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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-2334Y
Plant ID No.:	029-00008
Applicant:	Ergon - West Virginia, Inc. (Ergon)
Facility Name:	Newell Refinery
Location:	Newell, Hancock County
SIC/NAICS Codes:	2911/324110
Application Type:	Modification
Received Date:	September 14, 2015
Engineer Assigned:	Joe Kessler
Fee Amount:	$2,000
Date Received:	$1,000 (9/16/15), $1,000 (10/30/15)
Complete Date:	December 3, 2015
Due Date:	March 2, 2016
Applicant's Ad Date:	October 19, 2015
Newspaper:	*The Weirton Daily Times*
UTM's:	531.0 km Easting • 4,495.1 km Northing • Zone 17
Latitude/Longitude:	40.609173/-80.629196
Description:	Modification for the installation of new equipment and an increase of throughputs in the catalytic reforming (platformer) unit.

Entire Document
NON-CONFIDENTIAL

The Newell Refinery was originally constructed in 1972 by Quaker State and the facility was purchased by Ergon in 1995. On May 17, 2000, Permit Number R13-2334 was issued to Ergon that superceded and replaced all previous permits covering the facility. All portions of the facility are permitted under the current permit (R13-2334X) and no sections of the facility are grandfathered.

DESCRIPTION OF PROCESS/MODIFICATION

Existing Facility

The Newell Refinery processes crude oil into fuels and other industrial chemical feedstocks through the use of distillation and chemical reaction processes. The existing facility has a capacity of 803,000 barrels/month.

Proposed Modifications

Ergon has now submitted a permit application to make the following substantive modifications:

- Installation of a process gas-fired 8.745 mmBtu/hr process heater (H-505R) within the heater group H-500S to replace a similarly sized unit (H-505) that will be removed;
- Increase the catalytic reforming (platformer) unit capacity from 3,900 barrels per day (bpd) to 4,600 bpd;
- Add new equipment to recover liquid petroleum gas (LPG) from fuel gas used at the refinery; and
- Increase the crude oil throughput for the existing crude oil tank group from 705,180,000 gallons per year to 802,264,890 gallons per year.

Catalytic Reforming (Platformer Unit)

The platformer unit converts petroleum naphthas produced from distilling crude oil into high-octane liquid products called reformates, through a process known as catalytic reforming. These reformates can be used as premium blending stock for the production of gasoline or as a source of industrial feedstock for aromatic chemicals.

The process of catalytic reforming is shown in block diagram form in Attachment F of the permit application. Naphthas from the distillation of crude oil comes into the platformer unit and may be combined with hydrogen and other hydrocarbon streams. This is then heated and passed through catalyst beds to convert naphthas into branched or aromatic hydrocarbons of the desired range of molecular weights and chemical properties. This mixture of hydrocarbon products is then passed through a distillation tower to separate out the desired products.

At multiple points of this process, pumps and compressors are used to move liquid and gas streams from one unit of equipment to another, and process heaters and heat exchangers are used to bring liquids or gases to the desired temperature range for reactions or chemical separations to occur. Ergon is requesting to increase the platformer capacity from 3,900 bpd to 7,500 bpd to match the unifiner and allow the refinery to process an additional1,000 bpd of untreated naphtha.

Crude Oil Tanks

Ergon is proposing to increase the crude oil throughput for the existing crude oil tank group from 705,180,000 gallons per year to 802,264,890 gallons per year. The crude oil tank group consists of tanks 4000, 4001, 4060, and 4061. Ergon plans to accommodate the crude oil throughput increase by increasing the throughput on tanks 4060 and 4061. Tanks 4060 and 4061 are currently permitted for 176,295,000 gallons per year per tank. Ergon plans to increase the crude oil throughput on tanks 4060 and 4061 to 224,837,445 gallons per year per tank.

Heater H-505R

The new 8.745 mmBtu/hr process heater (H-505R) will be a replacement for the existing H-505 heater. H-505 is part of a heater group (H-500S) that share a common exhaust stack (004-01). The heater shall be fired primarily with process gas and supplemented, when needed with natural gas.

LPG Recovery

The fuel gas used at the refinery is primarily methane and ethane, but can contain propane and butane. To relieve current fuel system limitations, equipment installed as part of this proposal will separate propane and butane from the fuel gas produced in the platformer unit. This propane and butane will then be stored in pressurized containment vessels and loaded onto trucks and sold as Y-Grade LPG.

SITE INSPECTION

Due to the nature of the modification, the writer did not conduct a site inspection for this permitting action. According to information in the DAQ database, the last full on-site inspection occurred on July 25, 2014 by Mr. Michael Wade of the Compliance/Enforcement Section.

AIR EMISSIONS AND CALCULATION METHODOLOGIES

Ergon included in Attachment N of the permit application an estimate of the potential increase in potential emissions for each of the proposed modifications. The methodology of each calculation is discussed below.

