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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.: R13-2794A
Plant ID No.: 049-00130
Applicant: Fairmont Brine Processing, LLC
Facility Name: Marion County Brine Water Recycling Plant
Location: Fairmont, Marion County
SIC/NAICS Code: 1389/213112
Application Type: Class II Administrative Update
Received Date: June 17, 2016
Engineer Assigned: Joe Kessler
Fee Amount: \$300
Date Received: June 22, 2016
Complete Date: June 23, 2016
Due Date: August 22, 2016
Applicant's Ad Date: June 21, 2016
Newspaper: *Times West Virginian*
UTM's: 575.2 km Easting • 4,373.5 km Northing • Zone 17
Latitude/Longitude: 39.50800/-80.12600
Description: Class II Administrative Update (A/U) for an increase in the existing plant capacity to process brine water from area natural gas operations, the addition of a lime silo as part of an expansion of their pretreatment operations, and the addition of a new 34 mmBtu/hr natural gas-fired boiler to provide redundant backup heat.

On May 12, 2009 Permit Number R13-2794 was issued to AOP Clearwater, LLC for the construction of a brine water recycling plant. Since that time, Fairmont Brine Processing, LLC (FBP) has purchased the facility and transferred the permit into their name. On May 25, 2016, the DAQ sent FBP a "permit needed letter" (PD16-034) for the proposed changes to the facility described herein. On November 4, 2009, General Permit Registration Number G65-C277 was issued to FBP for the installation of a 131.6 horsepower (hp) Cummins WSG-1068A emergency generator at the facility to provide backup power. FBP has indicated that this unit has not been installed.

DESCRIPTION OF PROCESS/MODIFICATIONS

Existing Facility

FBP's Marion County Brine Water Recycling Plant treats, cleans, and recycles used brine water for use in future natural gas well development. The source water (untreated brine water) used is trucked in from natural gas well development and production. The water is pre-treated at the facility to remove oil and suspended solids. Following pretreatment, the water is processed at a maximum rate of 5,400 barrels/day to remove dissolved solids to a concentration of less than five hundred (500) mg/L. The distilled water is then discharged to the Monongahela River under National Pollutant Discharge Elimination System (NPDES) Permit No. WV0116408 or sold to natural gas well drilling companies for re-use in natural gas well development. The sodium and calcium chloride salts removed from the water are sold as products. A detailed post-modification process description is located in Attachment G of the permit application.

Brine Treatment

The facility receives untreated brine water with limited (less than 0.1%) crude oil, suspended solids, and dissolved solids by tank trucks. After arrival and before unloading (unless previously characterized), the contents of the trucks are sampled and tested for chemical composition and physical properties. The trucks are unloaded on a concrete pad with the untreated brine water transferred to a concrete-lined basin. Oil is removed by an oil skimmer from the top of the basin and stored in the oil storage tank (T-01). The treated brine water flows from the basin to the oil/water separator for oil removal to the oil storage tank. From the oil/water separator the treated brine water is currently pumped through bag filters for solids removal and then through activated carbon filters to remove the organics.

Evaporation

The brine water from the brine pond impoundment is currently processed at a rate of approximately 5,000 barrels per day to remove dissolved solids (S-3). The heat source for the process is steam produced by a 40 mmBtu/hr natural gas-fired boiler (S-1). The brine water from the brine pond impoundment is pumped through bag filters and heat exchangers to preheat the brine water for processing. The brine water feed is then pumped to vapor liquid separators (VLSs) for evaporation. In the VLSs, the brine water is concentrated as the distilled water is evaporated out the top of the vessel, passing through a mist eliminator vessel. A recirculating stream is pumped through the first effect heat exchanger and heated to allow vaporization of clean water from the brine water in the VLS. The water vapors from the first effect VLS continue to the second effect heat exchanger, which heats the recirculating brine in the second effect VLS system. The second effect VLS operates in the same manner as the first effect VLS where the water vapor from the top of the second VLS flows to the third effect heat exchanger for the recirculating of brine water to the third effect VLS. The brine water is delivered to the first and second VLSs in a parallel feed flow. Hence, the FBP plant has three vapor liquid separators with two operating in parallel for the process stream and three operating in series for efficient steam energy utilization.

The distilled water vapors from this process are condensed in the downstream heat exchangers and in a barometric condenser system. The distilled water is delivered to a hot well for delivery and storage in the existing 1.25 million gallon clean water pond. The non-condensable vapors from the barometric condenser system and from mist eliminator lines are pumped through

a vacuum pump separator and an activated carbon bed (GAC-3) to atmosphere. The activated carbon bed provides an 80% control of the evaporated vapors.

