west virginia department of environmental protection

Division of Air Quality
601 57th Street SE
Charleston, WV 25304
Phone (304) 926-0475 • FAX: (304) 926-0479

Earl Ray Tomblin, Governor
Randy C. Huffman, Cabinet Secretary
www.dep.wv.gov

ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-3167B
Plant ID No.:	017-00084
Applicant:	Antero Midstream LLC (Antero)
Facility Name:	Canton North Compressor Station
Location:	Center Point, Doddridge County
NAICS Code:	221210 (Natural Gas Distribution)
Application Type:	Modification
Received Date:	September 2, 2016
Engineer Assigned:	Jerry Williams, P.E.
Fee Amount:	$4,500.00
Date Received:	September 2, 2016
Complete Date:	September 27, 2016
Due Date:	December 26, 2016
Applicant Ad Date	September 9, 2016
Newspaper:	*The Doddridge Independent*
UTM's:	Easting: 527.254 km Northing: 4,361.686 km Zone: 17
Description:	Updated operating conditions of NSCR catalysts, tank emissions, installation of heater, increase in dehydration throughput, modify blowdown and pigging events and elimination of synthetic minor status.

NON-CONFIDENTIAL

DESCRIPTION OF PROCESS

The Canton North Compressor Station is located in Doddridge County, approximately 2.8 miles WNW of Center Point. This facility began operation on August 22, 2014 upon issuance of Permit R13-3167.

This modification application consists of:

- Updating compressor engine emissions to reflect catalyst data based on a new catalyst design from the manufacturer
- Updating storage tank emissions using ProMax 3.2
- New installation of a fuel conditioning heater (0.5 million BTU/hr capacity)
- Removing the generator hours of operation limit
- Eliminating the compressor fuel use limit and synthetic minor status
- Increasing the dehydrator throughput to 110 million standard cubic feet per day (mmscfd) per dehydrator
- Modifying the dehydrator flash tank control efficiency based on new standardized guidance from WVDEP
- Modifying compressor blowdown and pigging events based on expected operations

The following process description was taken from Permit Application R13-3167B:

The Canton North Compressor Station is located in Doddridge County, West Virginia. Gas from surrounding pipelines enters the facility through one (1) receiver and associated slug catcher. From there, the gas is metered and routed through a scrubber and filter separator. Any produced liquids from the scrubber or separator are sent to the 400 barrel settling tank (TK-1502). Gas from the filter separator is sent to one (1) of eleven (11) 1,680 hp Waukesha compressor engines (C-100 – C-1100). The eleven (11) compressor engines are controlled with NSCR catalysts and air-fuel ratio controllers (1C – 11C). Fuel gas for the compressor engines will be treated prior to the engines by a fuel conditioning skid with a 0.5 MMBtu/hr heater (FUEL1) to allow more complete combustion. Produced fluids are routed to the settling tank and gas going to one of the two (2) TEG dehydrators.

Each TEG dehydrator (DEHY1 – DEHY2) contains a flash gas tank and 1.5 MMBtu/hr reboiler. Each dehydrator has a design rate of 110 MMscf/day. Within the dehydrator unit, vent gas from the flash gas tank (DFLSH1 – DFLSH2) is routed to the reboiler (DREB1 – DREB2) and used as fuel. In the case where the flash tank gas cannot be used by the reboiler due to excess gas or the reboiler is offline, the gas will be sent to the vapor recovery units (VRU-100 and VRU-200) via the storage tanks and thus controlled by 98%. Combustion emissions from each reboiler are routed to the atmosphere. The dehydrator still vents (DEHY1 – DEHY2) are controlled by a flare with at least 98% control efficiency (FLARE1). Produced fluids from the dehydrator are routed to the settling tank. The dry gas from the dehydration process is either routed to a fuel gas scrubber, metered, and routed to the compressors as fuel gas or metered and sent to plant discharge.

All produced fluids enter one (1) 400 barrel settling tank (TK-1502) where the fluids settle out as either condensate or produced water. The produced water goes to two (2) 400 barrel produced water tanks (TK-1500 – TK-1501) and the condensate goes to two (2) 400 barrel condensate tanks (TK-200 – TK-201). Flashing only occurs at the settling tank as the fluids stabilize in the settling tank before going to the other storage tanks. All five (5) tanks are connected to a vapor recovery unit (VRU-100) where tank vapors are collected and recycled back into the gas system right before the initial filter scrubber. There is a second vapor recovery unit (VRU-200) that is used as a back-up control for the storage tanks. The produced fluids are trucked out via tanker trucks as needed (LDOUT1). The production is 150 barrels per day of condensate and 45 barrels per day of produced water.

