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**west virginia** department of environmental protection

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Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
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## **ENGINEERING EVALUATION / FACT SHEET**

### BACKGROUND INFORMATION

Application No.: R13-3076  
Plant ID No.: 033-00200  
Applicant: E. Marcellus Asset Company, LLC  
Facility Name: Tichenal Station  
Location: Harrison County  
NAICS Code: 486210  
Application Type: Modification  
Received Date: May 8, 2013  
Engineer Assigned: David Keatley  
Fee Amount: \$1,500  
Date Received: May 8, 2013  
Complete Date: September 27, 2013  
Due Date: December 26, 2013  
Applicant Ad Date: February 6, 2013  
Newspaper: *The Exponent Telegram*  
UTM's: Easting: 547.619 km Northing: 4,337.377 km Zone: 17  
Description: Removal of five (5) compressor engines and installation of five more powerful engines.

### DESCRIPTION OF PROCESS

Natural gas enters the facility via pipeline. The natural gas stream first goes to the inlet separator where liquids fall out of the natural gas stream and flow to the produced water tanks (T01, T02, T08, and T09). The natural gas stream which leaves the inlet separator goes to nine (9) compressors to raise the pressure of the natural gas stream. Drains from the compressors go to the produced water tanks. The compressors are powered by nine compressor engines CE-6 through CE-14. The nine compressor engines are natural gas fired rich-burn four-stroke 1,680 bhp Waukesha L7044GSI. The compressor engines are equipped with Maxim three-way catalyst which reduces the following pollutants by the following percentages: nitrogen oxides, 96.5%; carbon monoxide (CO) 95%, volatile organic compounds (VOCs), 90%; and formaldehyde, 98%. The compressed natural gas stream flows to two (2) triethylene glycol (TEG) dehydration units to reduce the water

content of the natural gas stream. Lean TEG will flow countercurrent to the natural gas stream in the contactors to removal water and other constituents. The rich TEG will then be sent to the flash tank where vapors flash and are controlled by the flame zone of the reboiler (98% control efficiency). The liquids from the flash tank then go to the regenerator to remove the water from the rich TEG. The vapors from the regenerator are piped to a condenser to remove most of the water vapor and then piped to the flash zone of the reboiler for a 98% combustion efficiency. The Reboilers (RBV-1 and RBV-2) combusts vapors from the flash tank and condenser and warms the regenerator to evaporate water allow with other pollutants from the rich TEG stream.

## SITE INSPECTION

A site visit was conducted by the writer on March 7, 2013. The facility seemed to be an appropriate location for a natural gas compressor station.

## ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Emissions from tanks T03 through T07 will be considered negligible due to the substances vapor pressures.

The maximum controlled point source emissions are summarized in the table below:

Source ID	Emission Source	Pollutant	Maximum Hourly Emissions (lb/hr)	Maximum Annual Emissions (tpy)
CE-6	Compressor Engine Waukesha L7044GSI 1,680 bhp	Nitrogen Oxides	0.73	3.21
		Carbon Monoxide	2.20	9.65
		Volatile Organic Compounds	0.07	0.32
		Sulfur Dioxide	0.01	0.04
		Total Particulate Matter	0.27	1.17
		PM <sub>10</sub>	0.27	1.17
		Formaldehyde	<0.01	0.02
		CO <sub>e</sub>	2,011	8,809
CE-7	Compressor Engine Waukesha L7044GSI 1,680 bhp	Nitrogen Oxides	0.73	3.21
		Carbon Monoxide	2.20	9.65
		Volatile Organic Compounds	0.07	0.32
		Sulfur Dioxide	0.01	0.04
		Total Particulate Matter	0.27	1.17
		PM <sub>10</sub>	0.27	1.17
		Formaldehyde	<0.01	0.02
		CO <sub>e</sub>	2,011	8,809

