

Permit Amendment Source Analysis & Technical Review

Company	Shell Chemical LP	Permit Number	3179
City	Deer Park	Project Number	160508
County	Harris	Account Number	HG-0659-W
Project Type	Amend	Regulated Entity Number	RN100211879
Project Reviewer	Mr. Tom Lawshae	Customer Reference	CN601405145

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Site Name **Cumene And Phenol Acetone Units**

Project Overview

Shell Chemical, LP, (Shell) submitted amendment applications for Permits 266, 1968, 3173, 3179, 18576, and 19849. The purpose of these amendments is 1) to consolidate the emissions from the A & S Flare (EPN A1301) and the HIPA Flare (EPN A1333) into Permit 3179, remove the flares' emissions from the MAERTs of the other five permits, and remove conditions related to the flare from the other four permits and void permit 266, 2) to transfer the emissions from the A & S Flare (EPN A1301) to the HIPA Flare (EPN A1333), 3) to idle the A & S Flare and authorize the use of the A & S Flare as a backup to the HIPA Flare, and 4) to incorporate four unregistered Permits by Rule into the permit. As a result of the projects, this permit has acetone increases of 0.72 lb/hr and 2.00 tpy, CO increases of 103.39 lb/hr and 124.37 tpy, NO_x increases of 24.83 lb/hr and 44.89 tpy, VOC increases of 202.43 lb/hr and 18.28 tpy, and SO₂ increases of 3.43 lb/hr and 14.99 tpy. Increases due to the transfer of flare emissions from the other five permits are 0.57 lb/hr and 2.00 tpy of acetone, 82.50 lb/hr and 91.50 tpy of CO, 20.82 lb/hr and 38.74 tpy of NO_x, 192.30 lb/hr and 103.32 tpy of VOC, and 3.43 lb/hr and 14.99 tpy of SO₂. Increases due to the incorporation of the four unregistered Permits by Rule are 0.15 lb/hr and 0 tpy of acetone, 20.89 lb/hr and 32.87 tpy of CO, 4.01 lb/hr and 6.15 tpy of NO_x, 10.40 lb/hr and 14.96 tpy of VOC, and no hourly or annual increases in SO₂.

Compliance History Evaluation - 30 TAC Chapter 60 Rules

A compliance history report was reviewed on:	10/26/2010
Compliance period:	09/01/2005 to 08/31/2010
Site rating & classification:	10.91 (Average)
Company rating & classification:	3.97 (Average)
If the rating is 40<RATING<45, what was the outcome, if any, based on the findings in the formal report:	NA
Has the permit changed on the basis of the compliance history or rating?	NA

Public Notice Information - 30 TAC Chapter 39 Rules

Rule Citation	Requirement	
39.403	Is Public Notice Required?	No
	If no, give reason:	Emissions increases come solely from the incorporation of four unregistered permits by rule.

Construction Permit & Amendment Requirements - 30 TAC Chapter 116 Rules

Rule Citation	Requirement	
116.111(a)(2)(G)	Is the facility expected to perform as represented in the application?	Yes
116.111(a)(2)(A)(i)	Are emissions from this facility expected to comply with all TCEQ air quality Rules & Regulations, and the intent of the Texas Clean Air Act?	Yes
116.111(a)(2)(B)	Emissions will be measured using the following method:	Cooling tower water monitoring by air stripping method; monitoring of flare flame;

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		28RCT fugitive monitoring; 28 VHP fugitive monitoring; stack testing of Catalytic Incinerator (EPN H9200) and Thermal Oxidizer (EPN H87002); CEMS monitoring of Catalytic Incinerator
	Comments on emission verification:	None
116.111(a)(2)(D)	Subject to NSPS? Subparts A, Kb, VV, III, NNN, & RRR	Yes
116.111(a)(2)(E)	Subject to NESHAP? Subparts A, J, V, Y, & FF	Yes
116.111(a)(2)(F)	Subject to NESHAP (MACT) for source categories? Subparts F, G, & H	Yes
116.111(a)(2)(H)	Nonattainment review applicability: Shell submitted amendment projects for Permit 266 (Project 160506), Permit 1968 (Project 160498), Permit 3173 (Project 160507), Permit 3179 (Project 160508), Permit 160483 (Project 160483), and Permit 19849 (Project 160503). All six amendments were evaluated together for nonattainment review applicability. The site is located in Harris County, which is nonattainment for ozone. The only emission increases are due to the incorporation of unregistered Permits by Rule in the amendment for permit 3179, which have already been evaluated for nonattainment review applicability, so nonattainment review is not applicable.	
116.111(a)(2)(I)	PSD review applicability: As was done for nonattainment review applicability, all six amendments were evaluated together for PSD review applicability. The Shell Deer Park Plant is a named source and a major source for CO. The only emission increases are due to the incorporation of unregistered Permits by Rule in the amendment for permit 3179, which have already been evaluated for PSD review applicability, so PSD review is not applicable.	
116.111(a)(2)(L)	Is Mass Emissions Cap and Trade applicable to the new or modified facilities? If yes, did the proposed facility, group of facilities, or account obtain allowances to operate:	Yes No
116.140 - 141	Permit Fee: \$900.00	Fee certification: Yes