Two (2) natural gas microturbine generators, each rated at 600 kWe supply power to the facility (GEN1 – GEN2). Each 600 kWe generator is actually comprised of three smaller units, each rated at 200 kWe. Likely, the total generator capacity of 1,200 kWe will not be operating at 8,760 hours per year, however, emissions were calculated as such for maximum flexibility. A small 24,000 Btu/hr catalytic heater (CATHT1) is used to heat the fuel to power the generators. Fugitive emissions from component leaks and emissions from venting or blowdown events also occur.

There will also be six (6) small storage tanks (between 1,000 and 2,000 gallon storage capacity) onsite.

SITE INSPECTION

A site inspection was conducted on October 21, 2015 by Doug Hammell of the DAQ Enforcement Section. According to Mr. Hammell, the facility was operating in compliance.

Latitude: 39.404250
Longitude: -80.683450

Directions to the facility are as follows:

From US-50 near Salem: Travel approximately 15 miles on WV-23W/Jacobs Run Road to site.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Emissions associated with this application consist of the combustion emissions from eleven (11) natural gas fired compressor engines (C-100 – C-1100), two (2) microturbine generators (GEN1, GEN2), two (2) TEG dehydrator still vents (DEHY1, DEHY2), two (2) TEG dehydrator reboilers (DREB1, DREB2), two (2) dehydrator flash tanks (DFLSH1, DFLSH2), five (5) 400 bbl (16,800 gal) tanks (settling, condensate, produced water) (TK-1502, TK-200, TK-201, TK-1500, TK-1501), six (6) miscellaneous storage tanks (oily water, used oil, TEG, compressor coolant, two (2) lube oil), one (1) product loadout rack (LDOUT1), one (1) flare (FLARE1), two (2) vapor recovery units (VRU-100, VRU-200), one (1) catalytic heater (CATHT1), one (1) fuel conditioning heater (FUEL1) and fugitive emissions. Fugitive emissions for the facility are based on calculation methodologies presented in EPA Protocol for Equipment Leak Emission Estimates. The following table indicates which methodology was used in the emissions determination:

Emission Unit ID#	**Process Equipment**	**Calculation Methodology**
C-100 – C-1100	1,680 hp Waukesha 7044 GSI Reciprocating Internal Combustion Engine (RICE) w/ NSCR	Manufacturer's Data, EPA AP-42 Emission Factors
GEN1, GEN2	600 kW Capstone C600 NG Microturbine Generators	Manufacturer's Data, EPA AP-42 Emission Factors
CATHT1	0.024 MMBTU/hr Catalytic Heater	EPA AP-42 Emission Factors
FUEL1	0.5 MMBTU/hr Fuel Conditioning Heater	EPA AP-42 Emission Factors
DEHY1, DEHY2	110 mmscfd TEG Dehydrator Still Vent w/ Condenser/Recycle and Flare	GRI-GlyCalc 4.0
DREB1, DREB2	1.5 MMBtu/hr TEG Dehydrator Reboiler	EPA AP-42 Emission Factors
TK-1502	400 bbl (16,800 gal) Produced Water/Condensate Settling Tank	EPA Tanks 4.09d and ProMax Simulation (Flashing)
TK-200, TK-201	400 bbl (16,800 gal) Condensate Storage Tanks	EPA Tanks 4.09d
TK-1500, TK-1501	400 bbl (16,800 gal) Produced Water Storage Tanks	EPA Tanks 4.09d
TK-300	1,000 gal Compressor Skid Oily Water Storage Tank	Negligible
TK-301	1,000 gal Used Oil Storage Tank	Negligible
TK-104	1,000 gal TEG Make-Up Storage Tank	Negligible
TL-106	2,000 gal Compressor Coolant Storage Tank	Negligible
TK-107	2,000 gal Engine Lube Oil Storage Tank	Negligible
TK-108	2,000 gal Compressor Lube Oil Storage Tank	Negligible
LDOUT1	195 bbl (8,190 gal) / day Product Loadout Rack	EPA AP-42 Emission Factors
VRU-100	Vapor Recovery Unit #1	Electric Driven
VRU-200	Vapor Recovery Unit #2	Electric Driven
FLARE1	4.8 MMBTU/hr Flare Control Device	EPA AP-42 Emission Factors

