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west virginia department of environmental protection

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## ENGINEERING EVALUATION/FACT SHEET

### BACKGROUND INFORMATION

Application No.:	R13-3111D
Plant ID No.:	039-00007
Applicant:	Bayer CropScience LP
Facility Name:	Institute Site
Location:	Institute
NAICS Code:	325320
Application Type:	Modification
Received Date:	December 12, 2016
Engineer Assigned:	Edward S. Andrews, P.E.
Fee Amount:	\$2000.00
Date Received:	December 13, 2016
Complete Date:	December 13, 2016
Due Date:	March 13, 2017
Applicant Ad Date:	December 1, 2016
Newspaper:	<i>The Charleston Gazette</i>
UTM's:	Easting: 432.0 km      Northing: 4,248.3 km      Zone: 17
Description:	This application is for the additional installation of one 106 MM Btu/hr, natural gas fired boiler, which is identified as Boiler 20.

### DESCRIPTION OF PROCESS

Bayer CropScience LP (Bayer) owns and operates Power House #2 at the Institute Plant. The plant is currently configured with one main steam plant (Power House No. 2). Power House No. 2 has three, 360 MMBtu/hr boilers with a steam output of about 225,000 pounds of steam per hour from each unit (Boilers 10, 11, and 12). This steam is needed to support the chemical manufacturing operation at the site. Due to downturns in the chemical manufacturing operation at the site, the demand for steam has seen a significant decrease over the past couple of years. In 2012, Bayer elected to permanently shut down Power House No. 1, which was configured with three, 180 MMBtu/hr gas-fired boilers. Once Power House No. 1 was shutdown, the site lost its flexibility to adjust steam output on short notice based on demand.

To resolve the reliability issues with the boilers in Power House No. 2 and prepare to ensure compliance with the Boiler MACT (Subpart DDDDD of Part 63), Bayer had elected to replace the units in Power House No. 2 with three package style boilers (Boiler Nos. 16, 17, and 18) as part of a new steam plant in the Institute Plant. These new boilers will be rated with a heat input of 350 MMBtu/hr for each unit and a steam output of 252,000 pounds per hour at 400 psi and 700°F. Each of these units will be fueled solely with natural gas and each one vented to a dedicated stack.

Boilers 16 and 17 were constructed and scheduled to start-up before the end of 2016. However, each boiler experienced a catastrophic failure during the static hydro test of each unit as part of the commission phase for these new boilers. Currently, the Institute Site is receiving its steam from Power House #2. Bayer has committed to shutting down Power House #2 by no later than January 31, 2017, as part of Bayer's plan to achieve compliance with the Boiler MACT.

Bayer currently operates chemical manufacturing units at the Institute Plant. These units require a significant amount of heat energy to operate, which is in the form of steam. To avoid a shutdown of manufacturing units at the Institute Site while Boilers 16 and 17 are being repaired or replaced after Power House #2 ceases operations, Bayer has elected to install two additional 106 MMBtu/hr boiler. Boiler 19 is covered by R13-3111C. This application is for Boiler 20. Both boilers are identical.

Boiler 20 is equipped with low-NO<sub>x</sub> burners with flue gas recirculation to minimize the formation of thermal oxides of nitrogen (NO<sub>x</sub>) while improving combustion efficiency. To better maintain combustion efficiency while minimizing the generation of carbon monoxide (CO), the boiler is equipped with oxygen trim systems that regulates the amount of combustion air that is introduced based on the oxygen level in the exhaust stream in the exhaust stack. To improve the overall thermal efficiency of the boiler, an economizer is proposed to be installed a part of the boiler, which is a heat exchanger in the exhaust stack that is used to preheat the boiler feed water prior to being introduced into the boiler.