Title V Applicability - 30 TAC Chapter 122 Rules

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Rule Citation	Requirement
122.10(13)	Title V applicability: Title V is applicable. The company's Title V permit is O-1945.
122.602	Periodic Monitoring (PM) applicability: This permit has the following monitoring requirements: Cooling Tower - Special Condition 12 requires monthly monitoring of cooling tower water using a TCEQ-approved air stripping method. Phenol 2 Unit Fugitives - Special Condition 22 requires 28RCT fugitive monitoring. Cumene Section Monitoring - Special Condition 23 requires 28VHP fugitive monitoring. Catalytic Incinerator - Special Condition 24 requires stack testing, and Special Condition 25 requires CEMS monitoring. Thermal Oxidizer - Special Condition 24 requires stack testing.
122.604	Compliance Assurance Monitoring (CAM) applicability: CAM is applicable. General CAM requirements were added as Special Condition 15.

Request for Comments

Received From	Program/Area Name	Reviewed By	Comments
Region:	12	Shonta Moore	No comments
City:	Deer Park	No response	
County:	Harris	No response	
Toxicology:			
Compliance:			
Legal:			
Comment resolution and/or unresolved issues:			

Process/Project Description

The Cumene and Phenol Acetone Units consist of the oxidation unit, the cleavage unit, the acetone unit, the phenol unit, the alpha-methyl styrene recovery unit, and the dephenolation unit.

In the oxidation unit, a series of oxidizers uses fresh air to oxidize cumene to cumene hydroperoxide and several by-products, including dimethyl benzyl alcohol (DMBA), acetophenone (AP), methanol, formaldehyde, and formic acid. In the spent air treatment section, cumene is recovered by condensation and refrigeration, and the remaining volatile organic compounds are sent to the incinerator (EPN H87002).

The product mixture from the oxidation is fed to the cleavage unit, where cumene is removed by two distillation columns. The concentrated CHP is fed into the cleavage reactor, which forms phenol and acetone by the acid-catalyzed decomposition of CHP.

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After removal of leftover acid from the product mixture, the product is fed to the acetone unit, where it is fractionated and purified. The heavy fraction is then fed to the phenol unit, which consists of three fractionation columns. The phenol is purified and useful organics are recovered and recycled.

Alpha-methyl styrene (AMS), a major byproduct of the chemical process, is recovered in the AMS recovery unit. The crude AMS is fractionated and hydrogenated to cumene, which is recycled back to the oxidation step. Vent gases from the AMS reactor are routed to the HIPA/A & S Flares.

Phenol is removed from phenolic wastewater by collection and neutralization of the wastewater followed by steam stripping.

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Pollution Prevention, Sources, Controls and BACT- [30 TAC 116.111(a)(2)(C)]

The two emission sources affected by this amendment include the A & S Flare (EPN A1301) and the HIPA Flare (EPN A1333). Both are steam-assisted flares that meet the requirements of 40 CFR 60.18, as required by Special Condition 14 of Permit 3179. They both achieve a destruction efficiency of 99% for compounds with up to three carbons and 98% for compounds with greater than three carbons. This meets BACT requirements.

Four unregistered Permits by Rule that are directly related to the flares are being incorporated into Permit 3179 as follows:

Unregistered PBR 106.4 and Standard Exemption 80: Shell used this PBR/Standard Exemption combination to authorize the venting of waste gas from the Occidental VCM Unit to the HIPA Flare, which meets BACT requirements.

Unregistered PBR 106.4 and 106.492: Shell used this combination to authorize the unloading of crude isoprene from tank trucks into process vessels. This occurs in three steps: 1) Crude isoprene is pumped from a tank truck to process vessel V-IP-907. V-IP-907 is vented to the HIPA Flare. 2) The crude isoprene is then pumped from V-IP-907 to process vessel V-IP-906, which is a pressurized vessel equipped with a pressure control system. When the pressure inside the vessel exceeds the setpoint, the pressure valve vents to the HIPA Flare. 3) The crude isoprene is then pumped via a closed system to the Isoprene Recovery Unit. Since neither V-IP-907 nor V-IP-906 are being used to store the material, bottom or submerged loading is not required. Venting of both vessels to the HIPA Flare is accepted as BACT.

Unregistered PBR 106.4 and 106.492: Shell used this combination to authorize the routing of emissions from relief valves in the Off Spec Bullet Area to the HIPA Flare, which meets BACT requirements.

Unregistered PBR 106.4 and 106.492: Shell used this combination to authorize the use of natural gas as an assist gas in the HIPA and A & S Flares to ensure that the Btu content meets the requirements of 40 CFR 60.18. The HIPA and A & S Flares meet BACT requirements.

