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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.: R13-1686G
Plant ID No.: 107-00001
Applicant: DuPont
Facility Name: Washington Works
Location: Washington, Wood County
NAICS Code: 325211
Application Type: Modification
Received Date: June 10, 2010
Engineer Assigned: Laura Jennings
Fee Amount: \$1,000.00
Date Received: June 30, 2010
Complete Date: June 30, 2010
Due Date: August 29, 2010
Applicant Ad Date: June 12, 2010
Newspaper: *The Parkersburg News*
UTM's: Easting: 442.38 km Northing: 4346.8 km Zone: 17
Description: The permit modification application was submitted to address revised emission factors for the natural gas-fired process heaters associated with the "Z" process area. Source 257-02 is removed. There is no change in operations associated with the application.

DESCRIPTION OF PROCESS

The changes described in this application are based on the use of more appropriate emission factors and the recalculation of hourly and annual potential emissions. No physical changes are proposed as part of this action.

The application addresses four natural gas fired process heaters that support the continuous polymerization process. One of the units, 254-02, was not previously registered on this permit because it was installed prior to the permitting rule and was not changed after that date. Emission rate estimates for prior permits were calculated for three other units using the July 1995 version of EPA's AP-42 document, Chapter 1.4 for natural gas combustion.

The purpose of this update is to provide better emission estimates using more appropriate and / or more current factors.

Three of the units 254-01, 254-02, and 254-05, were manufactured by T-Thermal and are known to operate at higher temperatures than was typical for units included in EPA's AP-42 study. The specific operating features of these units cause higher emissions of nitrogen oxides, NO_x, and lower emissions of carbon monoxide, CO, on basis of pounds emitted per million cubic foot of gas burned than is described using the AP-42 factors. The emissions limits are recalculated here using factors provided by the manufacturer.

The fourth unit, 254-06, was produced by North American Manufacturing. Because the operation of this source is optimized for maximum heat recovery, the NO_x and CO emissions are recalculated using an approach provided by the manufacturer. The emission rates of the other combustion related pollutants are calculated using the current version (January 1998) of EPA's AP-42 factors.

In the current permit, the limit for TSP from vent 252-81 was listed at ten times the amount shown in the permit application, 0.0395 tpy versus 0.00395 tpy. The new limit should be rounded to 0.01 tpy.

Source 257-02S and the corresponding vent are removed from this application.

SITE INSPECTION

A site visit was conducted on July 20, 2010 as part of the R13-2838 case-by-case Boiler MACT permit application of which these process heaters are subject. The writer, Renu Chakrabarty (Air Toxics), and Beena Modi (Title V) participated in the site inspection and meeting associated with these permits.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Three of the natural gas combustion units 254-01, 254-02, and 254-05 use burners produced by T-Thermal Corp. and are known to operate at higher temperatures and therefore produce higher NO_x but lower CO than the burners described in the EPA AP-42 factors. The emissions are estimated using the emission factors provided from the vendor.

The fourth unit, 254-06, uses a burner from North American Manufacturing. The emission rates of regulated pollutants are calculated using the EPA AP-42 factors for natural gas combustion dated July 1998, with the exception of nitrogen oxides and carbon monoxide.

For nitrogen oxides, the emission factor employed is 290 lb NO₂ per 10⁶ ft³ of natural gas combusted. This factor is derived from information provided by the vendor, North American Manufacturing, Inc. for burner model 4821-18. The information consisted of test results for NO_x and CO at similar firing rates but with different initial temperatures for the

inlet combustion air. The inlet air temperatures and exhaust vent concentrations are shown in the table below.

Air Temp (°F)	ppmv NO _x @ 3% O ₂	ppmv CO @ 3% O ₂
70	62	63
780	253	2
	interpolated	interpolated
554	192	21.4

The operating inlet combustion air temperature for the No. 6 unit is 554 °F (290 °C).

