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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-2776B
Plant ID No.:	045-00133
Applicant:	Chesapeake Appalachia, LLC (CHK)
Facility Name:	Smokehouse Compressor Station
Location:	Chapmanville, Logan County
SIC Code:	1311
NAICS Code:	211111
Application Type:	Modification
Received Date:	Augsst 25, 2014
Engineer Assigned:	Laura Jennings
Fee Amount:	$2,000.00
Date Received:	August 27, 2014
Complete Date:	October 29, 2014
Due Date:	January 27, 2015
Applicant Ad Date:	August 22, 2014
Newspaper:	*The Logan Banner*
UTM's:	Easting: 405.18 km Northing: 4197.81 km Zone: 17
Description:	Installation of a 1,775 hp Caterpillar G3606 compressor engine [EUCE-2R]; correction of manufacture date for emergency generator engine [GEN-1]; and removal of compressor engine [EUCE-2] that was permitted but never installed.

OVERVIEW

Chesapeake Appalachia, LLC (Chesapeake), a subsidiary of Chesapeake Energy Corporation, operates the Smokehouse Compressor Station under permit R13-2776A dated November 19, 2008. With this modification application, Chesapeake requests authorization to install a 1,775-hp Caterpillar G3606 compressor engine at the site. Chesapeake also requests to update the permit to reflect a correction to the manufacture date of the emergency generator. The generator was ordered in spring 2008 and was expected to have a manufacture date before January 1, 2009, the NSPS Subpart JJJJ applicability date for emergency engines. It was recently discovered during an internal audit that the generator has a manufacture date of February 17, 2009 and is thus subject to NSPS Subpart JJJJ requirements. Emissions for the engine have been revised to

reflect a catalyst control and Subpart JJJJ emissions limitations. One of the currently permitted compressor engines [EU-CE2] was never installed and should be removed from the permit. Also, emissions from tanks currently installed have been quantified for the first time with this application.

DESCRIPTION OF PROCESS

The following process description was taken from Permit Application R13-2776B:

After installation of the proposed engine, facility equipment will include: one (1) natural gas-fired 1,653-hp Caterpillar G3606 TALE compressor engine with oxidation catalyst [EU-CE1], one (1) natural gas-fired 1,775-hp Caterpillar G3606 compressor engine with oxidation catalyst [EUCE-2R], one (1) natural gas-fired 690-hp Caterpillar G3412 TA emergency generator [EU-GEN1], one (1) 17.0 MMSCFD ethylene glycol dehydration unit [EU-EG] consisting of still vent [EP-STL] and 0.5 MMBTU/HR reboiler [EP-RBL], one (1) 4,200 gallon pipeline fluids tank[EUTK-1], one (1) 2,000 gallon pipeline fluids tank [EU-TK-2], and associated fugitive emissions [EU-FUG]. A non-fractionating processing plant is also present at the facility. One (1) 2,000 gallon waste oil tank, one (1) 2,000 gallon compressor lube oil tank, one (1) 2,000 gallon engine oil tank, two (2) 300 gallon compressor lube oil tanks, two (2) compressor engine oil tanks, one (1) 2,000 gallon glycol tank, and one (1) 1,000 gallon glycol tank are also onsite but have insignificant emissions. Note that other small storage tanks may be present on site but are considered *de minimis* sources per Table 45-13B and are not addressed further in this modification application.

The emission units table for the changes addressed in this application is provided at the end of this section.

The facility is a natural gas compressor station and processing (dew point) plant. Inlet gas enters the facility via pipeline. The gas travels through a scrubber to remove pipeline liquids and then travels to the compressor (four stages) where the gas is compressed to 600/1,050 psig. The gas is sent to a refrigerated natural gas dew point plant (nonfractionating processing plant) for hydrocarbon (butanes plus) removal. This is accomplished by a series of heat exchanges and the refrigeration system. The gas is cooled to approximately 20° F. Ethylene glycol is also injected into the gas stream to prevent freezing and remove entrained water. The gas then travels to a three phase separator that sends the natural gas (primarily ethane and methane) to a pipeline for transmission/sales. The hydrocarbons in liquid form are sent to the pressurized natural gas liquids (NGL) storage tanks. NGL is sold and transported off location via tanker truck.