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

Emission Unit	Pollutant	Control Device	Control Efficiency
1,680 hp Waukesha 7044 GSI RICE w/ NSCR (C-100 – C-1100)	Nitrogen Oxides	NSCR	97.5 %
	Carbon Monoxide		97.5 %
	Volatile Organic Compounds		84 %
	Formaldehyde		90 %
	Methane		70 %
110 mmscfd TEG Dehydrator Still Vents (DEHY1, DEHY2)	Volatile Organic Compounds	Flare	98 %
	Hazardous Air Pollutants		98 %
110 mmscfd TEG Dehydrator Flash Tanks (DFLSH1, DFLSH2)	Volatile Organic Compounds	Recycled Reboiler/ Condenser w Backup VRU System	98 %
	Hazardous Air Pollutants		98 %
Product Tanks (TK-1502, TK-200, TK-201, TK-1500, TK-1501)	Volatile Organic Compounds	Vapor Recovery Units	98 %
	Hazardous Air Pollutants		98 %

The total facility PTE (including fugitives) for the Canton North Compressor Station is shown in the following table:

Pollutant	R13-3167A PTE (tons/year)	R13-3167B PTE (tons/year)	PTE Change (tons/year)
Nitrogen Oxides	90.77	65.72	-25.05
Carbon Monoxide	93.71	71.94	-21.77
Volatile Organic Compounds	86.30	50.34	-35.96
Particulate Matter-10/2.5	11.97	13.94	1.97
Sulfur Dioxide	0.46	0.59	0.13
Formaldehyde	1.93	0.93	-1.00
Total HAPs	11.43	10.49	-0.94
Carbon Dioxide Equivalent	95,111	109,837	14,726

Maximum detailed controlled point source emissions were calculated by Antero and checked for accuracy by the writer and are summarized in the table on the next page.

Antero Midstream LLC – Canton North Compressor Station (R13-3167B)

Emission Point ID#	Source	NO_x		CO		VOC		PM-10/2.5		SO_2		Formaldehyde		Total HAPs		CO2e
		lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	lb/hr	ton/year	ton/year
1E	Compressor Engine #1	1.26	5.52	1.19	5.19	0.25	1.09	0.27	1.18	<0.01	0.04	0.02	0.08	0.18	0.81	8731
2E	Compressor Engine #2	1.26	5.52	1.19	5.19	0.25	1.09	0.27	1.18	<0.01	0.04	0.02	0.08	0.18	0.81	8731
3E	Compressor Engine #3	1.26	5.52	1.19	5.19	0.25	1.09	0.27	1.18	<0.01	0.04	0.02	0.08	0.18	0.81	8731
4E	Compressor Engine #4	1.26	5.52	1.19	5.19	0.25	1.09	0.27	1.18	<0.01	0.04	0.02	0.08	0.18	0.81	8731
5E	Compressor Engine #5	1.26	5.52	1.19	5.19	0.25	1.09	0.27	1.18	<0.01	0.04	0.02	0.08	0.18	0.81	8731
6E	Compressor Engine #6	1.26	5.52	1.19	5.19	0.25	1.09	0.27	1.18	<0.01	0.04	0.02	0.08	0.18	0.81	8731
7E	Compressor Engine #7	1.26	5.52	1.19	5.19	0.25	1.09	0.27	1.18	<0.01	0.04	0.02	0.08	0.18	0.81	8731
8E	Compressor Engine #8	1.26	5.52	1.19	5.19	0.25	1.09	0.27	1.18	<0.01	0.04	0.02	0.08	0.18	0.81	8731
9E	Compressor Engine #9	1.26	5.52	1.19	5.19	0.25	1.09	0.27	1.18	<0.01	0.04	0.02	0.08	0.18	0.81	8731
10E	Compressor Engine #10	1.26	5.52	1.19	5.19	0.25	1.09	0.27	1.18	<0.01	0.04	0.02	0.08	0.18	0.81	8731
11E	Compressor Engine #11	1.26	5.52	1.19	5.19	0.25	1.09	0.27	1.18	<0.01	0.04	0.02	0.08	0.18	0.81	8731
12E	Microturbine Generator #1	0.24	1.05	0.66	2.89	0.06	0.26	0.04	0.18	0.02	0.09	<0.01	0.02	<0.01	0.03	3499
13E	Microturbine Generator #2	0.24	1.05	0.66	2.89	0.06	0.26	0.04	0.18	0.02	0.09	<0.01	0.02	<0.01	0.03	3499
14E	Dehydrator Still Vent #1	0	0	0	0	1.16	5.08	0	0	0	0	0	0	0.11	0.49	305
16E	Dehydrator Reboiler	0.15	0.64	0.12	0.54	<0.01	0.04	0.01	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	771
17E	Dehydrator Still Vent #2	0	0	0	0	1.16	5.08	0	0	0	0	0	0	0.11	0.49	305
19E	Dehydrator Reboiler	0.15	0.64	0.12	0.54	<0.01	0.04	0.01	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	771
20E	Settling Storage Tank	0	0	0	0	0.96	4.19	0	0	0	0	0	0	0.03	0.11	27
21E, 22E	Condensate Storage Tanks	0	0	0	0	0.02	0.10	0	0	0	0	0	0	<0.01	<0.01	1
23E, 24E	Produced Water Storage Tanks	0	0	0	0	<0.01	<0.01	0	0	0	0	0	0	<0.01	<0.01	<1
25E	Product Loadout Rack	0	0	0	0	39.26	3.87	0	0	0	0	0	0	1.03	0.10	25
26E	Flare Combustion	0.33	1.44	1.78	7.79	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2475
27E	Catalytic Heater	<0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	12
28E	Fuel Conditioning Heater	0.05	0.21	0.04	0.18	<0.01	0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	257
BD	Compressor Blowdowns	0	0	0	0	NA	8.32	0	0	0	0	0	0	NA	0.15	903
CSU/PS	Compressor Startup/Shutdown	0	0	0	0	NA	4.62	0	0	0	0	0	0	NA	0.02	501
LPPV	Low Pressure Pig Venting	0	0	0	0	NA	0.40	0	0	0	0	0	0	NA	0.01	43
HPPV	High Pressure Pig Venting	0	0	0	0	NA	2.85	0	0	0	0	0	0	NA	0.05	309
Total Point Source		15.01	65.72	16.42	71.94	45.41	47.11	3.08	13.50	0.13	0.59	0.21	0.93	3.25	10.41	109743
Fugitive	Component Leaks	0	0	0	0	0.74	3.23	0	0	0	0	0	0	0.01	0.06	94
Fugitive	Dust	0	0	0	0	0	0	0.1	0.44	0	0	0	0	0	0	0
Total Fugitive		0	0	0	0	0.74	3.23	0.10	0.44	0	0	0	0	0.01	0.06	94
Total Sitewide		**15.01**	**65.72**	**16.42**	**71.94**	**46.15**	**50.34**	**3.18**	**13.94**	**0.13**	**0.59**	**0.21**	**0.93**	**3.27**	**10.47**	**109837**

