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GENERAL PERMIT REGISTRATION APPLICATION
ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Registration No.: G35-A047D
Plant ID No.: 005-00083
Applicant: Cranberry Pipeline Corporation (c/o Cabot Oil and Gas Corporation)
Facility Name: Hamon Compressor Station
Location: Sylvester, Boone County
SIC Code: 1311
NAICS Code: 211111
Application Type: Modification
Received Date: September 23, 2015
Engineer Assigned: Thornton E. Martin Jr.
Fee Amount: \$3,000
Date Received: September 24, 2015
Complete Date: October 27, 2015
Applicant Ad Date: October 07, 2015
Newspaper: The Coal Valley News
UTM's: Easting: 452.278 km Northing: 4208.096 km Zone: 17
Description: This modification is to reflect the facility's adjusted emission levels from the dehydration unit still vent based on the most recent wet gas analysis taken on May 29, 2014. The sources Potential to Emit (PTE) has been adjusted and new emission limits are proposed so that the facility remains within permitted throughput constraints.

TYPE OF PROCESS

The Hamon Compressor Station was originally permitted on December 05, 2003 under registration G30-A054. The equipment included in this application is as follows:

Table with 4 columns: Emission Unit ID, Emission Unit Description (Make, Model, Serial No.), Year Installed, Design Capacity. Rows include CE-1, RBV-1, RSV-1, and T01.

Natural gas enters the compressor station via pipelines at relatively low pressure. Natural gas fired engines power compressors that compress the gas to higher pressure. The products of combustion from

the engines are vented through exhaust stacks to the atmosphere. Excess liquids are removed before the gas is dehydrated. After compression, the wet gas is transferred to a triethylene glycol (TEG) dehydration unit. The triethylene glycol dehydration unit removes excess water from the natural gas stream prior to being transferred to customers. Pipeline quality natural gas has a moisture content of 7 pounds per million standard cubic feet. The TEG attracts and removes the water from the natural gas. The result is a small amount of pipeline fluids collected in a storage tank. The material is predominantly water, but it may contain small amounts of oils and other petroleum based compounds. TEG that is saturated with water is called rich TEG. During the absorption process, aromatic hydrocarbons including benzene, toluene, ethylbenzene and xylene (BTEX), hexane as well as other VOCs and HAPs are present in the gas stream are absorbed along with the water vapor into the glycol stream. The rich TEG is heated through the glycol still reboiler where the water is boiled off as well as other liquid hydrocarbons through the still vent. Once the water has been removed from the TEG, it is called lean TEG. The lean TEG is recirculated through the unit where the process begins again.

The reboiler has an exhaust stack where the by-products of natural gas combustion are vented. The TEG dehydration unit still vent emits volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) depending on the concentration of the constituents in the processed wet gas.

Modification (G35-A047D)

The recent wet gas analysis from the Hamon Compressor Station taken on May 29, 2014 indicate that a G35-A General Permit Modification is required to reflect the facility's adjusted emission levels from the dehydration unit still vent.

The new emission estimates show the need to increase the VOC and Xylene levels only. It is proposed to preserve the limits on all other pollutants to account for future variability such as that which the original permit was based. The changes to the emissions were a result of increases to the Xylene and C8+ gas fractions measured within the wet gas inlet to the contactor column.

All other operating parameters on the dehydration unit were set to its' maximum capacity. The lean TEG is recirculated through the unit by a gas-driven Kimray TEG pump, model 9015 PV. The pump has a maximum pump rate of 1.5 GPM. The gas throughput was modeled to reflect the stations maximum flow of 5 MMscf/d. Additionally, the inlet water content was assumed to be saturated at 350 psig and 100 °F. The outlet is assumed to be pipeline quality NG at 7 lb H₂O/MMscf. This equates to a TEG recirculation ratio of 3.35 gal TEG/lb H₂O removed from the wet gas so, this scenario appears to be within the units design specifications and very close to the optimum recycle ratio of 3.

Pipeline liquids and produced water is separated at the station's inlet and dehy separators as well as 'compression drip' which is removed in the compression process are all by-products of the Hamon Compressor Station's process and are transferred through various operations to a single above ground storage tank (AST) represented in the equipment table as "Pipeline liquids Tank", T01. The flashing emissions from the transfer of "compression drip" in addition to tank working and breathing losses have been included within this application to better represent the storage vessel's PTE. Then emission estimates for the tank are based on direct measurement pressurized liquid testing and E&P Tanks simulation analysis taken at a representative Cranberry Pipeline site. The throughput was based on a maximum of 5 bbl/d.