Emission Units Table:

Emission Unit ID	Emission Point ID	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type and Date of Change	Control Device
EUCE-2	EPCE-2	Caterpillar G3606 TALE Engine	N/A	1,653-hp	Remove	Oxidation Catalyst
EUCE-2R	EPCE-2R	Caterpillar G3606 Engine	2014	1,775 hp	New	Oxidation Catalyst
EUGEN-1	EPGEN-1	Caterpillar G3412 TA Emergency Generator Engine	2008	690 hp	Modification	NSCR
EUTK-1	EPTK-1	Pipeline Fluids Tank	2008	4,200 gal	Name	N/A

					Change[1]	
EUTK-2	EPTK-2	Pipeline Fluids Tank	2008	2,000 gal	Name Change[2]	N/A
EUTK-6	EPTK-7	Ethylene Glycol Tank	2008	2,000 gal		N/A
EUTK-7	EPTK-7	Ethylene Glycol Tank	2008	1,000 gal		N/A
EU-LOAD	EP-LOAD	Pipeline Fluids Truck Loading	2008	25,500 gal/yr[3]	Name Change	N/A

[1] – Formerly known as waste liquids tank
[2] – Formerly known as produced fluids tank
[3] – Loading capacity represents hydrocarbon portion of fluids, which is assumed to be 20% of total throughput.

SITE INSPECTION

A site inspection is not required for this modification application because the site is already in operation.

The facility was last inspected on July 2, 2014 by James Jarrett of DAQ's Compliance and Enforcement section.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

A fuel heating value of 905 Btu/scf was used to calculate emissions from natural gas-fired equipment. Actual heating value may vary (generally 905 - 1,300) but using a lower heating value in the emissions calculations provides a more conservative (higher) estimate of fuel use. Compressor engine and generator engine emissions were calculated with manufacturer emission factors when available and AP-42 factors for all other pollutants. The emergency generator [GEN-1] emissions are based on 500 operating hours per year. Emissions are also provided for the existing pipeline fluids storage tanks EPTK-1 and EPTK-2 and for the pipeline fluids truck loading. Pipeline fluid tank emissions were calculated with EPA TANKS 4.09d, with 20% of contents modeled as Gasoline RVP10. Tank truck loading emissions were calculated using the equation in AP-42, Chapter 5.2. The emissions calculations were reviewed and verified by the writer.

Emissions Summary Table:

Emission Point ID	Emission Unit ID	Control Device	Pollutant	Maximum Controlled Emission Rate	
				Hourly (lb/hr)	Annual (ton/year)
EPCE-2R	CE-2R	Oxidation Catalyst	NO_X	1.96	8.57
			CO	7.83	34.28
			VOC	2.74	12.00
			SO_2	0.01	0.03
			$PM_{2.5}$	<0.01	<0.01
			PM Total	0.12	0.53
			Formaldehyde	0.23	1.03
			Total HAPs	0.46	2.00

			CO_2e	1,747	6,947
EPGEN-1	GEN-1	NSCR	NO_X	3.04	0.76
			CO	6.08	1.52
			VOC	1.52	0.38
			SO_2	<0.01	<0.01
			$PM_{2.5}$	0.05	0.01
			PM Total	0.10	0.03
			Formaldehyde	0.10	0.03
			Total HAPs	0.16	0.04
			CO_2e	592	148
EPTK-1	EUTK-1	None	VOC	0.07	0.32
			Total HAPs	<0.01	0.01
EPTK-2	EUTK-2	None	VOC	0.02	0.10
			Total HAPs	<0.01	<0.01
EP- LOAD	EU-LOAD	None	VOC	n/a	0.06
			Total HAPs	n/a	<0.01
			CO_2e	0.02	0.09

Facility PTE Table:

Regulated Pollutant	Current Potential Emissions [1] (TPY)	Proposed Potential Emissions [2] (TPY)	PTE Emissions Change (TPY)
NO_X	56.58	18.75	-37.83
CO	9.80	39.48	29.68
VOC	53.64	53.97	0.33
SO_2	0.37	0.22	-0.15
PM 10	1.15	1.14	-0.01
Formaldehyde	3.42	2.72	-0.70
Total HAPs	13.14	12.27	-0.87

(1) Current potential emissions include: 1,653 hp Caterpillar G3606 TALE Engines (CE-1, CE-2), 690 hp Caterpillar G3412 TA Emergency Generator Engine (GEN-1), EG Dehydration Unit (EU-EG), and Fugitive Emissions. Note 1: although the pipeline storage tanks and loading are existing emission units, they were not previously quantified. Note 2: although engine CE-2 was never installed, it is included because the emissions were permitted.

(2) Proposed emissions include: 1,653 hp Caterpillar G3606 TALE Engine (CE-1), 1,775 hp Caterpillar G3606 Engine (CE-2R), Revised 690 hp Caterpillar G3412 TA Emergency Generator Engine (GEN-1), EG Dehydration Unit (EU-EG), Pipeline Fluids Tanks (TK-1, TK-2), Pipeline Fluids Truck Loading (EU-Load), and Fugitive Emissions.

REGULATORY APPLICABILITY

The following rules were reviewed and are applicable for this modification application.

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)

Potential emissions associated with this application exceed the thresholds of 6 lb/hr and 10 tpy of a regulated pollutant and therefore meet the definition of a modification per § 2.17.a.

The applicant has demonstrated compliance with this rule by submitting a complete permit application and providing the public notice in *The Logan Banner* on August 22, 2014.

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

45CSR16 applies to this source by reference of 40CFR60, Subpart JJJJ and Supart OOOO as further discussed below.

45CSR30 (Requirements for Operating Permits)

The Smokehouse Compressor station does not meet the definition of a major source according to the definition provided in § 2.26.a.1 because the facility PTE does not meet the threshold of 10 tpy for a single HAP or more than 25 tpy of any combination of HAPs. Furthermore, the facility does not meet the definition provided in § 2.26.b because the facility PTE is less than the threshold of 100 tpy of any air pollutant subject to regulation.

The facility is a nonmajor source subject to 45CSR30. CHK is subject to 45CSR30 due to them being subject to the area source provisions of 40CFR60, Subparts JJJJ and OOOO and 40CFR63, Subpart ZZZZ; however, they are exempt from the obligation to obtain a Title V permit because they are not otherwise required to do so.

45CSR34 (Emission Standards for Hazardous Air Pollutants)

The facility is subject to 45CSR34 because they are subject to 40CFR63, Subpart ZZZZ.

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

40CFR60 Subpart JJJJ sets forth emission limits, fuel requirements, installation requirements, and monitoring requirements based on the year of installation of the subject internal combustion engine. 40CFR60 Subpart JJJJ is applicable to owners and operators of new stationary spark ignition internal combustion engines manufactured after July 1, 2007, for engines with a maximum rated power capacity greater than 500 hp.

The manufacture date of the proposed 1,775-hp, four-stroke, lean-burn natural gas-fired engine [CE-2R] has not yet been determined, but it is presumed to have been manufactured after July 1, 2010. The engine is subject to the emission standards for

engines greater than or equal to 500 hp (except lean burn 500≤HP<1,350 and gasoline or rich burn LPG) that commenced construction after June 12, 2006 and were manufactured on or after July 1, 2007. The emission standards are: NO_X - 1.0 g/HP-hr; CO - 2.0 g/HP-hr; and VOC - 0.7 g/HP-hr (excluding formaldehyde). Based on the manufacturer's specifications for these engines, the emission standards will be met.

