Permit Amendment
Source Analysis & Technical Review

Company	**BASF Total Petrochemicals LLC**	Permit Number	**36644**
City	**Port Arthur**	Project Number	**334944**
County	**Jefferson**	Regulated Entity Number	**RN100216977**
Project Type	**Amendment**	Customer Reference Number	**CN604166967**
Project Reviewer	**Michael Brown**	Received Date	**November 2, 2021**
Site Name	**BASF Fina Nafta Region Olefins Complex**		

Project Overview

BASF TOTAL Petrochemicals LLC (BTP) operates an ethylene cracker and associated support facilities at a plant site located in Port Arthur, Jefferson County, Texas. Air emissions from the ethylene cracker unit are authorized under New Source Review (NSR) Permit No. 36644. On November 2, 2021, BTP submitted an amendment application for Permit No. 36644. In the amendment application, the following is being updated and/or corrected: i) correction to the volatile organic compound (VOC) emission factor for Cogen Starting Engines, Units 20A and 20B, Emission Point Numbers (EPNs) GTGENG-1 and GTGENG-2, ii) correction to the short-term VOC emission rate for EPN TK1703 due to a typographical error, iii) replacement of Facility Identification Number (FIN) TK1704, a yellow plastic tank, with a comparably sized stainless steel tank, iv) increase the annual throughput for tank EPNs TK1701, TK1702, TK1703, TK1704, and TK-CWT, and v) update Table 2 to more accurately reflect operations.

No Permit by Rule (PBR) or Standard Permit (SP) registrations are being incorporated in the current project.

Maintenance, start-up, and shutdown (MSS) emissions from the processes at the ethylene cracker are authorized in the NSR permit. MSS emissions are being updated in the current project.

Project Emission Summary

Air Contaminant	Current Allowable Emission Rates (tpy)	Proposed Allowable Emission Rates (tpy)	Change in Allowable Emission Rates (tpy)	Project Changes at Major Sources (Baseline Actual to Allowable)*
VOC	0.05	0.07	0.02	0.07

*Conservatively, baseline actual emissions for this project were assumed to be zero. Please see the Federal Rules Applicability Section for more information including the retrospective federal review.

Federal Rules Applicability

Requirement	
Subject to NSPS?	**Yes**
Subparts A, Db, Kb, GG, NNN, RRR, VV, & YYY	
Subject to NESHAP?	**Yes**
Subparts A, FF, J & V	
Subject to NESHAP (MACT) for source categories?	**Yes**
Subparts A, F, G, H, XX & YY	
Nonattainment review applicability: The plant is located in Jefferson County which is designated as attainment or unclassifiable for all criterial pollutants. Therefore, Nonattainment New Source Review (NNSR) is not applicable.	

PSD review applicability: The plant is an existing major source. The modification of EPNs GTGENG-1 and GTGENG-2 is retrospective to Project No. 184853. Both the retrospective and current federal applicability reviews shall be addressed.

Regarding the retrospective federal applicability review, the retrospective federal applicability analysis for Project No. 184853 shows that the retrospective VOC project emission increase for the project was 0.04 tpy. There were no other changes to project emission increases for any other pollutants in Project No. 184853. Project emission increases which are different from the project emission increases in the original federal review applicability analysis for Project No. 184853 are shown in the table below. Based on the retrospective review, the new/updated project emission increase of VOC should have been 0.04 tpy. Therefore, the original PSD review determination will not change.

Regarding the current federal applicability analysis, there is a project emission increase of 0.07 tpy VOC. There are no other project emission increases. Therefore, PSD review does not apply.

Project Emission Increases (tpy)		
EPN	VOC (Original)*	VOC (Retrospective)**
GTGENG-1	0.01	**0.02**
GTGENG-2	0.01	**0.02**
Total	0.02	**0.04**

*These values were the original VOC project emission increases for Project No. 184853.
**These are the new values after the emissions are retrospectively applied to Project No. 184853.

Title V Applicability - 30 TAC Chapter 122 Rules

Requirement

Title V applicability: The site is a major source and is currently operating under Title V Permit Nos. O-2551 and O-2629.

Periodic Monitoring (PM) applicability: The site is subject to PM. The following PM provisions are applicable for new, modified, and affected sources in the current project:

- Records of operating hours for the Cogen starting engines, units 20A and 20B (EPNs GTGENG-1, GTGENG-2) shall be maintained per Special Condition (SC) No. 59.
- Per SC No. 10.F, records shall be kept of the tanks to demonstrate that the permit holder maintains the “new” exterior tank conditions.
- For the purposes of assuring compliance with VOC emission limitations associated with tanks, the permit holder shall maintain records in accordance with SC No. 10.G.

Compliance Assurance Monitoring (CAM) applicability: The site is subject to CAM. However, no CAM provisions apply to new, modified, and affected sources in the current project.