Crystallization

Salt crystallization begins in the VLSs as the water is evaporated and the concentration of the remaining brine exceeds the saturation point of the brine water solution. A salt crystal bearing brine water slurry is transferred between evaporators and then removed as a single stream leaving the third effect VLS. The slurry is pumped to the settler tank where continued salt formation occurs before it is transferred to the centrifuge. The salt crystals are separated from the concentrated brine water in the centrifuge and are then fed via a conveyor to a 10 mmBtu/hr natural gas-fired rotary dryer (S-2). The wet salt cake from the conveyor is dried in the rotary dryer and then conveyed to a storage pile to await customer distribution. The concentrated brine water from the centrifuge is returned to the second and third effect VLSs for continued processing, as well as pumped to CaCl₂ storage are for external sale.

Proposed Modifications

FBP is now proposing to make the following modifications at the facility:

- Replace the existing third-effect heat exchanger, which will allow for an increase in plant capacity to treat brine water from 8,750 gallons/hr to 9,000 gallons/hour;
- Expand their pretreatment operations to include chemical precipitation, clarification, and effluent and sludge processing. This includes the installation of a new lime silo (S-6); and
- Installation of a second natural gas-fired boiler (S-7), a 34 mmBtu/hr Cleaver-Brooks CB 800-300#, to provide a redundant heat source for the evaporation process. It is important to note that FBP states the boilers will not operate concurrently.

SITE INSPECTION

Due to the nature of the proposed modification, a site inspection by the writer was deemed as not necessary. On February 12, 2016, a site inspection of the SSA facility was conducted by Mr. Karl Dettinger of the DAQ Compliance/Enforcement (C/E) Section. This inspection found the facility be "Status 30 - In Compliance."

AIR EMISSIONS AND CALCULATION METHODOLOGIES

FBP included in Attachment N emissions calculations for the proposed modifications at the Marion County Brine Water Recycling Plant. The following will review and summarize those emission calculations.

Evaporator Emissions

Uncontrolled emissions from evaporator operations (E-3) were based on material balance equations (all pollutants in the source brine water are considered emitted during the evaporation process) and analytical results for ten (10) recent samples pulled from two (2) sample locations at the facility. Maximum hourly emissions were based on a maximum throughput of 9,450 gallons per hour and annual emissions were based on operating 8,760 hours per year. All results were increased by a safety factor of three (3) to account for potential variability. Controlled emissions were based on the GAC-3 carbon absorption system providing an 80% control factor for the uncontrolled emissions.

New Lime Silo

Controlled emissions from the new lime silo (E-6) are based on an outlet dust filter grain loading of 0.01 gr/dscf and on a total air volume/event as calculated from the size of vessel and filling time.

New Boiler

Emissions from the new 34 mmBtu/hr Cleaver-Brooks CB 800-300# natural gas-fired boiler (E-7) were based on emissions information as provided by the vendor and as based on emission factors provided in AP-42, Section 1.4 (AP-42 is a database of emission factors maintained by USEPA). Maximum hourly emissions were based on the maximum design heat input (MDHI) of the boiler and the annual emissions were based on the boiler operating 8,760 hours per year. As noted above, it is important to note that FBP states the boilers will not operate concurrently and, therefore, as the new boiler is smaller than the existing boiler (S-1), the addition of this boiler will not add to the potential-to-emit (PTE) of the facility.

Emissions Summary

The new post-modification potential-to-emit (PTE) of the Marion County Brine Water Recycling Plant is given in the following table:

Table 1: Post-Modification Facility-Wide PTE

Source	CO		NO _x		PM ⁽¹⁾		SO ₂		VOCs		HAPs	
	PPH	TPY	PPH	TPY	PPH	TPY	PPH	TPY	PPH	TPY	PPH	TPY
Boilers	3.20	14.02	2.34	16.21	0.19	0.82	0.02	0.10	0.21	0.91	0.07	0.32
Dryer	0.34	1.48	0.40	1.76	0.03	0.13	0.01	0.01	0.02	0.10	0.02	0.08
Evaporator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.70	0.05	0.23
Lime Silo	0.00	0.00	0.00	0.00	0.07	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Generator	1.16	0.29	0.58	0.15	0.01	0.01	0.01	0.01	0.29	0.07	0.06	0.02
Totals →	4.70	15.79	3.32	18.12	0.30	0.98	0.04	0.12	0.68	1.78	0.20	0.65

- (1) All particulate matter emissions assumed to be 2.5 microns or less.
- (2) As boilers will not run concurrently, emissions are based on the higher emitting boiler S-1.

