguous or adjacent properties, the emissions from the Fork Ridge Pad should not be aggregated with other facilities in determining major source or PSD status.

MONITORING OF OPERATIONS

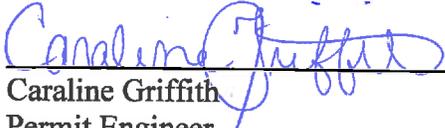
SWN will be required to perform the following monitoring and recordkeeping associated with this permit (Taken from the original permit evaluation, G70-A091):

- Monitor and record quantity of natural gas consumed for all engines, and combustion sources.
- Monitor all applicable requirements of 40CFR60 Subparts JJJJ and OOOO, and 40CFR63 Subparts HH and ZZZZ.
- Monitor and record the operating hours of the vapor combustor.

- Monitor the presence of the flare pilot flames using a thermocouple or any other equivalent device to detect the presence of a flame at the vapor combustor.
- Monitor and record the actual average flowrate of natural gas to the glycol dehydration unit to demonstrate a continuous exemption status.
- Maintain records of testing conducted in accordance with the permit.
- Maintain records of the visible emission opacity tests conducted per the permit.
- Maintain a record of all potential to emit (PTE) HAP calculations for the entire facility. These records shall include the natural gas compressor engines and ancillary equipment.
- Monitor the tanks to ensure that the tanks vapors will be sent to vapor combustor.
- Monitor the condensate truck loading to ensure that vapor return/combustion is used.
- The records shall be maintained on site or in a readily available off-site location maintained by SWN for a period of five (5) years.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates SWN's Fork Ridge Pad meets all the requirements of applicable regulations. Therefore, it is recommended that the Marshall County location be granted the modification permit registration G70-A091A.



Caraline Griffith
Permit Engineer

1/14/16

Date