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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.: R13-3262
Plant ID No.: 051-00165
Applicant: Williams Ohio Valley Midstream LLC
Facility Name: Neehouse Compressor Station
Location: Marshall County
NAICS Code: 213112
Application Type: Construction
Received Date: July 31, 2015
Engineer Assigned: Steven R. Pursley, PE
Fee Amount: \$3,500.00
Date Received: August 7, 2015
Complete Date: August 28, 2015
Due Date: November 25, 2015
Applicant Ad Date: July 30, 2015
Newspaper: *Moundsville Daily Echo*
UTM's: Easting: 536.42 Northing: 4,418.82 Zone: 17
Description: Application to install a produced water tank and increase the Dehy glycol recirculation rate at an existing but unpermitted facility.

DESCRIPTION OF PROCESS

Williams Ohio Valley Midstream (OVM) has submitted a permit application for the modification of an existing but unpermitted 5 mmscf/day triethylene glycol (TEG) GDU located approximately 0.4 miles north-northeast of 236 Wolf Run Rd, Cameron, Marshall County, WV. The facility began operation in 2013. According to information submitted to WVDAQ, and reviewed by James Jarrett of the Compliance and Enforcement Section, in October of 2014, emissions from the existing facility were less than permitting thresholds. However, with this modification, emissions will exceed 6 pounds per hour and 10 tons per year of VOCs (additionally, HAP emissions will exceed 5 tons per year).

The modification includes the installation of a 210 bbl produced water tank. Additionally, Williams is proposing to increase the dehydration unit glycol circulation rate from 0.67 gpm to 1.5 gpm.

One natural gas fueled compressor engine is utilized at the facility. The lean-burn engine drives a natural gas compressor to increase the pressure of the natural gas.

One triethylene glycol dehydrator is utilized at the facility. The dehydrator is comprised of a contactor/absorber tower and a regenerator/still vent. The dehydrator is

used to remove water vapor from the inlet wet gas stream to meet pipeline specifications. In the dehydration process, the wet inlet gas stream flows through a contactor tower where the gas is contacted with lean glycol. The lean glycol absorbs the water in the gas stream and becomes rich glycol laden with water and trace amounts of hydrocarbons. The rich glycol is then sent to the regenerator/still where the TEG is heated to drive off the water vapor and any remaining hydrocarbons. Once boiled, the glycol is returned to a lean state and used again in the process. A reboiler is utilized to supply the heat for the regenerator/still vent.

The new produced water tank will receive liquid from the dehydrator and inlet separator. Liquids removed through the dehydration process are cooled, condensed and sent to the tank. The inlet separator removes produced fluids and these liquids are also sent to the tank. This produced water will be removed from the tank by truck.

SITE INSPECTION

On October 9, 2014, Mr. James Jarrett of the DAQ Compliance/Enforcement Section conducted an inspection of the Neehouse facility. The facility is located at the end of an access road just off of Wolf Run Road near Cameron, Marshall County. The location is fairly rural in nature, with the nearest occupied residence located approximately (as based on Google Earth) 0.5 miles to the south along Wolf Run Road. Attached is a picture of the facility taken on October 9, 2014.



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ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Glycol Regenerator Column/GDU Flash Tank Emissions

Uncontrolled VOC and Hazardous Air Pollutant (HAP) emissions from the glycol regenerator are based on the emissions calculation program GRI-GLYCalc Version 4.0. GRI-GLYCalc is a well-known program for estimating air emissions from glycol units using TEG. Included in the application is a copy of the appropriate GLY-Calc analysis sheets. A site-specific gas analysis taken on June 27, 2014 was used to provide inputs to GLY-Calc and was included in the permit application. A 50% flash tank recycle rate was used in the calculations.