CE-8	Compressor Engine Waukesha L7044GSI 1,680 bhp	Nitrogen Oxides	0.73	3.21
		Carbon Monoxide	2.20	9.65
		Volatile Organic Compounds	0.07	0.32
		Sulfur Dioxide	0.01	0.04
		Total Particulate Matter	0.27	1.17
		PM <sub>10</sub>	0.27	1.17
		Formaldehyde	<0.01	0.02
		CO <sub>e</sub>	2,011	8,809
CE-9	Compressor Engine Waukesha L7044GSI 1,680 bhp	Nitrogen Oxides	0.73	3.21
		Carbon Monoxide	2.20	9.65
		Volatile Organic Compounds	0.07	0.32
		Sulfur Dioxide	0.01	0.04
		Total Particulate Matter	0.27	1.17
		PM <sub>10</sub>	0.27	1.17
		Formaldehyde	<0.01	0.02
		CO <sub>e</sub>	2,011	8,809
CE-10	Compressor Engine Waukesha L7044GSI 1,680 bhp	Nitrogen Oxides	0.73	3.21
		Carbon Monoxide	2.20	9.65
		Volatile Organic Compounds	0.07	0.32
		Sulfur Dioxide	0.01	0.04
		Total Particulate Matter	0.27	1.17
		PM <sub>10</sub>	0.27	1.17
		Formaldehyde	<0.01	0.02
		CO <sub>e</sub>	2,011	8,809
CE-11	Compressor Engine Waukesha L7044GSI 1,680 bhp	Nitrogen Oxides	0.73	3.21
		Carbon Monoxide	2.20	9.65
		Volatile Organic Compounds	0.07	0.32
		Total Particulate Matter	0.27	1.17
		PM <sub>10</sub>	0.27	1.17
		Formaldehyde	<0.01	0.02
		CO <sub>e</sub>	2,011	8,809
		CE-12	Compressor Engine Waukesha L7044GSI 1,680 bhp	Nitrogen Oxides
Carbon Monoxide	2.20			9.65
Volatile Organic Compounds	0.07			0.32
Sulfur Dioxide	0.01			0.04
Total Particulate Matter	0.27			1.17
PM <sub>10</sub>	0.27			1.17
Formaldehyde	<0.01			0.02
CO <sub>e</sub>	2,011			8,809

CE-13	Compressor Engine Waukesha L7044GSI 1,680 bhp	Nitrogen Oxides	0.73	3.21
		Carbon Monoxide	2.20	9.65
		Volatile Organic Compounds	0.07	0.32
		Sulfur Dioxide	0.01	0.04
		Total Particulate Matter	0.27	1.17
		PM <sub>10</sub>	0.27	1.17
		Formaldehyde	<0.01	0.02
		CO <sub>e</sub>	2,011	8,809
CE-14	Compressor Engine Waukesha L7044GSI 1,680 bhp	Nitrogen Oxides	0.73	3.21
		Carbon Monoxide	2.20	9.65
		Volatile Organic Compounds	0.07	0.32
		Sulfur Dioxide	0.01	0.04
		Total Particulate Matter	0.27	1.17
		PM <sub>10</sub>	0.27	1.17
		Formaldehyde	<0.01	0.02
		CO <sub>e</sub>	2,011	8,809
RBV-1	Reboiler 1.5 MMBTU/hr	NO <sub>x</sub>	0.15	0.67
		CO	0.13	0.56
		VOC	0.01	0.04
		Total Particulate Matter	0.01	0.05
		PM <sub>10</sub>	0.01	0.05
		CO <sub>e</sub>	185	810
RSV-1	TEG Regenerator Still Vent 64 MMCF/day	VOC	0.40	1.76
		n-Hexane	<0.01	0.01
RBV-2	Reboiler 1.5 MMBTU/hr	NO <sub>x</sub>	0.15	0.67
		CO	0.13	0.56
		VOC	0.01	0.04
		Total Particulate Matter	0.01	0.05
		PM <sub>10</sub>	0.01	0.05
		CO <sub>e</sub>	185	810
RSV-2	TEG Regenerator Still Vent 60 MMCF/day	VOC	0.41	1.77
		n-Hexane	<0.01	0.01
FUG	Fugitive Emissions	VOC	0.16	0.70
B&P	Blowdowns and Pigging	VOC	-	0.43
T01, T02, T08, and T09	Produced Water Tanks	VOC	0.06	0.25

The following table represents the facility wide total emissions and the change in emissions:

Pollutant	Increase in emissions tons/year	Total Facility Emissions tons/year
Nitrogen Oxides	2.41	30.25
Carbon Monoxide	17.40	88.0
Volatile Organic Compounds	-51.98	9.71
Particulate Matter-10	5.97	10.64
Sulfur Dioxide	0.01	0.33
Formaldehyde	0.02	0.15
Benzene	0.08	0.09
n-Hexane	0.00	0.01
Carbon Dioxide Equivalent	15,794	80,900

#### REGULATORY APPLICABILITY

##### **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 of the proposed fuel burning units RBV-1 (1.5 MMBTU/hr) and RBV-2 (1.5 MMBTU/hr) are below 10 MMBTU/hr. Therefore, these units are exempt from the aforementioned sections of 45CSR2. However, RBV-1 and RBV-2 are 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**

This facility shall not cause the discharge of air pollutants which cause or contribute to an objectionable odor at any location occupied by the public. 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.

**45CSR10 - To Prevent and Control Air Pollution From the Emissions of Sulfur Oxides  
The Reboilers**

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 of the proposed fuel burning units RBV-1 (1.5 MMBTU/hr) and RBV-2 (1.5 MMBTU/hr) are below 10 MMBTU/hr. Therefore, this unit 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**

45CSR13 applies to this source due to the fact that the changes proposed under this permitting action results in an emissions increase above permitting thresholds (6 lb/hr and 10 tons/year). Therefore, E. Marcellus is required to submit a modification application. E. Marcellus has published the required Class I legal advertisement notifying the public of their permit application.