The change in PTE as a result of the proposed modifications evaluated herein is given in the following table:

Table 2: Change In Facility-Wide Annual PTE

Pollutant	R13-2794 G65-C277 ⁽¹⁾	R13-2794A	Change
	tons/year	tons/year	tons/year
CO	15.79	15.79	0.00
NO _x	18.12	18.12	0.00
PM _{2.5} /PM ₁₀ /PM	0.96	0.98	0.02
SO ₂	0.12	0.12	0.00
VOCs	1.74	1.78	0.04
HAPs	0.67	0.65	-0.02

(1) Emissions taken from R13-2794 and G65-C277 Fact Sheets (as corrected by the writer).

REGULATORY APPLICABILITY

The following will discuss only the regulatory applicability of general rules and specific rules to the emission units that have been proposed to be added or modified as part of this permitting action.

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

The new 27 mmBtu/hr natural gas-fired boiler has been determined to meet the definition of a “fuel burning unit” under 45CSR2 and is, therefore, subject to the applicable requirements therein. Each substantive 45CSR2 requirement is discussed below.

45CSR2 Opacity Standard - Section 3.1

Pursuant to 45CSR2, Section 3.1, the boiler is subject to an opacity limit of 10%. Proper maintenance and operation of the boiler (and the use of natural gas as fuel) should keep the opacity of the unit well below 10% during normal operations.

45CSR2 Weight Emission Standard - Section 4.1.b

The allowable particulate matter (non-condensable total particulate matter) emission rate for the boiler, identified as a Type “b” fuel burning unit, per 45CSR2, Section 4.1.a, is the product of 0.09 and the total design heat input of the boiler in million Btu per hour. The maximum aggregate design heat input (short-term) of the boiler will be 34 mmBtu/hr. Using the above equation, the

45CSR2 particulate matter emission limit of the boiler will be 3.06 lb/hr. The maximum potential hourly PM emissions (including condensables) from the boiler is estimated to be 0.19 lb/hr. This emission rate is 6.21% of the 45CSR2 limit.

45CSR2 Testing, Monitoring, Record-keeping, & Reporting (TMR&R) - Section 8

Section 8 of Rule 2 requires testing for initial compliance with the limits therein, monitoring for continued compliance, and keeping records of that compliance. The TMR&R requirements are clarified under 45CSR2A and discussed below.

45CSR2A Applicability - Section 3

Pursuant to §45-2A-3, as an individual applicable “fuel burning unit” under 45CSR2 with an MDHI less than 100 mmBtu/hr, the boiler is not subject to the Testing and MRR Requirements under 45CSR2A.

45CSR7: To Prevent and Control Particulate Air Pollution from Manufacturing Process Operations

45CSR7 has three substantive requirements potentially applicable to the particulate matter-generating operations at the brine water recycling facility. These are the opacity requirements under Section 3, the mass emission standards under Section 4, and the fugitive emission standards under Section 5. Each of these sections will be discussed below.

45CSR7 Opacity Standards - Section 3

Section 3.1 sets an opacity limit of 20% on the lime silo emission point. The pneumatic transfer of lime will be controlled by a dust filter. This should mitigate any substantive opacity problems from the lime silo.

45CSR7 Weight Emission Standards - Section 4

Under Section 10.5 of 45CSR7, “[t]he owner or operator of a manufacturing process shall be exempt from subsection 4.1 for source(s) of emissions that have a potential to emit less than one (1) pound per hour of particulate matter and an aggregate of less than one thousand (1000) pounds per year for all such sources of particulate matter located at the stationary source.” As the lime silo is the only particulate matter-generating operation at the facility subject to Section 4.1 and has an emission rate less than the exemption threshold, it is not subject to the standard under Section 4.1.

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

45CSR10 has requirements limiting SO₂ emissions from “fuel burning units,” limiting in-stack SO₂ concentrations of “manufacturing processes,” and limiting H₂S concentrations in process gas streams. Pursuant to the definition of “fuel burning unit” under 45CSR10 (“producing heat or power by indirect heat transfer”), the limitations on fuel burning units under 45CSR10 do not apply to the combustion turbines. The proposed new boiler is defined as a “fuel burning unit” and subject to the applicable requirements discussed below.

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45CSR10 Fuel Burning Units - Section 3

The allowable SO₂ emission rate for the boiler (located in Region III), identified as a Type “b” fuel burning unit, per 45CSR10, Section 3.3(f), is the product of 3.2 and the total design heat input of the boiler in million Btu per hour. The maximum aggregate design heat input (short-term) of the boiler will be 27 mmBtu/hr. Using the above equation, the 45CSR10 SO₂ emission limit of the boiler will be 86.4 lb/hr. The maximum potential hourly SO₂ emissions from the boiler is estimated to be 0.02 lb/hr. This emission rate is only a trace of the 45CSR10 limit.

45CSR10 Testing, Monitoring, Record-keeping, & Reporting (TMR&R) - Section 8

Section 8 of Rule 10 requires to test for initial compliance with the limits therein, monitor for continued compliance, and keep records of that compliance. The TMR&R requirements are clarified under 45CSR10A and discussed below.