REGULATORY APPLICABILITY

The following rules apply to this modification:

45CSR2 (Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers)

The purpose of 45CSR2 is to establish emission limitations for smoke and particulate matter which are discharged from fuel burning units. 45CSR2 states that any fuel burning unit that has a heat input under ten (10) million B.T.U.'s per hour is exempt from sections 4 (weight emission standard), 5 (control of fugitive particulate matter), 6 (registration), 8 (testing, monitoring, recordkeeping, reporting) and 9 (startups, shutdowns, malfunctions). However, failure to attain acceptable air quality in parts of some urban areas may require the mandatory control of these sources at a later date.

The individual heat input of the reboilers (DREB1, DREB2) and heaters (CATHT1, FUEL1) are below 10 MMBTU/hr. Therefore, these units are exempt from the aforementioned sections of 45CSR2.

Antero would also be subject to the opacity requirements in 45CSR2, which is 10% opacity based on a six minute block average.

45CSR6 (To Prevent and Control Air Pollution from the Combustion of Refuse)

The purpose of this rule is to prevent and control air pollution from combustion of refuse.

Antero has one (1) flare at the facility. The flare is subject to section 4, emission standards for incinerators. The flare has negligible hourly particulate matter emissions. Therefore, the facility's flare should demonstrate compliance with this section. The facility will demonstrate compliance by maintaining records of the amount of natural gas consumed by the flare and the hours of operation. The facility will also monitor the flame of the flare and record any malfunctions that may cause no flame to be present during operation.

45CSR10 (To Prevent and Control Air Pollution from the Emissions of Sulfur Oxides)

The purpose of 45CSR10 is to establish emission limitations for sulfur dioxide which are discharged from fuel burning units. 45CSR10 states that any fuel burning unit that has a heat input under ten (10) million B.T.U.'s per hour is exempt from sections 3 (weight emission standard), 6 (registration), 7 (permits), and 8 (testing, monitoring, recordkeeping, reporting). However, failure to attain acceptable air quality in parts of some urban areas may require the mandatory control of these sources at a later date.