The following changes were made to the Special Conditions:

<u>Old SC</u>	<u>New SC</u>	<u>Discussion</u>
1-12	1-12	No change
13	13	Modified Catalytic Incinerator and Regenerative Thermal Oxidizer requirement at company request
14	14	Updated flare requirements
	15	Added general CAM requirements
15-18	16-19	No change
	20	Transferred storage tank control requirement from Permit 266
19-21	21-23	No change
22	24	Updated references in stack testing requirements
23	25	No change

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The following changes were made to the MAERT:

- The EPN and emission rates for the plant flares were updated.
- Footnote 7 was removed.

Impacts Evaluation - 30 TAC 116.111(a)(2)(J)

Was modeling conducted?	Yes	Type of Modeling:	SCREEN3
Will GLC of any air contaminant cause violation of NAAQS?			No
Is this a sensitive location with respect to nuisance?			No
[§116.111(a)(2)(A)(ii)] Is the site within 3000 feet of any school?			Yes
Additional site/land use information: Directly north of the Deer Park Plant is the Houston Ship Channel, and residential and commercial areas of the City of Deer Park are located directly south of the plant.			

Summary of Modeling Results

The evaluation of impacts for these projects includes three things: 1) evaluating the change in impacts due to transferring emissions from the A & S Flare to the HIPA Flare, 2) evaluating the impacts of the VOC emissions increases due to the incorporation of the four PBRs, and 3) evaluating the impacts of the NO_x increases due to the incorporation of the four PBRs to demonstrate compliance with the 1-hour NO₂ standard. To evaluate the change in impacts due to the consolidation of all flare emissions to the HIPA Flare, the total VOC and acetone hourly emission rates currently going through both flares were modeled using SCREEN3 and compared to the modeled SCREEN3 impact of the total VOC and acetone emissions going through the HIPA Flare alone. The total modeled VOC impact decreased from 83.48 µg/m³ to 55.57 µg/m³. The total modeled acetone impact decreased from 0.27 µg/m³ to 0.21 µg/m³.

The incorporation of the four PBRs causes emission increases for 19 compounds: propane, propylene, methane, ethane, ethylene, n-butane, 3-methyl-1-butene, isopentane, dimethyl acetylene, 1-pentene, 2-methyl-1-butene, n-pentane, isoprene, trans-2-pentene, cis-2-pentene, 2-methyl-2-butene, trans-1,3-pentadiene, cyclopentadiene, and cis-1,3-pentadiene.

Propane, propylene, methane, and ethane are listed on the Toxicology Screening List as simple asphyxiants, so no further review is required.

n-Butane, dimethyl acetylene, and cis-2-pentene has hourly increases below de minimis levels, as shown by the following table:

CAS No.	Chemical Name	Hourly ESL	Annual ESL	Hourly Increase
106-97-8	n-Butane	23750	2375	0.27
503-17-3	Dimethyl Acetylene	14400	1440	0.08
627-20-3	cis-2-Pentene	7500	750	0.26

For the twelve remaining compounds, increases were modeled using SCREEN3, and the modeled impact of each compound was determined to be less than ten percent of the respective ESL, as shown in the table below:

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CAS No.	Chemical Name	Hourly ESL	Modeled Impact	Percent of ESL
74-85-1	Ethylene	1400	0.62	0.04
563-45-1	3-Methyl-1-Butene	720	0.05	0.007
78-78-4	Isopentane	3500	0.32	0.009
109-67-1	1-Pentene	290	0.25	0.09
563-46-2	2-Methyl-1-Butene	1000	0.21	0.02
109-66-0	n-Pentane	3500	0.27	0.008
78-79-5	Isoprene	14	0.46	3.29
646-04-8	trans-2-Pentene	7500	0.15	0.002
513-35-9	2-Methyl-2-Butene	1000	0.09	0.009
504-60-9	trans-1,3-Pentadiene	1800	0.14	0.008
542-92-7	Cyclopentadiene	2000	0.03	0.002
1574-41-0	cis-1,3-Pentadiene	1800	0.05	0.003

Modeled impacts are acceptable.

The incorporation of the four PBRs caused an hourly NO_x increase of 4.01 lb/hr. This increase was modeled using SCREEN3 to demonstrate compliance with the 1-hour NO₂ NAAQS. The modeled NO_x impact of 1.16 µg/m³ was multiplied by 0.75 to obtain an NO₂ impact of 0.87 µg/m³, which is below the de minimis level of 7.5 µg/m³, so the NO_x increases will not cause an exceedance of the 1-hour NO₂ NAAQS.

Permit Concurrence and Related Authorization Actions

Is the applicant in agreement with special conditions?	Yes
Company representative(s):	Brent Dyer
Contacted Via:	Email
Date of contact:	February 17, 2011
Other permit(s) or permits by rule affected by this action:	Yes
List permit and/or PBR number(s) and actions required or taken:	Flare emissions from Permits 266, 1968, 3173, 18576, and 19849 were transferred to this permit. Four unregistered permits by rule were also incorporated into the permit.

Project Reviewer	Date	Team Leader/Section Manager/Backup	Date
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