



west virginia department of environmental protection

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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.: G70-A131B
Plant ID No.: 017-00145
Applicant: Antero Resources Corporation
Facility Name: Balli Wellpad
Location: West Union, Doddridge County, WV
NAICS Code: 211111
Application Type: Modification
Received Date: October 26, 2015
Engineer Assigned: Caraline Griffith
Fee Amount: \$1,500
Date Received: October 27, 2015
Complete Date: November 18, 2015
Due Date: January 4, 2016
Applicant Ad Date: October 30, 2015
Newspaper: *The Doddridge Independent*
UTM's: Easting: 513.49 km Northing: 4,350.32 km Zone: 17N
Description: Increase in production, and the addition of 12 line heaters and 3 Cimarron enclosed combustors.

PROCESS DESCRIPTION

A mixture of condensate, water, and entrained gas from the condensate and gas wells enters the facility through a series of line heaters (LH001-LH012) and gas production units (H001-H012) which are 3-phase separators where the gas, condensate, and produced water are separated. The line heaters and GPUs are fueled by a slip stream of the separated gas. The separated gas from the 3-phase separators is metered and sent to the sales gas pipeline. The separated water flow to the produced water storage tanks (TANKPW001 and TANKPW002). The separated condensate is then sent to two phase low pressure separators where gas is further separated from the condensate. The separated gas is routed to the compressor (ENG001), compressed, and sent to

Promoting a healthy environment.

the sales gas line. The condensate from the two phase separators flow to the condensate storage tanks (TANKCOND001 – TANKCOND010). The line heaters are only used during the first several months from start of production and will be removed once production has normalized.

The facility has ten (10) tanks (TANKCOND001 – TANKCOND010) on site to store condensate and two (2) tanks (TANKPW001 and TANKPW-002) to store produced water prior to removal from the site. The flashing, working and breathing losses from the tanks are routed to up to four enclosed combustors (EC001-EC004) to control the emissions. The enclosed combustor(s) that will be used to control emissions are designed to achieve a VOC emissions efficiency of 98%.

Condensate and produced water are transported off site on an as needed basis via tanker truck. Truck loading connections are in place to pump condensate (L001) and produced water (L002) from the storage tanks into tanker trucks. Emissions from the loading operation are vented to the atmosphere.

Emissions from the facility’s emission sources were calculated using the extended analysis of the condensate and gas from Moore No. 1H, one of the wells in the Moore Wellpad. These extended analyses are considered representative of the materials from Balli Wellpad, being the same Marcellus rock formation.

SITE INSPECTION

On February 5, 2015, Doug Hammell of the DAQ’s compliance and enforcement section inspected the subject facility. The site received a rating of 30 and was deemed to be in compliance.

Directions to site:

Drive west on US-50 W for 29.7 miles. Turn right onto Wilhelm Run Rd. 0.1 miles. Continue on Stone Valley Rd. 1.2 miles. Sharp left onto CO Rte 36/1, 1.1 miles. Keep right to continue on Ramsey Ridge Rd., 0.4 miles. Access road will be on your right.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

The Line Heater calculations and the Enclosed Combustor calculations were all based on AP-42 Section 1.4 emission factors. Emissions given are for combined units. There are a total of 12 Line Heaters and three Enclosed Combustors.

Table 1: PTE Estimates

Emission Unit ID	Emission Unit Description	Pollutant	lb/hr	TPY
LH001 – LH012	2.00 mmBTU/hr Line Heaters	NOx	1.93	8.43
		CO	1.62	7.08
		VOC	0.11	0.46
		PM	0.15	0.64
		SO2	0.01	0.05
EC001, EC002, EC003, EC004	90 scfm Cimmaron	NOx	0.29	1.27
		CO	0.24	1.07

	Enclosed Combustors	VOC	3.35	14.68
		PM	0.02	0.10
		SO2	<0.01	<0.01
		Total HAPs	0.09	0.41
		CO2e	828.99	3,630.98

Table 2: Facility Wide Changes in PTE

Pollutant	G35-A131B (TPY)	G35-A131A (TPY)	Change in Emission limits (TPY)
NOx	17.40	9.17	+8.24
CO	38.18	31.26	+6.92
VOC	38.72	35.92	+2.80
PM	2.69	3.11	-0.41
SO2	0.09	0.04	+0.05
HAPs	2.37	2.29	+0.08

REGULATORY APPLICABILITY

The following state and federal regulations apply to sources requesting registration under the G70-A General Permit:

State Regulations:

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

The purpose of 45CSR2 (Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers) 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 heat input of all the existing and proposed fuel burning units (LH001-LH012 and H001-H012) is below 10 MMBTU/hr. Therefore, these units are exempt from the aforementioned sections of 45CSR2. However, Antero would be subject to the opacity requirements in 45CSR2, which is 10% opacity based on a six minute block average.