**45CSR22 - Air Quality Management Fee Program**

This facility is a minor source, not subject to 45CSR30, and the NSPS are Title V exempt. This facility is required to keep their Certificate to Operate current. E. Marcellus paid a \$1,000 construction application fee and \$1,000 NSPS fee. Since this facility has a total reciprocating engine capacity of greater than 1,000 hp (15,120 hp) this facility is subject to 8D with an annual fee of \$500.

**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. Tichenal Station is a natural gas production facility that processes, upgrades, or stores natural gas prior to transmission. Tichenal Station is an area source of HAPs refer to the previous facility wide emissions table.

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

average emissions of benzene from the glycol dehydration unit process vent to the atmosphere are less than 0.90 megagram [1 TPY] per year.”

As shown above, the maximum PTE of benzene emissions from the GDU process vent is 0.00 TPY. Therefore, the GDU is exempt from the Subpart HH requirements given under §63.764(d).

**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 Nice Station is subject to the area source requirements and has non-emergency spark ignition engines.

Engine CE-1 through CE-14 are "New Stationary RICE" sources at an area source of HAPs and are affected source because construction will commence after June 12, 2006 [63.6590(a)(2)(iii)] due to the manufacturer's dates of the engines.

This regulation states engine CE-6 through CE-14 must meet the requirements of 40CFR60 subpart JJJ, but has no additional requirements due to this regulation.

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

Engines (CE-6 through CE-14) are subject to 40CFR60 Subpart JJJJ because construction was after June 12, 2006; and were manufactured after July 1, 2007.

**[40CFR60.4230(4)(i)]**

40CFR60.4248 Table 1 provides the allowable emission standards for stationary spark ignition internal combustion engines. Engines (CE-6 through CE-14) is a non-emergency hp $\geq$ 500 manufacturer date after July 1, 2010 the allowable emission standards in g/hp-hr are: 1.0 for NO<sub>x</sub>, 2.0 for CO, and 0.7 for VOC. The engines will also have operating limits, performance tests, notification requirements, and recordkeeping requirements.

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

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

EPA issued its new source performance standards (NSPS) and air toxics rules for the oil and gas sector on April 17, 2012. 40CFR60 Subpart OOOO establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur

dioxide (SO<sub>2</sub>) 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:

- a. 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 will be nine (9) reciprocating compressor associated with CE-6 through CE-14 at this facility. The compressors associated with CE-6 through CE-14 were constructed in 2007 before the effective date of this regulation and therefore this regulation is not subject. The compressor associated with CE-2 was constructed after the effective date of this regulation and is therefore subject. Requirements will include replacing rod packing systems, recordkeeping, and reporting.*

- b.
  1. 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.
  2. 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.

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

- c. 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 nonearthen 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:

1. 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.

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

3. 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.

*Tanks T01, T02, T08, and T09 were constructed (2008) after August 23, 2011 and are not affected facilities.*

#### **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 tanks at this facility are 47.7 cubic meters each. Therefore these tanks would not be subject to this regulation.

#### TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

The following information was obtained from USEPA's Air Toxic Website

##### **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.

## **Formaldehyde**

Formaldehyde is used mainly to produce resins used in particleboard 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).

## **Hexane**

Hexane is used to extract edible oils from seeds and vegetables, as a special-use solvent, and as a cleaning agent. Acute (short-term) inhalation exposure of humans to high levels of hexane causes mild central nervous system (CNS) effects, including dizziness, giddiness, slight nausea, and headache. Chronic (long-term) exposure to hexane in air is associated with polyneuropathy in humans, with numbness in the extremities, muscular weakness, blurred vision, headache, and fatigue observed. Neurotoxic effects have also been exhibited in rats. No information is available on the carcinogenic effects of hexane in humans or animals. EPA has classified hexane as a Group D, not classifiable as to human carcinogenicity.

## AIR QUALITY IMPACT ANALYSIS

Based on the annual emissions rates this facility will not be a major source as defined by 45CSR14, so no air quality impact analysis was performed.

## CHANGES TO PERMIT G35-A062A

This permit will supercede and replace permit G35-A062A. Removal of five existing 1,380 bhp engines and installation of five 1,680 bhp horsepower compressor engines.

RECOMMENDATION TO DIRECTOR

E. Marcellus's request for a Modification to Tichenal Station near Tichenal, Harrison County, WV site should meet all applicable requirements and therefore should be granted.

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David Keatley  
Permit Writer

September 27, 2013  
Date

Fact Sheet R13-3076  
E. Marcellus Asset Company, LLC  
Tichenal Station