## SITE INSPECTION

On November 3, 2016, Mr. Todd Shrewsbury, P.E., a Compliance and Enforcement Engineer, and the writer conducted an announced site visit of the Institute Site. The Bayer representatives were Ms. Linda Tennant, Site Environmental Specialist, and Mr. Monty Buther, a Project Manager in the Engineering Department. Also, the writer requested UCC representatives to be on hand during this visit as well. UCC representatives included Mr. Freddie Sizemore, EHS Regulatory Specialist, Mr. Toby Scholl, P.E. Engineer, and project managers overseeing the installation of these boilers. During this visit, the writer was briefed on the steam capacity and demand at the facility and status of these proposed boilers from both companies.

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## ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

The applicant used pollutant specific emission factors from Chapter 1.4 of AP-42, collected emission data by Mr. Roy Huntly of EPA Region V and manufacturer's data to estimate emissions from the replacement boilers. The writer reproduced the estimated emissions from one replacement boiler, which are presented in the following table

<b>Table No. 1 – Emissions from One 106 MMBtu/hr Boiler using Natural Gas</b>			
<b>Pollutant</b>	<b>Emission Factor</b>	<b>Hourly Rate (lb/hr)</b>	<b>Annual Rate (tpy)</b>
PM Filterable/Condensable Fractions	0.00051 lb/MMBtu	0.054	0.24
PM <sub>10</sub> Filterable/Condensable Fractions	0.00051 lb/MMBtu	0.054	0.24
PM <sub>2.5</sub> Filterable/Condensable Fractions	0.0004 lb/MMcf	0.042	0.18
Sulfur Dioxide (SO <sub>2</sub> )	0.0006 lb/MMcf	0.06	0.26
Oxides of Nitrogen (NO <sub>x</sub> )	0.0369 lb/MMBtu	3.91	17.13
Carbon Monoxide (CO)	0.0364 MMBtu	3.86	16.91
Volatile Organic Compounds (VOCs)	0.0054 lb/MMBtu	0.57	2.50
Total Hazardous Air Pollutants (HAPs)	0.0019 lb/MMBtu	0.20	0.88
Carbon Dioxide Equivalent* (CO <sub>2e</sub> )	117.098 lb/MMBtu	12,412.39	54,366.27

\* Based on factors and global warming potentials from Tables A-1, C-1, and C-2 of Part 98 published on Federal Register on November 29, 2013.

## REGULATORY APPLICABILITY

The Institute Site is a major source under Title V (45CSR30) and currently possesses a valid Title V Operating Permit. Under this program, new emission units have 12 months upon start-up to be incorporated in the facility's operating permit. The facility is currently classified as a major source for PM/PM<sub>10</sub>/PM<sub>2.5</sub>, NO<sub>x</sub>, SO<sub>2</sub>, CO, and VOC under Prevention of Significant Deterioration (PSD), Title V and for HAPs.

The first step in determining if the proposed action has triggered a major modification of a major source is to determine which pollutants that the project is major for, which are illustrated in the following table. Since Bayer re-opened R13-3111B, the PSD applicability determination must be re-evaluated with the proposed Boiler 20 in conjunction with Boiler No. 16, 17, 18 and

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<b>Table No. 4 Step One of PSD Applicability</b>						
Pollutant	Potential from the 3 Boilers in R13-3111B (tpy)	Potential for Boiler 19 (R13-3111C) (tpy)	Potential for Boiler 20 (tpy)	Project Total (tpy)	Significance Threshold (tpy)	Significance Trigger (Yes/No)
PM	23.01	0.24	0.24	23.49	25	No
PM <sub>10</sub>	23.01	0.24	0.24	23.49	15	Yes
PM <sub>2.5</sub> Direct	23.01	0.20	0.20	23.41	10	Yes
SO <sub>2</sub> & precursor for PM <sub>2.5</sub>	2.64	0.27	0.27	3.18	40	No
NO <sub>x</sub> & precursor of Ozone and PM <sub>2.5</sub>	167.01	16.87	16.87	200.75	40	Yes
CO	157.29	17.13	17.13	191.55	100	Yes
VOCs	24.49	2.50	2.50	29.49	40	No

This project represents a “significant emission increase” (45CSR§14-2.75) for PM, PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>x</sub>, and CO. The next step is to determine if this project results in a “net significant emission increase” pursuant to 45CSR§§14-3.4 and 2.80.c.