The individual heat input of the reboilers (DREB1, DREB2) and heaters (CATHT1, FUEL1) are below 10 MMBTU/hr. Therefore, these units are exempt from the aforementioned sections of 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)

A 45CSR13 modification permit applies to this source due to the fact that Antero's modification is subject to a substantive requirement of an emission control rule (40CFR60 Subpart OOOO and 40CFR63 Subpart HH).

Antero paid the appropriate application fee and published the required legal advertisement for a modification permit application.

45CSR16 (Standards of Performance for New Stationary Sources Pursuant to 40 CFR Part 60)

45CSR16 applies to this source by reference of 40CFR60, Subparts JJJJ and OOOO. These requirements are discussed under those rules below.

45CSR22 (Air Quality Management Fee Program)

Antero is not subject to 45CSR30. The Canton North Compressor Station is subject to 40CFR60 Subparts JJJJ and OOOO, however they are exempt from the obligation to obtain a permit under 40 CFR part 70 or 40 CFR part 71, provided they are not required to obtain a permit for a reason other than their status as an area source.

Antero is required to pay the appropriate annual fees and keep their Certificate to Operate current.

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

40CFR60 Subpart JJJJ establishes emission standards for applicable SI ICE.

The 1,680 hp Waukesha 7044 GSI RICEs (C-100 – C-1100) were manufactured after the July 1, 2007 date for engines with a maximum rated power capacity greater than or equal to 500 hp.

The 1,680 hp Waukesha 7044 GSI RICEs (C-100 – C-1100) will be subject to the following emission limits: NOx – 1.0 g/hp-hr (3.70 lb/hr); CO – 2.0 g/hp-hr (7.41 lb/hr); and VOC – 0.7 g/hp-hr (2.59 lb/hr). Based on the manufacturer's specifications for these engines, the emission standards will be met.

The 1,680 hp Waukesha 7044 GSI RICEs (C-100 – C-1100) are not certified by the manufacturer to meet the emission standards listed in 40CFR60 Subpart JJJJ. Therefore, Antero will be required to conduct an initial performance test and conduct subsequent performance testing every 8,760 hours or three (3) years, whichever comes first, to demonstrate compliance.

40CFR60 Subpart OOOO (Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution for which Construction, Modification or Reconstruction Commenced after August 23, 2011, and on or before September 18, 2015)

EPA published in the Federal Register new source performance standards (NSPS) and air toxics rules for the oil and gas sector on August 16, 2012. 40CFR60 Subpart OOOO establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur dioxide (SO_2) emissions from affected facilities that commence construction, modification or reconstruction after August 23, 2011. The following affected sources which commence construction, modification or reconstruction after August 23, 2011 are subject to the applicable provisions of this subpart:
Each gas well affected facility, which is a single natural gas well.

There are no gas wells at this facility. Therefore, all requirements regarding gas well affected facilities under 40 CFR 60 Subpart OOOO would not apply.

a. Each centrifugal compressor affected facility, which is a single centrifugal compressor using wet seals that is located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment. For the purposes of this subpart, your centrifugal compressor is considered to have commenced construction on the date the compressor is installed (excluding relocation) at the facility. A centrifugal compressor located at a well site, or an adjacent well site and servicing more than one well site, is not an affected facility under this subpart.

There are no centrifugal compressors at the Canton North Compressor Station. Therefore, all requirements regarding centrifugal compressors under 40 CFR 60 Subpart OOOO would not apply.

b. Each reciprocating compressor affected facility, which is a single reciprocating compressor located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment. For the purposes of this subpart, your reciprocating compressor is considered to have commenced construction on the date the compressor is installed (excluding relocation) at the facility. A reciprocating compressor located at a well site, or an adjacent well site and servicing more than one well site, is not an affected facility under this subpart.

There are reciprocating internal combustion engines located at the Canton North Compressor Station that were constructed after August 23, 2011. Therefore, the requirements regarding reciprocating compressors under 40 CFR 60 Subpart OOOO will apply. Antero will be required to perform the following:

- Replace the reciprocating compressor rod packing at least every 26,000 hours of operation or 36 months or installation of a rod packing emissions collection system..

- Demonstrate initial compliance by continuously monitoring the number of hours of operation or track the number of months since the last rod packing replacement.

- Submit the appropriate start up notifications.

- Submit the initial annual report for the reciprocating compressors.