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. The facility-wide requirements of the general permit include the odor standards of 45CSR §4-3.1.

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

45CSR6 prohibits open burning, establishes emission limitations for particulate matter, and establishes opacity requirements. Sources subject to 45CSR6 include completion combustion devices, enclosed combustion devices, and flares.

The facility-wide requirements of the general permit include the open burning limitations §§45-6-3.1 and 3.2.

All completion combustion devices, enclosed combustion devices, and flares are subject to the particulate matter weight emission standard set forth in §45-6-4.1; the opacity requirements in §§45-6-4-3 and 4-4; the visible emission standard in §45-6-4.5; the odor standard in §45-6-4.6; and the testing standard in §§45-6-7.1 and 7.2. Sections 5.0, 6.0 and 14.0 of the G70-A general permit include requirements for 45CSR6.

Enclosed combustion control devices and flares that are used to comply with emission standards of NSPS, Subpart OOOO are subject to design, operational, performance, recordkeeping and reporting requirements of the NSPS regulation that meet or exceed the requirements of 45CSR6.

Antero will have four (4) enclosed combustors on site (EC001-EC004). These enclosed combustors will be used to comply with emissions standards of Subpart OOOO, being the control devices for the Condensate Tanks and the Produced Water Tanks.

45CSR10 To Prevent and Control Air Pollution from the Emission of Sulfur Oxides

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 heat input of all the existing and proposed fuel burning units (LH001-LH012 and H001-H012) is 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

The scope of the G70-A general permit is for minor stationary sources that are not subject to 45CSR14, 45CSR19, or 45CSR30. The general conditions of section 2.0 and the facility-wide requirements of section 3.0 of the G70-A general permit include the authority and other general provisions of 45CSR13.

Antero meets the criteria to apply for a Class II General Permit G70-A. Antero published a Class I legal ad in *The Doddridge Independent* on October 26, 2015.

45CSR22 Air Quality Management Fee Program

45CSR22 is the program to collect fees for certificates to operate and for permits to construct or modify sources of air pollution. 45CSR22 applies to all registrants. The general permit fee of \$500 is defined in 45CSR13. In addition to the application fee, all applicants subject to NSPS requirements or NESHAP requirements shall pay additional fees of \$1,000 and \$2,500, respectively.

Registrants are also required to obtain and have in effect a valid certificate to operate in accordance with 45CSR22 §4.1. The fee group for the G70-A general permit is group 9M (all other sources) with an annual operating fee of \$200.

Antero paid the application fee of \$500 and the NSPS fee of \$1000.

Federal Regulations:

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

40CFR60.4230 states that a source that commenced construction after June 12, 2006 whose SI ICE was less than 500 hp and was manufactured on or after July 1, 2008 is subject to this regulation. ENG001, based on the manufacture date of 2013, is subject to this regulation.

ENG001 engine is certified and must maintain compliance by keeping records of conducted maintenance.

40CFR60, Subpart OOOO (Standards of Performance for Crude oil and Natural Gas Production, Transmission and Distribution)

EPA published its new source performance standards (NSPS) and air toxics rules for the oil and gas sector on August 16, 2012. EPA published final amendments to the subpart on September 23, 2013.

40CFR60 Subpart OOOO establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur dioxide (SO₂) emissions from affected facilities that commence construction, modification or reconstruction after August 23, 2011. The affected sources which commence construction, modification or reconstruction after August 23, 2011 are subject to the applicable provisions of this subpart as described below:

- a. Each gas well affected facility, which is a single natural gas well.

This is a gas well affected facility because the wells were drilled with the primary purpose of natural gas production.

- b. 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. 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 this site.

- c. 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. 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 is one (1) reciprocating compressor engine located at this facility. The compressor was delivered after the effective date of this regulation. Therefore, this section would apply.