Reboiler Exhaust Emissions

Combustion exhaust emissions from the 0.14 mmBtu/hr reboiler were based on the emission factors provided for natural gas combustion as given in AP-42 Section 1.4. (AP-42 is a database of emission factors maintained by USEPA). Hourly emissions were based on the maximum design heat input (MDHI) of the unit (0.14 mmBtu/hr) and annual emissions were based on an annual operation of 8,760 hours. A natural gas heat content value of 1,020 Btu/ft³ was used in the calculations.

Storage Tanks

Air emissions from produced water storage tank were based on VOC/HAP emission factors taken from the document EPA-450/3-85-001a – "Volatile Organic Compound Emissions from Petroleum Refinery Wastewater Systems - Background Information for Proposed Standards" (for working/breathing losses) and based on ProMax Simulation Software. ProMax software is chemical process simulator for design and modeling of amine gas treating, glycol dehydration units, and other natural gas components. Based on a detailed input gas analysis and the components of the facility, the software can simulate and model the inputs and outputs of a facility. It is noted that any VOC/HAP emissions from produced water storage tanks is expected to be minimal as these constituents are not expected to be present in large percentages.

Truck Loadout

Air emissions from produced water truck loading operations occur as fugitive emissions generated by displacement of vapors when loading trucks. The emission factor used to generate the VOC emissions is based on Equation (1) of AP-42 Section 5.2-1. In this equation, OVM used variables specific to the liquids loaded and to the method of loading - in this case "splash loading." Additionally, worst-case annual emissions were based on a maximum loading rate of 106,000 gal/year of produced-water. As no maximum hourly pumping rate was provided, hourly emissions were based on 100 hours of loading per year. It is noted that any VOC/HAP emissions from a produced water loadout is expected to be minimal as these constituents are not expected to be present in large percentages.

Fugitives

OVM based their fugitive equipment leak calculations on emission factors taken from the document EPA-453/R-95-017 - "Protocol for Equipment Leak Emission Estimates." Emission factors were taken from Table 2-4.

Compressor Engine

The engine is a 203 hp, natural gas fired Caterpillar model G3306TA engine. Emissions of CO, NO_x, formaldehyde and NMNEHCs were based on vendor guarantees. VOC emissions were assumed to equal formaldehyde +NMNEHC. SO₂, PM/PM₁₀/PM_{2.5} and hall HAPs (except formaldehyde) were based on AP-42 Chapter 3. Rod packing leaks and crankcase emissions were based on manufacturers data. Blowdown emissions are based on an engineering estimate of 6.22 scf of gas per bhp per event. Hourly emissions for blowdowns/startups were based on 208 events per year.

Emissions Summary

The aggregate emissions associated with the Neehouse Dehydration Station is given in the following tables:

Facility-Wide Aggregate Hourly (lb/hr) PTE Summary

Source	CO	NO _x	PM/PM _{2.5}	SO ₂	VOCs	HAPs
GDU Still Vent	0.00	0.00	0.00	0.00	10.71	1.58
Reboiler	0.01	0.01	~0.00	~0.00	~0.00	~0.00
Storage Tank	0.00	0.00	0.00	0.00	0.02	<0.01
Truck Loadout	0.00	0.00	0.00	0.00	1.60	0.60
Compressor Engine	0.89	0.89	0.04	~0.00	0.14	0.07
CE Rod Packing/Crankcase	0.00	0.00	0.00	0.00	0.54	0.01
Blowdown	0.00	0.00	0.00	0.00	23.75	0.29
Equipment Leaks	0.00	0.00	0.00	0.00	2.15	0.24
Facility-Wide Totals →	0.90	0.90	0.04	0.00	38.91	2.80