- Maintain records of hours of operation since last rod packing replacement, records of the date and time of each rod packing replacement, and records of deviations in cases where the reciprocating compressor was not operated in compliance.

c. Pneumatic Controllers

- Each pneumatic controller affected facility, which is a single continuous bleed natural gas-driven pneumatic controller operating at a natural gas bleed rate greater than 6 scfh which commenced construction after August 23, 2011, and is located between the wellhead and the point of custody transfer to the natural gas transmission and storage segment and not located at a natural gas processing plant.

- Each pneumatic controller affected facility, which is a single continuous bleed natural gas-driven pneumatic controller which commenced construction after August 23, 2011, and is located at a natural gas processing plant.

All pneumatic controllers at the facility will be air driven. Therefore, there are no applicable pneumatic controllers which commenced construction after August 23, 2011. Therefore, all requirements regarding pneumatic controllers under 40 CFR 60 Subpart OOOO would not apply.

d. Each storage vessel affected facility, which is a single storage vessel, located in the oil and natural gas production segment, natural gas processing segment or natural gas transmission and storage segment.

40CFR60 Subpart OOOO defines a storage vessel as a unit that is constructed primarily of non-earthen materials (such as wood, concrete, steel, fiberglass, or plastic) which provides structural support and is designed to contain an accumulation of liquids or other materials. The following are not considered storage vessels:

- Vessels that are skid-mounted or permanently attached to something that is mobile (such as trucks, railcars, barges or ships), and are intended to be located at a site for less than 180 consecutive days. If the source does not keep or are not able to produce records, as required by §60.5420(c)(5)(iv), showing that the vessel has been located at a site for less than 180

consecutive days, the vessel described herein is considered to be a storage vessel since the original vessel was first located at the site.

- Process vessels such as surge control vessels, bottoms receivers or knockout vessels.

- Pressure vessels designed to operate in excess of 204.9 kilopascals and without emissions to the atmosphere.

This rule requires that the permittee determine the VOC emission rate for each storage vessel affected facility utilizing a generally accepted model or calculation methodology within 30 days of startup, and minimize emissions to the extent practicable during the 30 day period using good engineering practices. For each storage vessel affected facility that emits more than 6 tpy of VOC, the permittee must reduce VOC emissions by 95% or greater within 60 days of startup. The compliance date for applicable storage vessels is October 15, 2013.

The storage vessels located at the Canton North Compressor Station are controlled by a VRU which will reduce the potential to emit to less than 6 tpy of VOC. Therefore, Antero is not required by this section to further reduce VOC emissions by 95%. Antero is claiming a control efficiency of 98% for the VRU. In able to claim a control efficiency greater than 95%, Antero is required to meet additional design/function requirements. Antero will be required to perform three (3) of the following additional requirements:

- *Additional sensing equipment.*
- *Properly designed bypass system.*
- *Appropriate gas blanket.*
- *A compressor that is suitable and has the ability to vary the drive speed.*

e. The group of all equipment, except compressors, within a process unit is an affected facility.

- Addition or replacement of equipment for the purpose of process improvement that is accomplished without a capital expenditure shall not by itself be considered a modification under this subpart.

- Equipment associated with a compressor station, dehydration unit, sweetening unit, underground storage vessel, field gas gathering system, or liquefied natural gas unit is covered by §§60.5400, 60.5401, 60.5402, 60.5421 and 60.5422 of this subpart if it is located at an onshore natural gas processing plant. Equipment not located at the onshore natural gas processing plant site is exempt from the provisions of §§60.5400, 60.5401, 60.5402, 60.5421 and 60.5422 of this subpart.

- The equipment within a process unit of an affected facility located at onshore natural gas processing plants and described in paragraph (f) of

this section are exempt from this subpart if they are subject to and controlled according to subparts VVa, GGG or GGGa of this part.

The Canton North Compressor Station is not a natural gas processing plant. Therefore, Leak Detection and Repair (LDAR) requirements for onshore natural gas processing plants would not apply.

f. Sweetening units located at onshore natural gas processing plants that process natural gas produced from either onshore or offshore wells.

- Each sweetening unit that processes natural gas is an affected facility; and
- Each sweetening unit that processes natural gas followed by a sulfur recovery unit is an affected facility.
- Facilities that have a design capacity less than 2 long tons per day (LT/D) of hydrogen sulfide (H_2S) in the acid gas (expressed as sulfur) are required to comply with recordkeeping and reporting requirements specified in §60.5423(c) but are not required to comply with §§60.5405 through 60.5407 and paragraphs 60.5410(g) and 60.5415(g) of this subpart.
- Sweetening facilities producing acid gas that is completely reinjected into oil-or-gas-bearing geologic strata or that is otherwise not released to the atmosphere are not subject to §§60.5405 through 60.5407, 60.5410(g), 60.5415(g), and 60.5423 of this subpart.