45CSR10A Applicability - Section 3

Pursuant to §45-10A-3.1(b), as the boiler combusts “natural gas, wood or distillate oil, alone or in combination,” the boiler is not subject to the Testing and MRR Requirements under 45CSR10A.

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 proposed changes to the Marion County Brine Water Recycling Plant have the potential to increase a regulated pollutant (see Table 2 above). However, no regulated pollutant is increased is in excess of the thresholds that would define the changes as a "modification" under §45-13-2.17 and are, therefore, eligible to be reviewed as a Class II Administrative Update. Pursuant to §45-13-5.1, “[n]o person shall cause, suffer, allow or permit the construction, modification, relocation and operation of any stationary source to be commenced without . . . obtaining a permit to construct.”

As required under §45-13-8.3 (“Notice Level A”), FBP placed a Class I legal advertisement in a “newspaper of general circulation in the area where the source is . . . located.” The ad ran on June 21, 2016 in the *Times West Virginian* and the affidavit of publication for this legal advertisement was submitted on June 23, 2016.

45CSR30: Requirements for Operating Permits

45CSR30 provides for the establishment of a comprehensive air quality permitting system consistent with the requirements of Title V of the Clean Air Act. The modified Marion County Brine Water Recycling Plant does not meet the definition of a “major source under §112 of the Clean Air Act” as outlined under §45-30-2.26 and clarified (fugitive policy) under 45CSR30b. The modified facility-wide PTE of any regulated pollutant does not exceed 100 TPY, 10 TPY of any individual HAP, or 25 TPY of aggregate HAPs.

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However, as the facility is subject to a New Source Performance Standard (NSPS) - 40 CFR 60, Subpart Dc that does not contain a Title V permitting exemption, the facility is subject to Title V as a non-major source. Non-major sources subject to Title V, pursuant to DAQ policy, are deferred from having to submit a Title V application.

40 CFR 60, Subpart Dc: Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units

40 CFR 60 Subpart Dc is the New Source Performance Standard (NSPS) for industrial-commercial-institutional steam generating units for which construction, modification, or reconstruction is commenced after June 9, 1989 and that have a maximum design heat input capacity between 10 and 100 mmBtu/hr. The proposed new 34 mmBtu/hr boiler is subject to 40 CFR 60, Subpart Dc under the above applicability requirements of §60.40c(a). Subpart Dc does not have any emission standards for boilers that combust only natural gas. Boilers are, however, subject to the record-keeping and reporting requirements given under §60.48c.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

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

The majority of non-criteria regulated pollutants fall under the definition of HAPs which, with some revision since, were 188 compounds identified under Section 112(b) of the Clean Air Act (CAA) as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects. The following table lists each HAP identified by FBP with a facility-wide PTE above 0.05 TPY (100 lbs/yr) and the associated carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)):

Table 3: Potential HAPs - Carcinogenic Risk

HAPs	Type	Known/Suspected Carcinogen	Classification
Benzene	VOC	Yes	Category A - Known Human Carcinogen

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health affects 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

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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

The estimated maximum emissions of the modified facility are less than applicability thresholds that would define the proposed facility as “major” under 45CSR14 and, therefore, no air quality impacts modeling analysis was required. Additionally, based on the nature and location of the modified source, an air quality impacts modeling analysis was not required under 45CSR13, Section 7.

MONITORING, COMPLIANCE DEMONSTRATIONS, REPORTING, AND RECORDING OF OPERATIONS

The only substantive monitoring, compliance demonstration, and record-keeping requirement (MRR) that was added was an additional requirement under 4.4.5(f) to record the throughput of lime in the lime silo.

PERFORMANCE TESTING OF OPERATIONS

There were no changes to the performance testing requirements made as a result of the changes evaluated herein.

CHANGES TO PERMIT R13-2794

The substantive changes made changes to R13-2794 were limited to:

- Emission Units Table 1.0 of the draft permit was updated with revised information based on the proposed modifications evaluated herein;
- Emission limits were added from the new boiler under 4.1.1(a) and the MDHI limit of the new boiler was added under 4.1.1(e);
- New and revised emission and process limits were added to the evaporation requirements under 4.1.3;
- Requirements relating to the additional lime silo were added under 4.1.5.; and

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- An additional requirement under 4.4.5(f) was added to record the throughput of lime in the lime silo.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates that compliance with all applicable state and federal air quality regulations will be achieved. Therefore, I recommend to the Director the issuance of a Permit Number R13-2794A to Fairmont Brine Processing, LLC for the proposed modification of the Marion County Brine Water Recycling Plant located in Fairmont, Marion County, WV.



Joe Kessler, PE
Engineer



Date