Facility-Wide Aggregate Annual (tpy) PTE Summary

Source	CO	NO _x	PM/PM _{2.5}	SO ₂	VOCs	HAPs
GDU Still Vent	0.00	0.00	0.00	0.00	46.92	6.93
Reboiler	0.05	0.06	~0.00	~0.00	~0.00	~0.00
Storage Tank	0.00	0.00	0.00	0.00	0.13	0.02
Truck Loadout	0.00	0.00	0.00	0.00	0.08	0.03
Compressor Engine	3.90	3.90	0.15	~0.00	0.61	0.29
CE Rod Packing/Crankcase	0.00	0.00	0.00	0.00	2.37	0.06
Blowdown	0.00	0.00	0.00	0.00	2.47	0.03
Equipment Leaks	0.00	0.00	0.00	0.00	9.42	1.03
Facility-Wide Totals →	3.95	3.96	0.15	0.00	62.00	8.39

REGULATORY APPLICABILITY

This section will address the potential regulatory applicability/non-applicability of substantive state and federal air quality rules relevant to the Neehouse Compressor Station.

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

The GDU Reboiler has been determined to meet the definition of a "fuel burning unit" under 45CSR2 and is, therefore, subject to the applicable requirements therein. However, pursuant to the exemption given under §45-2-11, as the MDHI of the GDU Reboiler is less than 10 mmBtu/hr, the unit is not subject to sections 4, 5, 6, 8 and 9 of 45CSR2. The only remaining substantive requirement is under Section 3.1 - Visible Emissions Standards.

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 use of natural gas as fuel) should keep the opacity of the unit well below 10% during normal operations.

45CSR10: To Prevent and Control Air Pollution from the Emission of Sulfur Oxides (NON APPLICABILITY)

45CSR10 has requirements limiting SO₂ emissions from "fuel burning units," limiting in-stack SO₂ concentrations of "manufacturing processes," and limiting H₂S concentrations in process gas streams. The only potential applicability of 45CSR10 to the Neehouse Compressor Station is the limitations on fuel burning units. The GDU Reboiler has been determined to meet the definition of a "fuel burning unit" under 45CSR10. However, pursuant to the exemption given under §45-10-10.1, as the MDHI of the GDU Reboiler is less than 10 mmBtu/hr, the unit is not subject to the limitations on fuel burning units under 45CSR10.

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 Neehouse Compressor Station has a maximum emission rate of a regulated pollutant (VOCs in this case) in excess of six (6) lbs/hour and ten (10) and, therefore, pursuant to §45-13-2.24, the facility is defined as a "stationary source" under 45CSR13. Pursuant to §45-13-5.1, "[n]o person shall cause, suffer, allow or permit the construction . . . and operation of any stationary source to be commenced without . . . obtaining a permit to construct." Therefore, OVM is required to obtain a permit under 45CSR13 for the construction and operation of the natural gas production facility.

As required under §45-13-8.3 ("Notice Level A"), OVM placed a Class I legal advertisement in a "newspaper of general circulation in the area where the source is . . . located." The ad ran on July 30, 2015 in the Moundsville Daily Echo and the affidavit of publication for this legal advertisement was submitted on August 6, 2015.

Potential Source Aggregation

Classifying multiple facilities as one "stationary source" under 45CSR13, 45CSR14, and 45CSR19 is based on the definition of "Building, structure, facility, or installation" as given in §45-14-2.13 and §45-19-2.12. The definition states:

"Building, Structure, Facility, or Installation" means all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control). Pollutant-emitting activities are a part of the same industrial grouping if they belong to the same "Major Group" (i.e., which have the same two (2)-digit code) as described in the Standard Industrial Classification Manual, 1987 (United States Government Printing Office stock number GPO 1987 0-185-718:QL 3).

The Neehouse Compressor Station is co-located on a site with a well-pad (and associated production facility) owned and operated by Chevron Appalachia, LLC. The application included an analysis of a potential "one-source" classification of the existing well-pad and the dehydration station. The Williams' analysis, determined to be reasonable by the DAQ, indicates that while the two facilities do belong to the same industrial grouping and are located on one or more contiguous or adjacent properties, the facilities are not under control of the same person (or persons under common control).