- d. For the natural gas production segment (between the wellhead and the point of custody transfer to the natural gas transmission and storage segment and not including natural gas processing plants), 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.

The pneumatic controllers at this facility will be intermittent or vent less than 6 scf/hr and therefore this facility is not subject to this section of this regulation.

- e. 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, and has the potential for VOC emissions equal to or greater than 6 tpy as determined according to this section by October 15, 2013 for Group 1 storage vessels and by April 15, 2014, or 30 days after startup (whichever is later) for Group 2 storage vessels. A storage vessel affected facility that subsequently has its potential for VOC emissions decrease to less than 6 tpy shall remain an affected facility under this subpart.

The ten (10) condensate tanks (TANKCOND001-TANKCOND010) and the two (2) produced water tanks (TANKPW001 and TANKPW002) have the potential to emit over 6 tpy each. Antero has the responsibility to limit emissions by at least 95%. Antero is using four (4) enclosed combustor units to control the emissions from these tanks with 100% control efficiency.

- f. Processing units, sweetening units and compressor stations are outside the scope of the G70-A general permit and are excluded from applicability for the general permit. The G70-A general permit is focused on activities at the production pad facility and is not intended to be a comprehensive NSPS, Subpart OOOO general permit.

There is no sweetening unit at this facility.

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

Engine G-1 was manufactured after June 12, 2006 and has engine power of 500 hp or less (24 hp) and is therefore subject to Subpart JJJJ. Subpart ZZZZ states engine G-1 must meet the requirements of 40CFR60 subpart JJJJ.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

Small amounts of non-criteria regulated hazardous air pollutants such as benzene, toluene, and formaldehyde may be emitted when natural gas is combusted in reciprocating engines, combusted in the fuel burning units, or combusted in one of the combustion type air pollution control devices.

All natural gas production facilities that are issued a G70-A general permit registration by the Director will be limited to those that are classified as minor sources of hazardous air pollutants. Minor sources of hazardous air pollutants are defined as those that have a potential to emit of less than 10 tons per year of any hazardous air pollutant or less than 25 tons per year of any combination of hazardous air pollutants.

Listed below is information regarding each of the possible hazardous air pollutants.

BTEX:

BTEX is the term used for benzene, toluene, ethylbenzene, and xylene. Each of these possible hazardous air pollutants are identified in this section.

Benzene:

Benzene is found in the air from emissions from burning coal and oil, gasoline service stations, and motor vehicle exhaust. Acute (short-term) inhalation exposure of humans to benzene may cause drowsiness, dizziness, headaches, as well as eye, skin, and respiratory tract irritation, and, at high levels, unconsciousness. Chronic (long-term) inhalation exposure has caused various disorders in the blood, including reduced numbers of red blood cells and aplastic anemia, in occupational settings. Reproductive effects have been reported for women exposed by inhalation to high levels, and adverse effects on the developing fetus have been observed in animal tests. Increased incidence of leukemia (cancer of the tissues that form white blood cells) have been observed in humans occupationally exposed to benzene. EPA has classified benzene as a Group A, human carcinogen.

Ethyl Benzene:

Ethyl benzene is mainly used in the manufacturing of styrene. Acute (short-term) exposure to ethyl benzene in humans results in respiratory effects, such as throat irritation and chest constriction, irritation of the eyes, and neurological effects, such as dizziness. Chronic (long-term) exposure to ethyl benzene by inhalation in humans has shown conflicting results regarding its effects on the blood. Animal studies have reported effects on the blood, liver, and kidneys from chronic inhalation exposure to ethyl benzene. Limited information is available on the carcinogenic effects of ethyl benzene in humans. In a study by the National Toxicology Program (NTP), exposure to ethyl benzene by inhalation resulted in an increased incidence of kidney and

testicular tumors in rats, and lung and liver tumors in mice. EPA has classified ethyl benzene as a Group D, not classifiable as to human carcinogenicity.