Heater Emissions

Potential emissions from the replacement heater H-505R were based on the maximum design heat input (MDHI) of the heater (8.745 mmBtu/hr) and emission factors provided by the manufacturer. Annual emissions were based on 8,760 hours of operation per year. A fuel gas heat content of 1,019 Btu/scf was used in the calculations.

Storage Tanks

Potential VOC emissions associated with the TK-4060 and TK-4061 crude oil tanks (working/breathing emissions) emission factors and calculation methodologies as provided under AP-42, Section 7 (AP-42 is a database of emission factors maintained by USEPA). The emissions from each tank were based on the new maximum throughput of 224,837,445 gallons per year.

Fugitive Emissions

Ergon based their fugitive process and piping components leak calculations on the "EPA Correlation Approach" taken from the document EPA-453/R-95-017 - "Protocol for Equipment Leak

Emission Estimates." Leak Rate/Screening Value correlations were taken from Table 2-10 "Petroleum Industry Leak Rate/Screening Value Correlations."

Emissions Summary

Based on the above estimation methodologies, he change in annual facility-wide PTE as a result of the modifications evaluated herein is given in the following table:

Table 1: Change In Facility-Wide Annual PTE

Pollutant	R13-2334X(1)	R13-2334Y	Change
	tons/year	tons/year	tons/year
CO	251.68	250.31	-1.37
NO_X	207.56	204.65	-2.91
$PM_{2.5}/PM_{10}/PM$	24.26	24.21	-0.05
SO_2	79.04	79.19	0.15
VOCs	134.08	135.87	1.79
HAPs	21.94	22.07	0.13

(1) Emissions taken from R13-2334X Fact Sheet.

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 modified as part of this permitting action.

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

The replacement heater has, based on determinations in previous permitting actions at the Newell Refinery, been determined to meet the definition of a "fuel burning unit" under 45CSR2 and is, therefore, subject to the applicable requirements therein. However, pursuant to the exemption given under §45-2-11, as the MDHI of the unit is less than 10 mmBtu/hr, it is not subject to sections 4, 5, 6, 8 and 9 of 45CSR2. The only remaining substantive requirement is under Section 3.1 - Visible Emissions Standards.

Pursuant to 45CSR2, Section 3.1, the heater is subject to an opacity limit of 10% (from the combined exhaust stack of 004-01. Proper maintenance and operation of the unit (and the use of process gas as fuel) should keep the opacity of the unit (and the other heaters that make up the heater group H-500S) well below 10% during normal operations.

45CSR10: To Prevent and Control Air Pollution from the Emission of Sulfur Oxides (NON-APPLICABILITY)

45CSR10 has requirements limiting SO_2 emissions from "fuel burning units," limiting in-stack SO_2 concentrations of "manufacturing processes," and limiting H_2S concentrations in process gas streams. The only potential applicability of 45CSR10 to the proposed modifications is the limitations on fuel burning units. Pursuant to the exemption given under §45-10-10.1, as the MDHI of the new replacement heater - which has been determined to meet the definition of a "fuel burning unit" under 45CSR10 - is less than 10 mmBtu/hr, the unit is not subject to the limitations on fuel burning units under 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 proposed modification of the Newell Refinery has the potential to increase a regulated pollutant (see Table 1 above). However, no regulated pollutant is increased is in excess of six (6) lbs/hour, and ten (10) TPY or 144 lbs/day and, therefore, the proposed changes would normally be eligible to be reviewed as a Class II Administrative Update. However, Ergon voluntarily submitted the application as a modification and it was reviewed as such. 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." Therefore, Ergon is required to obtain a permit under 45CSR13 for the modification of the Newell Refinery.

As required under §45-13-8.3 ("Notice Level A"), Ergon placed a Class I legal advertisement in a "newspaper of *general circulation* in the area where the source is . . . located." The ad ran on October 19, 2015 in *The Weirton Daily Times* and the affidavit of publication for this legal advertisement was submitted on November 16, 2015.

45CSR14: Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration - (NON APPLICABILITY)

The Newell Refinery is located in Hancock County, WV. Hancock County is classified as "in attainment" with all National Ambient Air Quality Standards. However, as the facility is a "listed source" under §45-14-2.43 ("Petroleum Refineries"), the individual major source applicability threshold for all pollutants is 100 TPY. As shown in Table 1, the existing facility-wide PTE of the Newell Refinery is greater than 100 TPY for CO, NO_x, and VOCs. Therefore, the existing facility is defined as a "major stationary source" under 45CSR14 and the modifications evaluated herein are subject to a Prevention of Significant Deterioration (PSD) Applicability Analysis.