As a result of this proposed permit revision, the tank, flashing potential, loading losses and fugitive equipment leaks will be more accurately accounted for along with the new assessment of dehydration emissions based on updated gas measurement. This provides a conservative estimate of potential emissions. These proposed limits do not trigger any additional permit levels.

DESCRIPTION OF FUGITIVE EMISSIONS

Fugitive emissions consist of those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Fugitive leaks are leaks from sealed surfaces associated with process equipment.

Equipment specific to the gas production and processing operation, which result in fugitive emissions includes equipment such as separators, pipelines and pumps. Pneumatic devices such as gas actuated pumps and pressure/level controllers also result in fugitive emissions. Fugitive emissions may also result from process upsets such as pressure relief device releases due to over-pressure. Other process-related sources of emissions include fugitive emissions from flanges, valves, connectors, fittings and emissions from routine maintenance activities involving equipment depressurization (blowdown) or complete purging and filter replacement.

The amount of gas vented by pressure and level controllers is dependent on the manufacturer, application, age and orifice size. In general, controllers in liquid service have larger orifices than those in pressure service. Valves in liquid service are designed to quickly open or close to avoid throttling which can erode the valve seat and reduce the life of the valve. Emissions from gas actuated pumps will be impacted by the gas composition, fuel supply pressure, discharge head (pressure) and the flow rate of the liquid pumped. Factors affecting blowdown emissions include maintenance schedules, line pressures and the volume of gas relieved. More frequent maintenance results in more frequent gas relief.

Fugitive emissions typically may emanate from some or all of the following:

- Storage tanks
- Emergency and process vents
- Gas actuated pumps
- Loading losses (storage tank to tanker truck)
- Pneumatic devices
- Blowdown and blowout
- Equipment leaks (connectors, flanges, open ended lines and valves)

SITE INSPECTION

A site inspection was conducted on June 17, 2010 by Andy Grimm of DAQ Enforcement Section. The registrant was operating in compliance at that time.

Directions as given in the permit application are as follows:

Hamon Compressor Station is situated 1.0 mile northeast of Sylvester. From Sylvester go north on SR-3 for 4.9 miles, then turn right onto CR-14 (Upper White Oak Road) for 3.0 miles. Turn right on local Hamon Road for 0.03 miles.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Emissions from still vent RSV-1 was estimated using GRI-GLYCalc 4.0. Emissions for Engine CE-1 were estimated with engine manufacturer emission factors and AP-42 emission factors. Air emissions for RBV-1 were estimated with AP-42 emission factors. Storage vessel and tank truck loading emissions have been included for the first time with this modification.

The new gas analysis (May 29, 2014) for source emissions from Cranberrys' Hamon Compressor Station are summarized in the tables below.

Gas Analysis – Criteria PTE									
Source	PM	PM ₁₀	PM _{2.5}	SO ₂	NO _x	CO	VOC	HAPs	CO _{2e}
Engine – CE-1 (ton/yr)	0.195	0.195	0.195	0.012	36.152	5.006	6.118	2.135	2304.364
Reboiler – RBV-1 (ton/yr)	0.009	0.009	0.009	0.001	0.113	0.095	0.006	0.002	128.054
Dehys – RSV-1 (ton/yr)	--	--	--	--	--	--	44.800	14.007	859.685
Storage Tank – T01 (ton/yr)							0.319		
Truck Loading (ton/yr)							0.140		
Fugitives (ton/yr)	--	--	--	--	--	--	4.081	--	94.885
Total Emission (ton/yr)	0.204	0.204	0.204	0.012	36.265	5.101	55.464	16.144	3386.988
Total Emissions (lb/day)	1.116	1.116	1.116	0.067	198.714	27.948	303.918	88.461	18558.839
Total Emissions (lb/hr)	0.047	0.047	0.047	0.002	8.280	1.165	12.663	3.686	773.285

Gas Analysis – HAP's PTE						
Source	Benzene	Ethylbenzene	Toluene	Xylene	n-Hexane	Formaldehyde
Engine – CE-1 (ton/yr)	0.038	0.000	0.019	0.005	0.000	1.669
Reboiler – RBV-1 (ton/yr)	0.000	0.000	0.000	0.000	0.000	0.000
Dehys – RSV-1 (ton/yr)	0.525	1.427	1.813	9.846	0.396	0.000
Storage Tank – T01 (ton/yr)	0.000	0.000	0.000	0.000	0.000	0.000
Total Emission (ton/yr)	0.563	1.427	1.832	9.851	0.396	1.669
Total Emissions (lb/day)	3.086	7.820	10.038	53.980	2.170	0.090
Total Emissions (lb/hr)	0.129	0.326	0.418	2.249	0.090	0.004