Process Description

The ethylene cracking unit converts low-value paraffins such as ethane, propane, and butane into high-value olefins such as ethylene, propylene, and butene. The conversion takes place in the presence of dilution steam by raising the hydrocarbon/dilution steam temperature to cracking temperatures. The temperature acts to destabilize the structure of the hydrocarbon molecule and initiate the rearrangement of the hydrocarbon molecular bonds.

The ethylene cracking unit consists of various processing steps such as: the convection section of the cracking furnaces, radiant section of the cracking furnaces, quenching, fractionation, and support facilities.

Convection Section of the Cracking Furnaces
Firstly, hydrocarbon is gradually preheated in multiple sections by recovering waste heat from flue gas. Later, the hydrocarbon feed is injected with dilution steam to control the rate of cracking and to reduce the rate of coke formation.

Radiant Section of the Cracking Furnaces
Downstream of the convection section of the cracking furnaces, in the radiant section of the cracking furnaces, radiant heat generated from the combustion of fuel gas at the floor and wall burners rapidly raises the temperature of the feed material. Once raised to the appropriate temperature, the cracking reaction takes place very quickly (< one second).

Quenching
Once outside the radiant section of the furnace, quenching occurs in tube-in-tube type transfer line exchanges (TLEs). The heat of the cracked gas is transferred to boiler feed water, producing super high-pressure steam and cooling the cracked gas. Downstream of the TLEs, the cracked gas is routed to the gasoline fractionator via transfer lines. In the second phase of quenching, two sets of quench oil fittings inject cool quench oil into the transfer lines to cool the cracked gas.

Fractionation
The quenched cracked gas is fractionated into cracked gas overhead, a pyrolysis gas oil product, and a residual quench oil stream inside the gasoline fractionator. Cracked gas sent overhead is cooled in the quench tower and treated further in the cold section for recovery of cracked products. The pyrolysis gas oil product is steam stripped in the pyrolysis gas oil stripper, filtered, and used as purge oil or exported as product with pyrolysis fuel oil.

Support Facilities
Support facilities in the utilities section of the plant include two cogeneration units and an auxiliary boiler that provide high pressure process steam and electricity to the process, and two package boilers that provide process steam.

Project Scope

In this project the following is proposed:

Cogen Starting Engine, Unit #20A and #20B (EPNs GTGENG-1, GTGENG-2)
Update the VOC emission factor for the Cogen starting engines in order to align with AP-42 Ch. 3.4. The change results in an increase in short-term and long-term VOC emissions. The original emission calculations (submitted in TCEQ Project No. 184853) used an incorrect VOC emission factor.

Tank TK1703 (EPN TK1703)
Update the short-term VOC emission rate calculation. The original calculation in the permit renewal (Project No. 305464) contained a typographical error in the hourly emissions. Additionally, increase in annual tank throughput. The emission increases resulting from the increase in annual tank throughput are within rounding error and do not require any update to the MAERT.

Tank TK1704 (EPN TK1704)
Replace this source, a yellow poly tank, with a stainless-steel tank of comparable size. Increase in annual tank throughput resulting in a long-term VOC emissions increase. Additionally, the replacement of the tank results in an increase in short-term VOC emissions. BACT and impact reviews were completed.

Tanks TK1701, TK1702, and water treatment chemicals storage (EPNs TK1701, TK1702, and TK-CWT)
Annual tank throughputs are being increased. The resulting emission increases are within rounding error and do not require any update to the MAERT.

Update Table 2 to More Accurately Reflect Operations
Table 2 (confidential material balance) is being updated to more accurately reflect operations. Extraneous materials are being removed from Table 2. No increase in raw material or product throughputs are occurring. Solid and liquid wastes are being updated to reflect that output is variable. There are no increases in emissions or modifications occurring as a result of the update. The reference to Table 2 in SC No. 8 is being updated.

Changes to MAERT:

- Increase in short-term and long-term VOC emissions for Cogen Starting Engines, Unit #20A and #20B (EPNs GTGENG-1, GTGENG-2).
- Increase in short-term VOC emissions for Tank TK1703 (EPN TK1703).
- Increase in short-term and long-term VOC emissions for Tank TK1704 (EPN TK1704).

Changes to Special Conditions:

Prior SC no.	New SC no.	Description of Change
8	8	Updated the reference to Table 2 from March 2020 to January 2022 to reflect changes made to Table 2 in the current project.
10.F.	10.F.	Added boilerplate language from the tank boilerplate pertaining to tank exterior surfaces represented as “new”. For stainless steel, the surface must maintain a like-new appearance.
10.H.	10.H.	Update the SC language to now reference the current project.
10.L.	10.L.	Removed the word ‘painted’. Tank TK1703 and Tank TK1704 are made of a yellow plastic. They are not painted.
-	10.M.	Creation of a new SC which states that Tank TK1704 (EPN TK1704) shall be replaced in accordance with the current project. Tank TK1704 shall be stainless steel and is exempt from the color requirements of SC No. 10.F. because it stores a corrosive chemical.