There are no sweetening units at the Canton North Compressor Station. Therefore, all requirements regarding sweetening units under 40 CFR 60 Subpart OOOO would not apply.

40CFR63 Subpart HH (National Emission Standards for Hazardous Air Pollutants for Oil and Natural Gas Production Facilities)

Subpart HH establishes national emission limitations and operating limitations for HAPs emitted from oil and natural gas production facilities located at major and area sources of HAP emissions. The glycol dehydration units at the Canton North Compressor Station are subject to the area source requirements for glycol dehydration units. However, because the facility is an area source of HAP emissions and the actual average benzene emissions from the glycol dehydration unit is below 0.90 megagram per year (1.0 tons/year) it is exempt from all requirements of Subpart HH except to maintain records of actual average flowrate of natural gas to demonstrate a continuous exemption status.

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 (C-100 – C-1100) at the Canton North Compressor Station are subject to the area source requirements for non-emergency spark ignition engines.

The applicability requirements for new stationary RICEs located at an area source of HAPs, is the requirement to meet the standards of 40CFR60 Subpart JJJJ. These requirements were outlined above. The proposed engine meets these standards.

Because these engines are not certified by the manufacturer, Antero 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.

The following rules do not apply to the facility:

45CSR14 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollutants)

45CSR19 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contribute to Nonattainment)

The Canton North Compressor Station is located in Doddridge County, which is an unclassified county for all criteria pollutants, therefore the Canton North Compressor Station is not applicable to 45CSR19.

As shown in the following table, Antero is not a major source subject to 45CSR14 or 45CSR19 review. According to 45CSR14 Section 2.43.e, fugitive emissions are not included in the major source determination because it is not listed as one of the source categories in Table 1. Therefore, the fugitive emissions are not included in the PTE below.

Pollutant	PSD (45CSR14) Threshold (tpy)	NANSR (45CSR19) Threshold (tpy)	Canton North PTE (tpy)	45CSR14 or 45CSR19 Review Required?
Carbon Monoxide	250	NA	71.94	No
Nitrogen Oxides	250	NA	65.72	No
Sulfur Dioxide	250	NA	0.59	No
Particulate Matter 2.5	250	NA	13.50	No
Ozone (VOC)	250	NA	47.11	No

45CSR30 (Requirements for Operating Permits)

Antero is not subject to 45CSR30. The Canton North Compressor Station is subject to 40CFR60 Subparts JJJJ and OOOO, however they are exempt from the obligation to obtain a permit under 40 CFR part 70 or 40 CFR part 71, provided they are not required to obtain a permit for a reason other than their status as an area source.

40CFR60 Subpart Kb (Standards of Performance for VOC Liquid Storage Vessels)

40CFR60 Subpart Kb does not apply to storage vessels with a capacity less than 75 cubic meters. The largest tanks that Antero has installed are 63.60 cubic meters each. Therefore, Antero would not be subject to this rule.

40CFR60 Subpart KKK (Standards of Performance for Equipment Leaks of VOC from Onshore Natural Gas Processing Plants)

40CFR60 Subpart KKK applies to onshore natural gas processing plants that commenced construction after January 20, 1984, and on or Before August 23, 2011. The Canton North Compressor Station is not a natural gas processing facility, therefore, Antero is not subject to this rule.

40CFR60 Subpart KKKK (Standards of Performance for Stationary Combustion Turbines)

40CFR60 Subpart KKKK does not apply because there are no stationary combustion turbines at the facility with a heat input at peak load equal to or greater than 10 MMBTU/hr, based on the higher heating value of the fuel (§60.4305).

40CFR60 Subpart OOOOa (Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution for which Construction, Modification or Reconstruction Commenced after September 18, 2015)

EPA published its New Source Performance Standards (NSPS) and air toxics rules for the oil and gas sector on August 16, 2012. EPA published amendments to the Subpart on September 23, 2013 and June 3, 2016. 40CFR60 Subpart OOOOa establishes emission standards and compliance schedules for the control of the pollutant greenhouse gases (GHG). The greenhouse gas standard in this subpart is in the form of a limitation on emissions of methane from affected facilities in the crude oil and natural gas source category that commence construction, modification or reconstruction after September 18, 2015. This subpart also establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur dioxide (SO_2) emissions from affected facilities that commence construction, modification or reconstruction after September 18, 2015. The effective date of this rule is August 2, 2016.