45CSR14: 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 (NON APPLICABILITY)

The facility-wide PTE of the Neehouse Compressor Station is below the levels that would define the source as "major" under 45CSR14 and, therefore, the construction evaluated herein is not subject to the provisions of 45CSR14.

45CSR30: Requirements for Operating Permits - (NON APPLICABILITY)

45CSR30 provides for the establishment of a comprehensive air quality permitting system consistent with the requirements of Title V of the Clean Air Act. The facility does not meet the definition of a "major source under § 112 of the Clean Air Act" as outlined under §45-30-2.26 and clarified (fugitive policy) under 45CSR30b. Therefore, the Neehouse Compressor Station is not subject to 45CSR30. However, as the facility is subject to a Maximum Achievable Control Technology (MACT) rule - 40 CFR 63, Subpart HH - the facility would, in most cases, be subject to Title V as a "deferred source." Pursuant to §63.760(h), as a non-major "area source," OVM is not required to obtain a Title V permit for the proposed facility. Therefore, the Neehouse Compressor Station is not subject to 45CSR30.

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. Pursuant to §63.760(a)(3), as the Neehouse Compressor Station - an area source of HAPs - "process[es], upgrade[s], or store[s] natural gas prior to the point at which natural gas enters the natural gas transmission and storage source category or is delivered to a final end user," it is defined as an area source subject to the applicable provisions under Subpart HH.

Pursuant to §63.760(b)(2), each TEG 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): if (1) "actual annual average flowrate of natural gas to the glycol dehydration unit is less than 85 thousand standard cubic meters [3 mmscf/day] per day" or (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."

Pursuant to information in the permit application, the maximum aggregate PTE of benzene emissions from the GDU process vent is 0.56 TPY. Therefore, the GDU is exempt from the Subpart HH requirements given under §63.764(d).

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

Because the engine was constructed after June 6, 2006 it is a new engine under Subpart ZZZZ. Therefore, to comply with ZZZZ the engine need only comply with 40 CFR 60 Subpart JJJJ. However, as can be seen below, there are no requirements in JJJJ applicable to the engine.

40 CFR 60, Subpart JJJJ: Standards of Performance for Stationary Spark Ignition Internal Combustion Engines - (NON APPLICABILITY)

The compressor engine is not subject to Subpart JJJJ because it is a spark ignition engine less than 500 hp and was manufactured before July 1, 2008.

40 CFR 60, Subpart OOOO: Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution - (NON APPLICABILITY)

The Neehouse Compressor Station does not include any gas wells, compressor engines manufactured after August 23, 2011 (the compressor engine was manufactured in July of 2007), pneumatic controllers with a bleed rate of ≥ 6 scfh, or storage tanks with a PTE of 6 TPY. Therefore, the facility is not subject to any substantive provision of 40 CFR 60, Subpart OOOO.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

This section provides an analysis for those regulated pollutants that may be emitted from the Neehouse Compressor Station and that are not classified as "criteria pollutants." Criteria pollutants are defined as Carbon Monoxide (CO), Lead (Pb), Oxides of Nitrogen (NOx), Ozone, Particulate Matter (PM), Particulate Matter less than 10 microns (PM10), Particulate Matter less than 2.5 microns (PM2.5), and Sulfur Dioxide (SO2). These pollutants (with the exception of PM) have National Ambient Air Quality Standards (NAAQS) set for each that are designed to protect the public health and welfare. Other pollutants of concern, although designated as non-criteria and without national concentration standards, are regulated through various federal and programs designed to limit their emissions and public exposure. These programs include federal source-specific Hazardous Air Pollutants (HAPs) limits promulgated under 40 CFR 61 (NESHAPS) and 40 CFR 63 (MACT). Any potential applicability to these programs were discussed above under REGULATORY APPLICABILITY.