Under the review for Permit Number R13-2334T, Ergon modified the Unifiner to increase the capacity and replace the H-501 heater. Additionally, the increase in Unifiner capacity led to an increase in throughput for Tanks 4004, 4006, 4014, 4015, 4050, and also led to an increase in throughput to the truck loading operations [TLOAD and OXIDIZER]. As a result of the changes, a PSD Applicability Analysis was submitted under R13-2334T (as discussed in detail in the fact

sheet for that permitting action). This analysis showed that the difference in actual-to-potential emissions of the emission units involved in the modification and those affected upstream/downstream of the changes were less than the "significant" thresholds given under §45-14-2.74. Pursuant to §45-14-19.7 (shown below), once a synthetic minor has been issued for a modification, relaxing the limits upon which that synthetic minor was issued (that results in a "major modification") could result in the requirement for a retroactive PSD review.

> Any person who owns or operates any particular source or modification which becomes a major stationary source or major modification solely by virtue of a relaxation in any limitation, enforceable by the Administrator or the Secretary, on the capacity of the source or modification otherwise to emit a pollutant (such as a restriction on hours of operation), shall become subject to the requirements of this rule as though construction had not yet commenced on the source or modification.

Therefore, as a result of the changes requested under R13-2334Y, a new PSD Applicability Analysis was requested that showed, using the same baseline actual emissions used in the R13-2334T PSD Applicability Analysis (annualized emissions from 2009 and 2010), the new potential-to-emit (PTE) of the same equipment/processes (with some noted changes), was not, on a pollutant-by-pollutant basis, more that a "significant" difference that would define the modifications evaluated herein as major (based on the language under §45-14-19.7). The following table details the PSD Applicability Analysis for VOCs using the same equipment/processes (exceptions noted) presented in the R13-2334T PSD Applicability Analysis with the addition of new sources added as part of the modifications evaluated herein.

Table 2: PSD Applicability Analysis for VOCs

Emission Units	All Emissions in TPY		
	Baseline Actuals(1)	Future PTE	Difference
TK-4000	1.41	1.47	0.06
TK-4001	1.13	1.47	0.34
TK-4002	0.34	0.14	-0.20
TK-4004	1.58	1.58	0.00
TK-4006	1.69	1.71	0.02
TK-4014	1.21	1.20	-0.01
TK- 4015	1.12	1.12	0.00
TK-4050	0.71	0.72	0.01
TK-4060 (modified)	0.91	2.37	1.46
TK-4061 (modified)	0.91	2.40	1.49
TK-4062	7.14	12.27	5.13
TK-4063	0.00	12.27	12.27
Naptha Splitter	0.00	0.79	0.79

Emission Units	All Emissions in TPY		
	Baseline Actuals(1)	Future PTE	Difference
ISOM Unit	0.00	3.72	3.72
H-501	0.18	0.25	0.07
H-101 and H-102	2.39	1.84	-0.55
H-505R (new)	0.00	0.07	0.07
H-505 (will be replaced)	0.18	0.00	-0.18
PL-FUG (new)(3)	0.00	0.60	0.60
YNGL-FUG (new)(3)	0.00	0.94	0.94
Truck Loading [TLoad]	0.38	4.22	3.84
OXIDIZER	7.19	11.59	4.40
TOTAL →	28.47	62.74	34.27

(1) The MLD/MLDOX source that was part of the R13-2334T analysis has been removed from this analysis. According to Ergon, this source was installed as part of Permit Number R13-2334S and was not modified under R13-2334T. The MLD/MLDOX installation was a separate project and is unrelated to the other activities at the refinery and to the equipment modified under R13-2334T and currently being modified.

(2) Based on Annualized Emissions from 2009/2010 as presented in R13-2334T fact sheet.

(3) Fugitive Emissions are included as the Newell Refinery is a "listed source" under 45CSR14.

Based on information submitted by Ergon and on information from the R13-2334T fact sheet, the modifications evaluated herein are determined not to be defined as a "major modification" and, therefore, PSD Review pursuant to 45CSR14 is not required.

45CSR30: Requirements for Operating Permits - (NON APPLICABILITY)

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 Newell Refinery, defined under Title V as a "major source," was last issued a Title V renewal permit on August 18, 2015 (R30-02900008-2015). Proposed changes evaluated herein must also be incorporated into the facility's Title V operating permit. Commencement of the operations authorized by this permit shall be determined by the appropriate timing limitations associated with Title V permit revisions per 45CSR30.

40 CFR 60, Subpart Ja: Standards of Performance for Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After May 14, 2007

Subpart Ja of 40 CFR 60 is the NSPS for petroleum refineries which construction commenced after May 14, 2007. Process heater H-505R is subject to the requirements of Subpart Ja because it meets the applicability requirements and definition of a "fuel gas combustion device" in §60.100a and §60.100b, respectively. The only substantive standard applicable to H-505R is given under §60.102a(g)(1):

(1) Except as provided in (g)(1)(iii) of this section, for each fuel gas combustion device, the owner or operator shall comply with either the emission limit in paragraph (g)(1)(i) of this section or the fuel gas concentration limit in paragraph (g)(1)(ii) of this section.