Formaldehyde:

Formaldehyde is used mainly to produce resins used in particle board products and as an intermediate in the synthesis of other chemicals. Exposure to formaldehyde may occur by breathing contaminated indoor air, tobacco smoke, or ambient urban air. Acute (short-term) and chronic (long-term) inhalation exposure to formaldehyde in humans can result in respiratory symptoms, and eye, nose, and throat irritation. Limited human studies have reported an association between formaldehyde exposure and lung and nasopharyngeal cancer. Animal inhalation studies have reported an increased incidence of nasal squamous cell cancer. EPA considers formaldehyde a probable human carcinogen (Group B1).

n-Hexane:

n-Hexane is a solvent that has many uses in the chemical and food industries, either in pure form or as a component of commercial hexane. The latter is a mixture that contains approximately 52% n-hexane; the balance is made up of structural analogs and related chemicals such as methylpentane and methylcyclopentane. Highly purified n-hexane is used as a reagent for chemical or chromatographic separations. Other grades of n-hexane are used as solvents for extracting edible fats and oils in the food industry and as a cleaning agent in the textile, furniture, and printing manufacturing industries. Hexane is the solvent base for many commercial products, such as glues, cements, paint thinners, and degreasers. n-Hexane is a minor constituent of crude oil and natural gas and occurs in different petroleum distillates. No data are available regarding the potential toxicity of n-hexane in humans orally exposed to n-hexane. However, as might be expected for a chemical with such wide application, the potential exists for persons to be environmentally and/or occupationally exposed to n-hexane via other routes of exposure.

Toluene:

The acute toxicity of toluene is low. Toluene may cause eye, skin, and respiratory tract irritation. Short-term exposure to high concentrations of toluene (e.g., 600 ppm) may produce fatigue, dizziness, headaches, loss of coordination, nausea, and stupor; 10,000 ppm may cause death from respiratory failure. Ingestion of toluene may cause nausea and vomiting and central nervous system depression. Contact of liquid toluene with the eyes causes temporary irritation. Toluene is a skin irritant and may cause redness and pain when trapped beneath clothing or shoes; prolonged or repeated contact with toluene may result in dry and cracked skin. Because of its odor and irritant effects, toluene is regarded as having good warning properties. The chronic effects of exposure to toluene are much less severe than those of benzene. No carcinogenic effects were reported in animal studies. Equivocal results were obtained in studies to determine developmental effects in animals. Toluene was not observed to be mutagenic in standard studies.

2,2,4-Trimethylpentane

2,2,4-Trimethylpentane is released to the environment through the manufacture, use, and disposal of products associated with the petroleum and gasoline industry. During an accident, 2,2,4-trimethylpentane penetrated the skin of a human which caused necrosis of the skin and tissue in the hand and required surgery. No other information is available on the acute (short-term) effects in humans. Irritation of the lungs, edema, and hemorrhage have been reported in rodents acutely exposed by inhalation and injection. No information is available on the chronic (long-term), reproductive, developmental, or carcinogenic effects of 2,2,4-trimethylpentane in

humans. Kidney and liver effects have been observed in rats chronically exposed via gavage (experimentally placing the chemical in the stomach) and inhalation. EPA has not classified 2,2,4-trimethylpentane with respect to potential carcinogenicity.

Xylene:

Commercial or mixed xylene usually contains about 40-65% *m*-xylene and up to 20% each of *o*-xylene and *p*-xylene and ethyl benzene. Xylenes are released into the atmosphere as fugitive emissions from industrial sources, from auto exhaust, and through volatilization from their use as solvents. Acute (short-term) inhalation exposure to mixed xylenes in humans results in irritation of the eyes, nose, and throat, gastrointestinal effects, eye irritation, and neurological effects. Chronic (long-term) inhalation exposure of humans to mixed xylenes results primarily in central nervous system (CNS) effects, such as headache, dizziness, fatigue, tremors, and incoordination; respiratory, cardiovascular, and kidney effects have also been reported. EPA has classified mixed xylenes as a Group D, not classifiable as to human carcinogenicity. Mixed xylenes are used in the production of ethylbenzene, as solvents in products such as paints and coatings, and are blended into gasoline.

AIR QUALITY IMPACT ANALYSIS

Since this source is an area source and not subject to 45CSR14, no air modeling was deemed necessary.

RECOMMENDATION TO DIRECTOR

General permit G70-A131B meets all requirements of applicable state and federal regulations. Therefore, it is recommended that General Permit G70-A131B should be issued to Antero Resources Corporation.



Caraline Griffith
Permit Engineer

11/30/15

Date