For the purposes of 60.5397a (LDAR), a "modification" to a compressor station occurs when one or more compressors is replaced by one or more compressors of greater total horsepower than the compressor(s) being replaced. No increase in horsepower is being realized, therefore, for the purposes of LDAR, a "modification" has not occurred. No modifications occurred in regards to this rule.

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 HAPs are common to this industry. 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) or 45CSR19 (Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contribute to Nonattainment) as shown in the table listed in the Regulatory Discussion section under 45CSR14/45CSR19.

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 Source Determination Rule for the oil and gas industry was published in the Federal Register on June 3, 2016 and will become effective on August 2, 2016. EPA defined the term

"adjacent" and stated that equipment and activities in the oil and gas sector that are under common control will be considered part of the same source if they are located on the same site or on sites that share equipment and are within ¼ mile of each other.

The Canton North Compressor Station will operate under SIC code 4923 (Natural Gas Distribution). There are other compressor stations operated by Antero that share the same two-digit major SIC code of 49 for natural gas distribution.

"Contiguous or Adjacent" determinations are made on a case by case basis. There are no other equipment and activities in the oil and gas sector that are under common control of Antero that are located on the same site or on sites that share equipment and are within ¼ mile of each other.

Because the Canton North Compressor Station is not located on contiguous or adjacent properties with other facilities under common control, the emissions from this facility shall not be aggregated with other facilities for the purposes of making Title V and PSD determinations.

MONITORING OF OPERATIONS

Antero will be required to perform the following monitoring:

- 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 the presence of the flare pilot flame with a thermocouple or equivalent.

Antero will be required to perform the following recordkeeping:

- Maintain records of the amount of natural gas consumed and hours of operation for all engines and combustion sources.
- Maintain records of testing conducted in accordance with the permit. Said records shall be maintained on-site or in a readily accessible off-site location
- Maintain the corresponding records specified by the on-going monitoring requirements of and testing requirements of 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.
- Maintain records of all applicable requirements of 40CFR60 Subparts JJJJ and OOOO and 40CFR63 Subparts HH and ZZZZ.
- Maintain records of the flare design evaluation.
- The records shall be maintained on site or in a readily available off-site location maintained by Antero for a period of five (5) years.

CHANGES TO PERMIT R13-3167A

- Section 1.0 (Emission Units) – Revised the design capacity of the TEG Dehydration Units (DEHY1, DEHY2) and flash tanks (DFLSH1, DFLSH2)
- Section 1.0 (Emission Units) – Revised the control device status to include a backup VRU for the dehydrator flash tanks (DFLSH1, DFLSH2)
- Section 1.0 (Emission Units) – Addition of a fuel conditioning heater (FUEL1)
- Section 1.1 (Control Devices) – Revised the control efficiencies for engine NSCR
- Section 1.1 (Control Devices) – Included a backup VRU for the dehydrator flash tanks (DFLSH1, DFLSH2)
- Section 5.0 (C-100 – C-1100) – Removed natural gas throughput limitation and CO_2e emission limits as this source is no longer a synthetic minor
- Section 5.0 (C-100 – C-1100) – Revised emission limits based on new NSCR catalyst
- Section 5.0 (GEN1-GEN2) – Removed maximum yearly operation limitation and CO_2e emission limits as this source is no longer a synthetic minor
- Section 6.0 (Glycol Dehydration Units) – Revised the maximum throughput limitation from 60 mmscfd to 110 mmscfd
- Section 6.0 (Glycol Dehydration Units) – Revised the VOC emissions from the flare to account for the increase in throughput and more efficient operation of the glycol pumps
- Section 6.0 (Glycol Dehydration Units) – Addition of language to account for a backup VRU for the glycol dehydration flash tanks
- Section 7.0 – Addition of catalytic heater (CATHT1) and fuel conditioning heater (FUEL1)
- Section 8.0 (Storage Tanks) – Revise VOC emissions from TK-1502 from updated ProMax analysis
- Section 13.0 (Blowdown and Pigging Operations) – Addition of section to require recordkeeping and reporting of these events

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates that Antero meets all the requirements of applicable regulations. Therefore, impact on the surrounding area should be minimized and it is recommended that the Canton North Compressor Station should be granted a 45CSR13 modification permit for their facility.

Jerry Williams, P.E.
Engineer

NOV 3, 2016
Date