Basically, Boiler Nos. 16, 17, and 18 will replace the boilers located in Power House No. 2. Thus, the applicant selected the calendar years of 2013 and 2014 as the baseline period to determine the past actuals (24 consecutive month period) which is in accordance with 45 CSR §14-2.8. Step 2 of this PSD Applicability Determination is illustrated in the follow table, which includes the baseline emissions of Power House No. 2 and the new PTE of the five boilers to be covered by this permit. The writer verified the baseline emissions of Power House No. 2 from the facility’s emission inventory reported to the agency in SLEIS for Emission Years 2013 and 2014.

PROCESS NAME	2-YEAR AVERAGE BASELINE	CO	NOX	PM-10	PM-2.5
<b>NEW NETTING EVALUATION FOR INSTALLATION OF BOILER 20</b>					
PTE for Boiler 20	New (2017)	17.13	16.87	0.24	0.20
PTE for Boiler 19	New (12/2016)	17.13	16.87	0.24	0.20
PTE Boilers 16,17,18	New	157.2	166.8	23.01	23.01
Shutting Down Powerhouse #2 in January 2017	2013/2014	94.46	1088	86.27	41.545
Net Change in Emissions		97.00	-887.46	--62.78	-18.13
PSD Significance Levels		100	40	15	10
Does the project result in a Net Significant Increase in Emissions		NO	NO	NO	NO

No other changes at the facility has occurred during this contemporaneous period (January 2011 through December 2016).

Therefore, the net emission change in PM<sub>2.5</sub>, PM<sub>10</sub>, NO<sub>x</sub>, and CO emissions for this project is less than the significance level for each corresponding pollutant and the project does not pose a net significant increase in emissions of any regulated pollutant under the PSD program. Thus, this proposed project is not classified as a major modification and no further review under Rule 14 is required.

With regards to the National Ambient Air Quality Standards, Kanawha County is classified as attainment for all criteria pollutants as of March 31, 2014. Thus, no review of this proposed project is required for applicability under Rule 19 (West Virginia's Non-attainment Permitting Rule) for this particular application. Therefore, this proposed project does not require a permit under PSD and/or Non-Attainment New Source Review.

Boiler No. 20 is subject to the same applicable rules and regulations as Boiler Nos. 16, 17, 18, and 19. The requirements to comply with these rules and regulations are minimal for natural gas fired boilers to comply with the applicable emission standards. Boiler 20 will only be capable of consuming natural gas. It is understood that sources burning this fuel are significantly below the applicable allowable limitations in Rule 2 and Rule 10, which are the State of West Virginia's rules addressing particulate matter (PM) and sulfur dioxide (SO<sub>2</sub>) from boilers, regardless of the size of the unit. This understanding is confirmed with the provisions in Rules 2A and 10A, which exempts such sources from conducting periodic testing and monitoring for demonstrating compliance with the limitations under these rules. The permit will restrict the fuel type for Boiler 20 to natural gas which would ensure compliance with the applicable emission standards of these rules.

Boiler 20 is subject to the New Source Performance Standards of Subpart Db since the unit will have a design heat input rating of greater than 100 MMBtu/hr. Subpart Db establishes performance standards by pollutant and by fuel type (i.e. coal, oil, and natural gas). For natural gas-fired units, the subpart only establishes a performance standard for NO<sub>x</sub> emissions. Boiler 20 will be constructed after July 9, 1997 which makes the unit applicable to the limit in 40 CFR §60.44b(1) of 0.20 lb of NO<sub>x</sub> (expressed as NO<sub>2</sub>) per MMBtu. These units will be equipped with a low-NO<sub>x</sub> burner using flue gas recirculation with a maximum NO<sub>x</sub> rate of 0.037 lb/MMBtu. At this NO<sub>x</sub> rating, these units would have a margin of compliance of 82% of the applicable NO<sub>x</sub> limit.