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 Neehouse Compressor Station has the potential to emit the following HAPs in substantive amounts: Formaldehyde, Methanol, 2,2,4-TMP, n-Hexane, Benzene, Toluene, Ethyl-benzene, and Xylene. 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
n-Hexane	VOC	No	Inadequate Data
Benzene	VOC	Yes	Category A - Known Human Carcinogen
Toluene	VOC	No	Inadequate Data
Ethyl-benzene	VOC	No	Category D - Not Classifiable
Formaldehyde	VOC	Yes	B1 - Probable Human Carcinogen
Methanol	VOC	No	Inadequate Data
2,2,4-TMP	VOC	No	Inadequate Data
Xylene	VOC	No	Inadequate Data

AIR QUALITY IMPACT ANALYSIS

The construction does not meet the definition of a "major stationary source" pursuant to 45CSR14 and, therefore, an air quality impact (computer modeling) analysis was not required. Additionally, based on the nature of the construction, modeling was not required under 45CSR13, Section 7.

MONITORING OF OPERATIONS

The following substantive monitoring, compliance demonstration, reporting, and record-keeping requirements (MRR) shall be required:

- * For the purposes of demonstrating compliance with the maximum dry gas throughput limit set forth in 4.1.2(a) of the draft permit, OVM shall be required to monitor and maintain monthly and rolling twelve month records of the dry gas throughput of the Glycol Dehydration Unit.
- * Compliance with the Maximum Glycol Recirculation Limitation set forth in 4.1.2(b) of the draft permit shall be determined using an average of a minimum of quarterly readings of the actual glycol pump(s) rate. If more than one pump is operating simultaneously then the rate of each operating pump shall be recorded and totaled for compliance purposes.
- * For the purposes of demonstrating compliance with visible emissions limitations set forth in 4.1.3(d) of the draft permit, OVM shall be required to, at such reasonable times as the Secretary may designate, conduct Method 9 emission observations. Method 9 shall be conducted in accordance with 40 CFR 60 Appendix A.
- * For the purposes of demonstrating compliance with the maximum truck loadout limits set forth in 4.1.4 of the draft permit, OVM shall be required to monitor and record the monthly and rolling twelve month amount of produced water loaded into trucks.

- * The permittee shall regularly inspect, properly maintain and/or replace catalytic reduction devices and auxiliary air pollution control devices to ensure functional and effective operation of the engine's physical and operational design. The permittee shall ensure proper operation, maintenance and performance of catalytic reduction devices and auxiliary air pollution control devices by:
 1. Maintaining proper operation of the automatic air/fuel ratio controller or automatic feedback controller.
 2. Following the catalyst manufacturer emissions related operating and maintenance recommendations, or develop, implement, or follow a site-specific maintenance plan.

- * The permittee shall maintain records of the maintenance performed on the compressor engine.

PERFORMANCE TESTING OF OPERATIONS

The following substantive performance testing requirements shall be required:

With respect to any wet gas sampling, OVM shall be required to sample wet natural gas in accordance with the Gas Processor Association (GPA) Method 2166 and analyze the samples in accordance with GPA Method 2286. The permittee may utilize other equivalent methods provided they are approved in advance by DAQ as part of a testing protocol. If alternative methods are proposed, a test protocol shall be submitted for approval no later than 60 days before the scheduled test date.

The permittee shall verify that the closed-loop, automatic air/fuel ratio controller shall control a fuel metering valve to ensure a fuel-rich mixture and a resultant exhaust oxygen content of less than or equal to 2% during any performance testing.

RECOMMENDATION TO DIRECTOR

The information provided in permit application R13-3262 indicates that compliance with all applicable state and federal air quality regulations will be achieved. Therefore, I recommend to the Director the issuance of Permit Number R13-3262 to Williams Ohio Valley Midstream for the construction and operation of the Neehouse Compressor Station located near Cameron, Marshall County, WV.

Steven R. Pursley, PE
Engineer

November 2, 2015

Fact Sheet R13-3262
Williams Ohio Valley Midstream LLC
Neehouse Compressor Station