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DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

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NARRATIVE

TO: Stephen Damaske

FROM: Heather Brown

DATE: August 9, 2022

Facility Name:	**Stepan Company**
AIRS No.:	013-00001
Location:	Winder, GA (Barrow County)
Application #:	27495
Date of Application:	April 9, 2020; 6/2/2020, 12/17/2020, and 12/17/2021

Background Information

Stepan Company (Stepan) owns and operates a specialty chemical manufacturing facility located at 951 Bankhead Hwy, Winder, GA 30680 (Barrow County). The facility operates under Synthetic Minor Permit No. 2843-013-0001-S-02-0 issued on September 8, 2017 and three amendments issued on June 1, 2018, March 6, 2020, and May 24, 2021, respectively.

Purpose of Application

Application No. 27495 was received on April 10, 2020. It has been updated several times as additional information became available. A public advisory was not required because the project is for equipment and permit changes that result in a reduction in emissions.

The Georgia EPD issued a letter to Stepan dated December 9, 2019 requesting submittal of an air permit application, which would incorporate changes at the facility to reduce ethylene oxide (EtO) emissions. The letter also included a request for submission of a written Leak Detection and Repair (LDAR) Plan and detailed emissions calculations with a description of the methodology used, emission factors, any assumptions used, and operational parameters. The application was submitted electronically on April 10, 2020.

The calculations in the application show the benefit of the proposed additional control measures: LDAR implementation and the installation of rupture disks on all pressure relief valves. The calculations have also been updated to include results from stack testing performed in 2020. The application also presents batch production data and supporting information for emissions due to EtO handling at the facility.

Process Description

The Stepan facility produces intermediates for laundry detergent manufacturing and other similar products. These intermediates are produced through batch and continuous reaction processes. The facility consists of reactor vessels, blenders, batch neutralizers, continuous sulfonation process lines, a re-blend tank, and storage tanks. The facility also operates several boilers, emergency generators, and fire water pump engines. The full equipment list is included in this narrative.

EtO emissions from the Stepan facility result from the following processes:

- The depressurization of Alkoxylation Process Reactor R01;
- The depressurization of EtO Storage Tank T-3400 after railcar unloading;
- The cleaning of EtO Storage Tank T-3400;
- Fugitive equipment leaks from EtO unloading, EtO storage, and the alkoxylation process reactor area; and
- The purging of EtO lines throughout the facility.

Alkoxylation Reactor R01

Reactor R01 operates as a batch reactor and produces certain products that use EtO as a raw material. There are no emissions from the reactor during the reaction process, as R01 is a jet stream reactor that constantly pulls the headspace gas back into the reaction. However, when the reaction process ends, the product is pumped out and the vessel is depressurized. The depressurized gas, which contains EtO, is vented to Scrubber SCR-R01. Depressurization occurs for approximately 20 minutes per cycle. Approximately once or twice a month, batches with an additional cook time are conducted in Reactor R01. For these batches, operation charges the reactor with EO, allows the reaction to take place, and then depressurizes the reactor. This process is repeated several times before the batch is completed. All gases are routed to the scrubber. In addition, maintenance activities performed on the reactor, such as a reactor cleanout, include emptying the reactor and purging with nitrogen to ensure safety.

EtO Storage Tank T-3400

EtO is stored under pressure at specific temperature as liquid or gas dependent on pressure and temperature of the system. During railcar unloading, liquid EtO is transferred from the railcar to Storage Tank T-3400. This transfer is performed under a closed system between the railcar and the storage tank, which allows the balancing of vapors displaced during loading from the storage tank to the railcar (vapor balance system). EtO emissions result from depressurization of the tank after the railcar unloading has been completed. Depressurization occurs for approximately 20 minutes per cycle. Emissions from tank depressurization are routed to Scrubber SCR-R01 as required by the current permit and the provisions of 40 CFR 60 Subpart Kb.

Maintenance activities performed on the tank, such as a tank cleanout, include emptying the tank and purging with nitrogen to ensure safety. Tank cleaning is generally only performed approximately once every ten years to satisfy regulatory requirements for internal inspections. The tank cleaning process occurs in two stages, controlled and uncontrolled. In the controlled stage, stage one, EtO is unloaded from the tank to Reactor R01 where it is neutralized with potassium hydroxide (KOH). Reactor R01 is filled under a closed system and thus, there are no emissions associated with this part of the process. It is assumed that all EtO left in Reactor R01 is fully reacted with KOH and no EtO remains from the neutralization process.

After EtO is unloaded to Reactor R01, the tank is depressurized several times over a 48 hour period to Scrubber SCR-R01 following the pressurizing with nitrogen. After the tank is purged with nitrogen, it is washed with water several times, with the vent open to the scrubber when filling with water. The water is moved and neutralized with potassium KOH in the reactor. The reactor is also filled under a closed loop system and has no emissions. It is also assumed that all EtO left in the reactor is fully reacted with KOH and no EtO remains from the neutralization process. During the last wash, water is pumped to the storage tank to overflowing. This represents the uncontrolled stage of tank cleaning, stage two.