Subpart Db requires affected sources to demonstrate compliance with the NO<sub>x</sub> limit on a 30-day rolling average. This subpart requires the use of a NO<sub>x</sub> continuous emission monitoring system (NO<sub>x</sub> CEMS) with a means to measure either O<sub>2</sub> or CO<sub>2</sub> in the exhaust for demonstrating compliance with the NO<sub>x</sub> emission standard.

The facility is currently classified as a major source of HAPs, which means the facility has the potential to emit 10 tons per year of a single HAP or 25 tpy of total HAPs. Within the application, Bayer has not elected to determine if this project would change the facility's major

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source status for HAPs. Thus, Boiler 20 is subject to 40 CFR 63, Subpart DDDDD – National Emission Standard for Hazardous Air Pollutants (NESHAP) for Major Sources: Industrial Commercial, and Institutional Boilers and Process Heaters.

This regulation establishes work practices to comply with the emission standards (see Item 3 of Table 3 to Subpart DDDDD of Part 63). Boiler No. 20 will be equipped with oxygen trim systems to optimize the combustion air to minimize CO emissions. The rule recognizes this type of combustion control and defers the annual tune-up requirement to be performed once every five years in accordance with 40 CFR §63.7540. This boiler under Subpart DDDDD will be considered as a new unit. The one-time energy assessment is not required for new units. Therefore, the energy assessment is not applicable for this boiler.

The proposed change in permitted emissions from Boiler No. 20 are less than 6 pounds per hour. However, the timing of the requests between Boilers 19 and 20 are very close. The DAQ views the installation of Boiler Nos. 19 and 20 as one project. Thus, the sum of the hourly emissions from Boiler Nos. 19 and 20 exceed 6 pounds per hour and 10 tons per year for CO and NO<sub>x</sub>. Therefore, the whole project meets the definition of modification under Rule 13. Thus, the change meets the criteria of a “modification” under 45 CSR 13. Bayer has prepared and submitted a complete application, paid the filing fee, and published a Class I Legal ad in *The Charleston Gazette* on December 1, 2016.

#### TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

Boiler 20 will not emit any pollutants that aren’t already being emitted by another emission source at the facility. Therefore, no information about the toxicity of the hazardous air pollutants (HAPs) is presented in this evaluation.

#### AIR QUALITY IMPACT ANALYSIS

An air dispersion modeling study or analysis was not required, because the proposed modification does not meet the definition of a major modification of a major source as defined in 45CSR14.

## MONITORING OF OPERATIONS

Rules 2 and 10 only require recording of the amount of natural gas consumed each month for Boiler No. 20. However, these new units are subject to Subpart Db and the recordkeeping requirements in §60.49b(d)(1) requires daily fuel records. As noted earlier, the unit is subject to the Boiler MACT which requires tune-up once every five year for boiler using an oxygen trim system. The permit will require maintaining and operating such system with tune-up being conducted every 5 years to optimize CO emissions. Bayer will be required to install and operate NO<sub>x</sub> CEMS to demonstrate continuous compliance with the NO<sub>x</sub> emission limit for Boiler 20.

## CHANGES TO PERMIT R13-3111C

Changes to the permit mainly are limited to inserting specific limits for Boiler No. 20, which are in Condition 4.1.1 and through-out Sections 4.1 through 4.5. where the condition applies to all of the boilers covered by the permit.

## RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates the proposed modification will meet all the requirements of the applicable rules and regulations when operated in accordance with the permit application. Therefore, the writer recommends granting Bayer CropScience an modification permit in accordance with 45 CSR 13 for the Institute Site which is located in Institute, WV.

Edward S. Andrews, P.E.  
Engineer

January 10, 2017  
Date

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