From other insight, the vendor confirmed that the response curve for NO_x is known to be concave. From linear interpolation between the points, resulting in an over-estimate of the actual concentration, the exhaust concentration is estimated to be 192 ppmv.

Based on this concentration value for NO_x and the stack flow of 7860 ACFM (wet) @ 650 °F and assuming 1020 BTU/MM scf of gas, the emission limit should be determined using an emission factor of 290 lb NO₂ per 10⁶ ft³ of natural gas combusted. the factor is rounded up to the nearest 10 to be conservative.

For the CO test results, the predicted exhaust concentration would be 21.4 ppmv. Based on the stack flow, the emission factor should be 35 lb CO per 10⁶ ft³ of natural gas combusted which would result in a predicted concentration of 23.1 ppmv of CO. The factor is rounded up to the nearest 5 to be conservative.

The change in calculation methodology, the updated emission factors and the calculations have been verified by the writer. The updated emissions using the vendor provided emission factors are in the table below.

Equipment Name / (DHI)	Emission Point ID	Pollutant	Emission Factor	Source of EF	Emissions	
			(lb/MM scf NG)		pph	tpy

Dowtherm Vaporizer #1 / (14.0 MMBtu)	254-01	CO	7.752	Vendor	0.1064	0.466
		NO _x	193.800	Vendor	2.66	11.651
		PM	12.240	Vendor	0.168	0.736
		SO ₂	0.600	Vendor	0.008232	0.036
		VOC	2.142	Vendor	0.0294	0.129
Dowtherm Vaporizer #2 / (14.0 MMBtu)	254-02	CO	7.752	Vendor	0.1064	0.466
		NO _x	193.800	Vendor	2.66	11.651
		PM	12.240	Vendor	0.168	0.736
		SO ₂	0.600	Vendor	0.008232	0.036
		VOC	2.142	Vendor	0.0294	0.129
Dowtherm Vaporizer #5 / (16.5 MMBtu)	254-05	CO	7.752	Vendor	0.1254	0.549
		NO _x	193.800	Vendor	3.135	13.731
		PM	12.240	Vendor	0.198	0.867
		SO ₂	0.600	Vendor	0.009702	0.042
		VOC	2.142	Vendor	0.03465	0.152
Dowtherm Vaporizer #6 (18.0 MMBTU)	254-06	CO	35.000	Vendor	0.6176	2.705
		NO _x	290.000	Vendor	5.118	22.415
		PM	7.600	AP-42, 1998	0.134	0.587
		SO ₂	0.600	AP-42, 1998	0.010588	0.046
		VOC	5.500	AP-42, 1998	0.09706	0.425

The change in emissions are shown in the table below. The increase in NO_x emissions and the decrease in CO emissions are expected because the vaporizers have been optimized based on temperature for more complete combustion. CO emissions are an indicator of combustion efficiency. As temperature increases, the CO emissions are minimized and the NO_x emissions increase. The vendor data provided reflects this correlation and takes into consideration the operating parameters of the process heaters. The T-Thermal vendor (Vaporizers #1, #2, and #5) provided the applicant a complete set of emission factors. North American Manufacturing (Vaporizer #6) provided only the NO_x and CO emission factors ; AP-42 factors were used for the remaining pollutants.

Previous emissions were calculated using the 1995 AP-42 emission factors. When the AP-42 emission factors for natural gas combustion, section 1.4 were published in July, 1998, there was a decrease in the total particulate matter emission factor and an increase in the VOC emission factor. There was no change in the SO₂ emission factor.