EtO Fugitive Equipment Leaks

Piping components, such as valves, connectors, and pump seals, have the potential for fugitive leaks of EtO. Stepan created and implemented an enhanced LDAR program to detect, repair, and minimize emissions from fugitive components. The facility also installed rupture discs on pressure relief valves in EtO service as part of the emission reduction project. The rupture discs eliminate the valves as a source of fugitive emissions.

Line Purging

As a preventive measure prior to maintenance activity, certain EtO lines throughout the facility are purged. The vapor lines are purged to Scrubber SCR-R01. For the liquid lines, all of the liquid is blown down to Reactor R01 under a closed system where it is neutralized with KOH prior to purging of the line to the scrubber. During line breaks, any EtO remaining after the purge to the scrubber is vented to the atmosphere. When calculating emissions, the controlled portion of the calculations assume that all vapor inside the pipes is EtO prior to purging to the scrubber. For the liquid lines, it is assumed that no EtO remains from the neutralization process. Some of the lines associated with the unloading area are also purged to the scrubber after railcar unloading. There are no line breaks associated with these emissions

Updated Equipment List

The equipment list has been updated to include all sources of EtO at the facility.

EQUIPMENT LIST

Batch Reaction Processes and Associated Equipment					
Emission Units				Associated Control Devices	
Source Code	Description	Install Date	Applicable Requirements/Standards	Source Code	Description
R01*	Alkoxylation process reactor (8,000 gallons) including catch tanks and heat exchangers	1990	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) Avoidance of 40 CFR Part 70	SCR-R01	Scrubber (1998)
T-3300	31,780-gallon storage tank (typically holds propylene oxide), pressurized vessel, maximum true vapor pressure of 10.99 psia	1998	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) 391-3-1-.02(2)(vv) Avoidance of 40 CFR Part 70 40 CFR 60 Subpart A 40 CFR 60 Subpart Kb	SCR-R01	Scrubber (1998)
T-3400*	31,780-gallon storage tank (typically holds ethylene oxide), pressurized vessel, maximum true vapor pressure of contents: 20.2 psia	1998	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) 391-3-1-.02(2)(vv) Avoidance of 40 CFR Part 70 40 CFR 60 Subpart A 40 CFR 60 Subpart Kb	SCR-R01	Scrubber (1998)
T-3400 (Cleaning)*	Vapor space purge emission from tank cleaning – Controlled (Maintenance Activities)	1998	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) Avoidance of 40 CFR Part 70 40 CFR 60 Subpart A 40 CFR 60 Subpart Kb	SCR-R01	Scrubber (1998)
T-3400	Vapor space purge emission from tank cleaning – Uncontrolled	1998	391-3-1-.02(2)(e) 391-3-1-.02(2)(b)	None	None

(Cleaning Fugitive)*	(Maintenance Activities)		Avoidance of 40 CFR Part 70 40 CFR 60 Subpart A 40 CFR 60 Subpart Kb		
UNLOAD*	Railcar Unloading of EtO/PO	--	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) Avoidance of 40 CFR Part 70	SCR-R01	Scrubber (1998)
Equipment Fugitive EtO*	Ethylene oxide fugitive emissions from piping components	--	Avoidance of 40 CFR Part 70	LDAR	Leak Detection and Repair Program
Line Purges*	Ethylene oxide emissions from purging of lines – Controlled (Maintenance Activities)	--	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) Avoidance of 40 CFR Part 70	SCR-R01	Scrubber (1998)
Line Purges (Fugitive)*	Ethylene oxide emissions from purging of lines – Uncontrolled (Maintenance Activities)	--	Avoidance of 40 CFR Part 70	None	None
R02	Esterification process reactor (6,000 gallons) including process tanks, heat exchangers, and condenser(s).	1978	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) Avoidance of 40 CFR Part 70	SCR-NAOHR02	Scrubber (1978)
R04	Intermediate esterification process reactor (8.000 gallons) including process tanks, heat exchangers, and condenser(s).	2009	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) Avoidance of 40 CFR Part 70	SCR-NAOHR02	Scrubber (1978)
R05	Process which includes a reactor (8,500 gallons), heat exchangers, and condenser(s).	2001	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) Avoidance of 40 CFR Part 70	SCR-NAOHR02	Scrubber (1978)
DMS	Railcar/Truck Dimethyl Sulfate Unloading	--	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) Avoidance of 40 CFR Part 70	SCR-8126	DMS Storage Scrubber
T-126	25,000-gallon process vessel (typically holds Dimethyl Sulfate), pressurized vessel	1992	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) Avoidance of 40 CFR Part 70	SCR-8126	DMS Storage Scrubber
--	R05 Solids – Bag Dump Station	--	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) Avoidance of 40 CFR Part 70	None	None
--	R05 Solids Conveying Cyclone to R05 Reactor	--	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) Avoidance of 40 CFR Part 70	None	None

*Sources of ethylene oxide (EtO) emissions.