Although the new gas analysis shows a decrease in the HAP from the Dehy Still Vent, the operator is requesting the current emission limit be left in place in anticipation of changing gas concentrations in the future. The following table represents the previously permitted levels, differences found from the most recent gas analysis and the proposed emission levels:

Pollutant	PREVIOUS		Difference based on Gas Analysis		PROPOSED	
	Hourly Emissions (lb/hr)	Annual Emissions (tpy)	Hourly Emissions (lb/hr)	Annual Emissions (tpy)	Hourly Emissions (lb/hr)	Annual Emissions (tpy)
VOC	1.203	5.194	11.46	50.270	12.67	55.43
Benzene	0.109	0.562	0.02	0.001	0.109	0.562
Ethylbenzene	0.272	1.429	0.054	-0.002	0.272	1.429
Toluene	0.351	1.831	0.067	0.001	0.351	1.831
Xylenes	0.668	3.508	1.581	6.343	2.25	9.86
n-Hexane	0.078	0.406	0.012	-0.01	0.078	0.406
Formaldehyde	0.397	1.737	-0.393	-0.068	0.397	1.737
NO _x	8.615	37.733	-0.335	-1.468	8.615	37.733
PM _{2.5}	0.213	0.931	-0.166	-0.727	0.213	0.931
PM ₁₀	0.213	0.931	-0.166	-0.727	0.213	0.931
SO ₂	0.003	0.012	-0.001	0	0.003	0.012
CO	1.210	5.300	-0.045	-0.199	1.210	5.300
TOTAL	12.129	54.38	12.088	53.415	12.129	54.38
CO _{2e}	576.83	2,526.51	196.455	860.478	576.83	2,526.51

REGULATORY APPLICABILITY

PSD has no applicability to the proposed facility. The proposed modification of a natural gas compressor station is subject to the following state and federal rules:

45CSR2 To Prevent and Control Particulate Air Pollution From Combustion of Fuel in Indirect Heat Exchangers

45CSR2 establishes emission limitations for smoke and particulate matter which are discharged from fuel burning units. All fuel burning units will be subject to the weight emission standard for particulate matter set forth in 45CSR2. Each registrant is also subject to all applicable opacity requirements set forth in 45CSR2 Section 3.2.

Each substantive 45CSR2 requirement for the reboiler is discussed below.

45CSR2 Opacity Standard - Section 3.1

Pursuant to 45CSR2, Section 3.1, the reboiler is subject to an opacity limit of 10%. Proper maintenance and operation of the reboiler (and the primary use of natural gas) should keep the opacity of the units well below 10% during normal operations.

45CSR2 Weight Emission Standard - Section 4.1.b

The allowable particulate matter (PM) emission rate for the reboiler, identified as Type "b" fuel burning unit, per 45CSR2, Section 4.1.a, is the product of 0.09 and the total design heat input of the reboiler in million Btu per hour. The maximum design heat input of the reboiler will be 0.25 mmBtu/Hr. Using the above equation, the 45CSR2 facility-wide PM emission limit of the reboiler will be 0.023 lb/hr. The maximum potential hourly PM emissions during normal operations (firing natural gas) from the reboiler is estimated to be 0.009 lb/hr. This emission rate is 39% of the 45CSR2 limit.

45CSR4 To Prevent and Control the Discharge of Air Pollutants into the Open Air which Causes or Contributes to an Objectionable Odor or Odors

45CSR4 states that an objectionable odor is an odor that is deemed objectionable when in the opinion of a duly authorized representative of the Air Pollution Control Commission (Division of Air Quality), based upon their investigations and complaints, such odor is objectionable. All facilities are inspected by the DAQ Enforcement Section.

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

The Applicant has applied for a permit to modify based on increased emission levels for the facility as determined by the most recent wet gas analysis according to the requirements defined under §45-13-5.13

The applicant published a Class I legal advertisement in *The Coal Valley News* on October 7, 2015.

45CSR22 *Air Quality Management Fee Program*

45CSR22 applies to all registrants which are minor sources and no NSPS applies. The affected registrants will be subject to the fee schedule set forth in 45CSR22. They are also required to keep their Certificate to Operate status current.

The proposed modification and operation of this facility should meet the eligibility, siting, limitations, and emissions controls as specified in General Permit G35-A.