Equipment Name	Emission Point ID	Pollutant	Change in Emissions	
			pph	tpy
Dowtherm Vaporizer #1	254-01	CO	-0.38	-1.67
		NO _x	0.71	3.12
		PM	-0.03	-0.13
		SO ₂	0	0
		VOC	-0.01	-0.04
Dowtherm Vaporizer #2	254-02	CO	0.11	0.47
		NO _x	2.66	11.65
		PM	0.17	0.74
		SO ₂	0.01	0.04
		VOC	0.03	0.13
Dowtherm Vaporizer #5	254-05	CO	-0.45	-2.06
		NO _x	0.84	3.66
		PM	-0.03	-0.12
		SO ₂	0	0
		VOC	-0.03	-0.05
Dowtherm Vaporizer #6	254-06	CO	-0.52	-2.28
		NO _x	2.61	11.43
		PM	-0.12	-0.49
		SO ₂	0	0
		VOC	0.05	0.21
EPC #3 Transfer Station	257-02	PM	-0.12	-0.53

5 th Level S/C Vacuum	252-81	PM	-0.0081	-0.0356
All	Total emissions change	CO	-1.24	-5.54
		NO _x	6.82	29.86
		PM	-0.14	-0.57
		SO ₂	0.01	0.04
		VOC	0.04	0.25

REGULATORY APPLICABILITY

STATE REGULATIONS

45CSR13 PERMITS FOR CONSTRUCTION, MODIFICATION, RELOCATION AND OPERATION OF STATIONARY SOURCES OF AIR POLLUTANTS, NOTIFICATION REQUIREMENTS, ADMINISTRATIVE UPDATES, TEMPORARY PERMITS, GENERAL PERMITS, PERMISSION TO COMMENCE CONSTRUCTION, AND PROCEDURES FOR EVALUATION

This application meets the requirements of a modification per 45CSR13 because the increase in NO_x is greater than 6 pph and 10 tpy.

The Dowtherm Vaporizer #2 source, 254-02, was not previously registered on a Reg. 13 permit because it was installed prior to the rule and its operation had not changed since that time.

45CSR34 EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS

The process heaters 254-01S, 254-02S, 254-05S, and 254-06S are subject to 112(j) case-by-case Boiler MACT requirements. The engineering evaluation was conducted with the Washington Works site wide 112(j) case-by-case Boiler MACT permit R13-2838.

FEDERAL REGULATIONS

40 CFR 60 Subpart Dc STANDARDS OF PERFORMANCE FOR SMALL INDUSTRIAL - COMMERCIAL - INSTITUTIONAL STEAM GENERATING UNITS

The Dowtherm Vaporizer # 6 source, 254-06 is subject to NSPS, Supart Dc for small boilers. Because the unit design heat input capacity is 18 MMBtu and it burns only natural gas, this unit is not subject to any emission limitations. It is subject to the initial notice requirements per §60.48c(c),

and maintenance of monthly fuel records, per §60.48c(g)(2).

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

There are no new hazardous pollutants associated with this application.

AIR QUALITY IMPACT ANALYSIS

DuPont, Washington Works facility located in Wood County, WV is in an attainment area for ozone. The “significant” threshold for NO_x net increase is 40 tpy per 45CSR19-2.66. The increase in NO_x potential emissions associated with this permit modification is 29.87 tpy which is below the “significant” threshold. No modeling is required.

MONITORING OF OPERATIONS

- Added monitoring and recordkeeping requirements for the gas-fired process heaters as proposed in the application.

CHANGES TO PERMIT R13-1686F

- R13-2686F is not in the current permit format. Because this is a modification application, it will be updated to the current permit template.
- Emission limits were updated to reflect DAQ rounding policy.
- Emission limits were added for 254-02 and were updated for 254-01, 254-05, 254-06, and 252-81.
- Emission point 257-02 was removed from the permit.
- Reference to permit R13-2838 and the 112(j) case-by-case Boiler MACT requirements has been added and includes that changes to any case-by-case Boiler MACT requirements shall not be less stringent.

RECOMMENDATION TO DIRECTOR

It is the recommendation of the writer that permit modification R13-1686G be granted to DuPont, Washington Works Site located in Wood County, WV. Based on the information provided in the permit application and reviewed by the writer, the permittee meets all federal and state regulations.

Laura M. Jennings
Permit Engineer

Date