Best Available Control Technology

Source Name	EPN	Best Available Control Technology Description
Cogen Starting Engine Unit #20A	GTGENG-1	In accordance with 40 CFR § 60.4200(a)(2), the engines are not subject to the requirements of 40 CFR Part 60, Subpart IIII. However, the applicable emission standards for nonroad compression-ignition engines listed in Appendix I to Part 1039 of 40 CFR shall be met. Ultra-low sulfur diesel shall be used. Engine operation is limited to 96 hours per year. The engines have a non-resettable runtime meter. No visible emissions shall leave the property. BACT is satisfied.
Cogen Starting Engine Unit #20B	GTGENG-2	
Tank TK1703	TK1703	Fixed roof storage tank with VOC vapor pressure < 0.5 psia. Submerged fill shall be used. The tank has a volume of 3,000 gallons and is made out of a yellow plastic which cannot easily be painted. Due to the relatively small size of the tank and the low associated emissions, painting the tank white would not change the total emissions associated with the tank. The total emissions associated with the tank if it is white are 0.01 tpy VOC. The total emission associated with the tank if it is yellow are 0.01 tpy VOC. For the above reasons, the tank is authorized to be yellow. Per previously approved BACT, uninsulated exterior surfaces exposed to the sun are yellow per SC No. 10.L. BACT is satisfied.

Tank TK1704	TK1704	Fixed roof storage tank with VOC vapor pressure < 0.5 psia. Submerged fill shall be used. The tank shall be made of stainless-steel. The tank shall store Petroflo 21Y17C. Per the provided Safety Data Sheet (SDS), Petroflo 21Y17C is corrosive to metals. Therefore, a stainless-steel tank is needed to prevent corrosion. Furthermore, having the tank be stainless steel instead of a painted white tank results in only 0.06 lb/hr and 0.01 tpy greater VOC emissions. BACT is satisfied.
Tank TK1701	TK1701	Fixed roof storage tanks with VOC vapor pressures < 0.5 psia. Per SC No. 10.F, submerged fill shall be used and uninsulated exterior surfaces exposed to the sun shall be white or aluminum. BACT is satisfied.
Tank TK1702	TK1702	
Water Treatment Chemicals Storage	TK-CWT	

Impacts Evaluation

Was modeling conducted?	**No***	Type of Modeling:	**N/A***
Is the site within 3,000 feet of any school?		**No**	
Additional site/land use information: The surrounding land is primarily rural and industrial.			
* A unit impact multiplier from Appendix C of APDG 5874 was used for nonane.			

Summary of Modeling Results

On November 2, 2021, BTP provided the final Electronic Modeling Evaluation Workbook (EMEW) and the Modeling and Effects Review Applicability (MERA) analysis. No Air Quality Analysis (AQA) for the National Ambient Air Quality Standards (NAAQS) or State Property Line Standard (SPLS) was conducted because there is no increase in emissions of NAAQS or SPLS pollutants. The applicant followed the TCEQ's March 2018 guidance for the MERA analysis. The results are summarized below.

In step 0 of the MERA analysis, emission increases of health-effect pollutants from the Cogen Starting Engine, Unit #20A and #20B (EPNs GTGENG-1 and GTGENG-2) were excluded from MERA evaluation. EPNs GTGENG-1 and GTGENG-2 are emergency diesel engines which only run 96 hrs/yr and, in accordance with Appendix B of APDG 5874, are not expected to cause adverse health effects and do not require additional review through the MERA process. Additionally, there is a 0.06 lb/hr short-term and 0.02 tpy long-term increase in acetic acid emissions associated with Tank TK1704 (EPN TK1704). The short-term and annual Effects Screening Levels (ESLs) of acetic acid are 2,500 µg/m^3 and 250 µg/m^3, respectively. Therefore, a long-term impacts evaluation is not required. The short-term increase in acetic acid emissions is below the de minimis level in step 2 of the MERA. Therefore, acetic acid falls out at step 2 of the MERA.

In step 3 of the MERA analysis, a 0.08 lb/hr emissions increase of nonane associated with Tank TK1703 (EPN TK1703) was evaluated. Nonane has a short-term ESL of 4,800 µg/m^3 and an annual ESL of 450 µg/m^3. The tank height is 10 feet and the distance from the fence line is 1,000 feet. Therefore, a unit impact multiplier of 252 µg/m^3 per lb/hr was selected from Table 1 in Appendix C of APDG 5874. This unit impact multiplier implies a maximum ground level concentration (GLC_{max}) of 20.16 µg/m^3 for nonane which is below 10% of the corresponding short-term ESL value. Nonane falls out at Step 3 of the MERA.

No adverse public health, welfare, or environmental effects are expected to occur as a result of exposure to the emissions from the facilities authorized by this project.

Project Reviewer Michael Brown	June 15, 2022 Date	Team Leader Becky Tsuchiya	June 15, 2022 Date