The 690-hp, four-stroke, rich-burn natural gas-fired emergency generator engine [GEN-1] has a manufacture date of February 17, 2009 and is subject to the emissions limitations of this subpart for emergency engines greater than or equal to 100 hp. The emission standards are: NO_X - 2.0 g/HP-hr; CO - 4.0 g/HP-hr; and VOC - 1.0 g/HP-hr (excluding formaldehyde). Based on the manufacturer's specifications for these engines, the emission standards will be met. All emergency stationary ICE must comply with the requirements specified in § 60.4243(d) in order to be considered emergency stationary ICE.

Requirements for both engines include performance testing, recordkeeping, and reporting. Chesapeake has stated in the application that they will comply with all applicable requirements.

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

This subpart 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 emission sources affected by this subpart include well completions, pneumatic controllers, equipment leaks from natural gas processing plants, sweetening units at natural gas processing plants, reciprocating compressors, centrifugal compressors and storage vessels which are constructed, modified or reconstructed after August 23, 2011. The reciprocating compressor associated with the proposed engine [CE-2R] is subject to this subpart. All other potentially affected equipment at the facility was constructed prior to the effective date of the rule and is not subject to this subpart.

The facility will demonstrate compliance by demonstrating compliance with the permit requirements, including the rod packing requirements of § 60.5385, the initial compliance requirements in § 60.5410, the continuous compliance requirements of §60.5415, and the notification, recordkeeping, and reporting requirements of §60.5420.

The permit requirements will include the December 31, 2014 amendments.

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

Subpart ZZZZ establishes national emission limitations and operating limitations for hazardous air pollutants (HAP) emitted from stationary reciprocating internal combustion engines (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.

You are subject to this subpart if you own or operate a stationary RICE at a major or area source of HAP emissions, except if the stationary RICE is being tested at a stationary RICE test cell/stand. A stationary RICE located at an area source of HAP emissions is new if you commenced construction or reconstruction of the stationary RICE on or after June 12, 2006.

Both the proposed compressor engine [CE-1R] and the emergency generator engine [GEN-1] are considered new engines and will meet the requirements of this subpart by complying with the requirements under NSPS, Subpart JJJJ.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

There are no new hazardous air pollutants as a result of this modification application.

AIR QUALITY IMPACT ANALYSIS

The facility will not be a major source as defined by 45CSR14. Based on the nature of the emissions and the annual emission rate, no air quality impact analysis was performed.

MONITORING OF OPERATIONS

As a result of the changes proposed in this modification application, CHK will be required to perform the following monitoring:

- Recordkeeping requirements for the 500 hour operating limit for the emergency generator engine [GEN-1]
- Catalyst monitoring requirements for CE-2R and GEN-1
- NSPS, Subpart JJJJ monitoring, recordkeeping, and reporting requirements for CE-2R and GEN-1 for non-certified engines.
- NSPS, Subpart OOOO monitoring, recordkeeping, reporting requirements for CE-2R.

CHANGES TO PERMIT R13-2776A

- Miscellaneous changes to reflect current revision of the permit and current administration.
- The emissions unit table in Section 1.0 was revised as discussed in the process description section of this evaluation.
- Updated the correspondence address for the U.S. EPA in § 3.5.3.
- Section 5.0 - Emission limits were added for CE-2R and revised for GEN-1 as discussed in the emissions section of this evaluation. Natural gas consumption rates were added for CE-2R and revised for GEN-1 accordingly. An annual operating limit of 500 hours was placed on the emergency generator [GEN-1]. Requirements were added for Oxidation catalyst for CE-2R and for NSCR catalyst for GEN-1.
- NSPS Subpart JJJJ requirements in section 9.0 for engines CE-1 were added and/or revised to the current amendments because section 9.0 was written prior to the latest EPA

amendments.

- Section 10.0 was added for the NSPS Subpart OOOO requirements for CE-2R.

RECOMMENDATION TO DIRECTOR

The information provided in the modification application indicates that CHK's natural gas compressor station meets all the requirements of applicable regulations. Therefore, it is recommended that modification permit R13-2776B be granted to Chesapeake Appalachia, LLC for the Smokehouse Compressor Station located in Chapmanville, Logan County, WV.

Laura M. Jennings
Permit Engineer

Jan 29, 2015
Date