(i) The owner or operator shall not discharge or cause the discharge of any gases into the atmosphere that contain SO_2 in excess of 20 ppm_v (dry basis, corrected to 0-percent excess air) determined hourly on a 3-hour rolling average basis and SO_2 in excess of 8 ppm_v (dry basis, corrected to 0-percent excess air), determined daily on a 365 successive calendar day rolling average basis; or

(ii) The owner or operator shall not burn in any fuel gas combustion device any fuel gas that contains H_2S in excess of 162 ppm_v determined hourly on a 3-hour rolling average basis and H_2S in excess of 60 ppm_v determined daily on a 365 successive calendar day rolling average basis.

(iii) The combustion in a portable generator of fuel gas released as a result of tank degassing and/or cleaning is exempt from the emissions limits in paragraphs (g)(1)(i) and (ii) of this section.

Ergon has indicated they will comply with the above requirement through the use of continuous H_2S fuel monitoring (pursuant to the requirements of §60.107a) on the process gas that fires the new replacement process heater.

40 CFR 60, Subpart Kb: Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984

Subpart Kb of 40 CFR 60 is the NSPS for storage tanks containing Volatile Organic Liquids (VOLs) which construction commenced after July 23, 1984. The Subpart applies to storage vessels used to store volatile organic liquids with a capacity greater than or equal to 75 m^3 (19,813 gallons). However, storage tanks with a capacity greater than or equal to 151 m^3 (39,890 gallons) storing a liquid with a maximum true vapor pressure less than 3.5 kilopascals (kPa) or with a capacity greater than or equal to 75 m^3 but less than 151 m^3 storing a liquid with a maximum true vapor pressure less than 15.0 kPa are exempt from Subpart Kb. Subpart Kb was previously determined to apply to the modified storage tanks TK-4060 and TK-4061 and the modifications evaluated herein do not change that determination. The tanks will have to continue to meet the requirements given under §60.112b(a) and (b).

40 CFR 60, Subpart GGGa: Standards of Performance for Equipment Leaks of VOC in Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006

Subpart GGGa of 40 CFR 60 is the NSPS for equipment leaks of VOC in petroleum refineries for which construction commenced after November 7, 2006. The new Platformer Expansion (PL-FUG) and Y-Grade NGL (YNGL-FUG) Units are subject to the requirements under GGGa. Subpart GGGa incorporates by reference the fugitive requirements under 40 CFR 60, Subpart VVa. Ergon shall be required to meet these requirements within the permit.

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 (PM_{10}), Particulate Matter less than 2.5 microns ($PM_{2.5}$), and Sulfur Dioxide (SO_2). 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 modifications evaluated herein have the potential to increase the following HAPs: n-Hexane, Toluene, and Xylene. The following table lists each HAP's carcinogenic risk (as based on analysis provided in the Integrated Risk Information System (IRIS)):

Table 4: Potential HAPs - Carcinogenic Risk

HAPs	Type	Known/Suspected Carcinogen	Classification
n-Hexane	VOC	No	Inadequate Data
Toluene	VOC	No	Inadequate Data
Xylene	VOC	No	Inadequate Data

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 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 increase in emissions are less than applicability thresholds that would define the proposed modification as "major" under 45CSR14 and, therefore, no air quality impacts modeling analysis was required. Additionally, based on the nature of the modification and the location of the source, an air quality impacts modeling analysis was not required under 45CSR13, Section 7.

MONITORING, COMPLIANCE DEMONSTRATIONS, REPORTING, AND RECORDING OF OPERATIONS

No substantive change to the monitoring, compliance demonstration, reporting, and record-keeping requirements (MRR) in the draft permit was made. The modified and new emission units shall be integrated into the existing MRR requirements.

PERFORMANCE TESTING OF OPERATIONS

There was no change in the existing performance testing requirements.

CHANGES TO PERMIT R13-2334X

The substantive changes made changes to R13-2334X were limited to:

- Emission Units Table 1.0 of the draft permit was updated with revised information based on the modifications and the new fugitive areas added;
- The Source-Specific Requirements Table under Section 4.0 was updated with corrected information for H-500S;
- Emission limits of H-500S under 4.1.22. of the draft permit were revised;
- Emission limits for the two new fugitive areas were added under 6.1.4. of the draft permit; and
- Storage tank emission limits were revised under 7.1.2. of the draft permit;

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 R13-2334Y to Ergon - West Virginia, Inc. for the proposed modification of the Newell Refinery located in Newell, Hancock County, WV.

Joe Kessler, PE
Engineer

12/03/15
Date