The following rules and regulations do not apply to the facility:

40CFR60 Subpart JJJ 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 manufactured on or after January 1, 2008, for lean burn engines with a maximum engine power greater than or equal to 500 HP and less than 1,350 HP is subject to this regulation. Engine CE-1 based on engine manufacture date (2003) is not subject to this regulation.

40 CFR 63 Subpart HH National Emission Standards for Hazardous Air Pollutants From Oil and Natural Gas Production Facilities

On June 1, 2013 the DAQ took delegation of the area source provisions of 40 CFR 63, Subpart HH. This facility is a natural gas production facility that processes, upgrades, or stores natural gas prior to transmission. This facility is an area source of HAPs refer to the previous facility wide emissions table.

Pursuant to §63.760(b)(2), each glycol dehydration unit (GDU) located at an area source that meets the requirements under §63.760(a)(3) is defined as an affected facility under Subpart HH. The requirements for affected sources at area sources are given under §63.764(d). However, for a GDU, exemptions to these requirements are given under

§63.764(e)(2) "actual average emissions of benzene from the glycol dehydration unit process vent to the atmosphere are less than 0.90 megagram [1 TPY] per year."

The maximum PTE of benzene emissions from the GDU process vent (RSV-1) is 0.525 TPY. Therefore, the GDU is exempt from the Subpart HH requirements given under §63.764(d).

40CFR63 Subpart HHH National Emission Standards for Hazardous Air Pollutants: Natural Gas Transmission and Storage

These promulgated national emission standards for hazardous air pollutants (NESHAP) limit emissions of hazardous air pollutants (HAP) from oil and natural gas production and natural gas transmission and storage facilities.

The Hamon Compressor Station is exempt from the requirements of this Subpart because of the annual average flow of gas exemption of 10 mmscf/day.

40CFR63 *Subpart ZZZZ—National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*

Cranberry is not subject to 40CFR63 Subpart ZZZZ, National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines because the date constructed for the existing 2SLB engine at an area source is before June 12, 2006.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

Small amounts of non-criteria regulated hazardous or toxic air pollutants such as benzene, ethylbenzene, toluene, xylenes and formaldehyde may be emitted when natural gas is combusted in reciprocating engines. Total non-criteria regulated hazardous/toxic air pollutant emissions are tabulated for each registered natural gas compressor station in the Class II General Permit Registration Application. A toxicity analysis will be performed when the Director finds existing circumstances and/or submitted data provide cause for an assessment to be made concerning whether a specific natural gas compressor station may interfere with attainment or maintenance of an applicable ambient air quality standard or cause or contribute to degradation of public health and welfare. Any natural gas compressor station granted Class II General Permit registration by the Director shall not have a potential to emit of 10 tons per year of any hazardous/toxic pollutant or 25 tons per year of any combination of hazardous/toxic pollutants.

AIR QUALITY IMPACT ANALYSIS

Air dispersion modeling will be performed when the Director finds existing circumstances and/or submitted data provide cause for an assessment to be made concerning whether a specific natural gas compressor station may interfere with attainment or maintenance of an applicable ambient air quality standard or cause or contribute to a violation of an applicable air quality increment from any proposed Class II General Permit registration action. Factors to be considered when determining whether an ambient air assessment would be made include:

- a. Existing air quality of the area
- b. Topographic or meteorological factors
- c. Maximum emissions
- d. Siting criteria

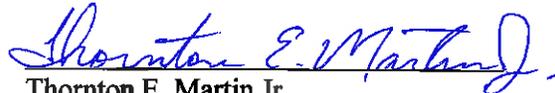
Air dispersion modeling was not performed due to the size and location of this facility. This facility will be located in Boone County, WV, which is currently in attainment for PM (particulate matter), PM₁₀ (particulate matter less than 10 microns in diameter) and PM_{2.5} (particulate matter less than 2.5 microns in diameter).

GENERAL PERMIT ELIGIBILITY

The proposed modification and operation of this facility meets the eligibility, siting, limitations, and emissions controls as specified in General Permit G35-A. Cranberry is not subject to 40CFR60 Subpart JJJJ, Standards of Performance for Stationary Spark Ignition Internal Combustion Engines.

RECOMMENDATION TO DIRECTOR

Cranberry's request to modify a natural gas compressor station at the Sylvester, Boone County, WV site meets the requirements of General Permit G35-A and all applicable rules and regulations and therefore should be granted a General Permit Registration to modify and operate the said facility.



Thornton E. Martin Jr.
Permit Engineer

October 27, 2015 _____

Date