Continuous Process Lines					
Emission Units				**Associated Control Devices**	
Source Code	**Description**	**Install Date**	**Applicable Requirements/Standards**	**Source Code**	**Description**
R-1002	Sulfonation I Process Line – includes sulfur burner, sulfur dioxide and sulfur trioxide coolers, air dryers, converter, sulfonator (or reactor), separators, acid gas absorbers, process scrubbers and process mist eliminators.	1977	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) Avoidance of 40 CFR Part 70	SCP-DRY1 SCP-DEM11 SCP-DEM12 SCP-NAOH1 SCP-TAIL1	Dry Scrubber (1977) Dry Scrubber Demister 1 (1977) Dry Scrubber Demister 2 (1977) Caustic Scrubber (2019) Tail Gas Demister (2019)
R420	Sulfonation II Process Line – includes sulfur burner, sulfur dioxide and sulfur trioxide coolers, air dryers, converter, sulfonator (or reactor), separators, acid gas absorbers, process scrubbers and process mist eliminators.	1992	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) 40 CFR 60 Subpart A 40 CFR 60 Subpart RRR Avoidance of 40 CFR Part 70	SCP-DRY2 SCP-DEM21 SCP-DEM22 SCP-NAOH2 SCP-TAIL2	Dry Scrubber (1992) Dry Scrubber Demister 1 (1992) Dry Scrubber Demister 2 (1992) Caustic Scrubber (2020) Tail Gas Demister (2020)
VS	Stripping System Condenser Vacuum System Vent	2021	391-3-1-02(2)(e) 391-3-1-.02(2)(b) 40 CFR 60 Subpart A 40 CFR 60 Subpart NNN Avoidance of 40 CFR Part 70	None	N/A

Batch Neutralizers					
Emission Units				Associated Control Devices	
Source Code	Description	Install Date	Applicable Requirements/Standards	Source Code	Description
R-BN1	Reactor #1 (8,000 gallons)	1984	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) Avoidance of 40 CFR Part 70	None	None
R-BN2	Reactor #2 (8,000 gallons)	1987			
R-BN3	Reactor #3 (17,000 gallons)	1989			
R-BN4	Reactor #4 (17,000 gallons)	1989			
T-550	7,400-gallon HVP Reblend Process Tank	1994			

Blenders					
Emission Units				Associated Control Devices	
Source Code	Description	Install Date	Applicable Requirements/Standards	Source Code	Description
R-BL1	Blender #1 (10,000 gallons) equipped with a venturi scrubber that operates as process equipment. Also included is a Silverson Mixer and Supersack Loader.	1977	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) Avoidance of 40 CFR Part 70	None	None
R-BL2	Blender #2 (10,000 gallons)	1977			
R-BL3	Blender #3 (1,000 gallons)	1988			

Oxidation Treatment Tanks					
Emission Units				Associated Control Devices	
Source Code	Description	Install Date	Applicable Requirements/Standards	Source Code	Description
R-2476	Oxidation Treatment Tank (30,000 gallons)	2021	391-3-1-.02(2)(e) 391-3-1-.02(2)(b)	None	None
R-2478	Oxidation Treatment Tank (30,000 gallons)	2021			

Cooling Towers					
Emission Units				Associated Control Devices	
Source Code	Description	Install Date	Applicable Requirements/Standards	Source Code	Description
CT1	Oxide Cooling Tower	1992	391-3-1-.02(2)(e) 391-3-1-.02(2)(b) Avoidance of 40 CFR Part 70	None	None
CT2	Sulfonation II Process Line Cooling Tower	1992			
CT	Stripping System Cooling Tower	2021			

Wastewater Treatment Plant					
Emission Units				Associated Control Devices	
Source Code	Description	Install Date	Applicable Requirements/Standards	Source Code	Description
WWTP	Wastewater Treatment Plant	--	391-3-1-02(2)(e) 391-3-1-.02(2)(b) Avoidance of 40 CFR Part 70	None	N/A

Fuel Burning Sources					
Emission Units				Associated Control Devices	
Source Code	Description	Install Date	Applicable Requirements/Standards	Source Code	Description
BLR	800 Break Horsepower natural gas-fired boiler	2021	391-3-1-.02(2)(d) 391-3-1-.02(2)(g) 40 CFR 60 Subpart A 40 CFR 60 Subpart Dc	None	None
E-001	16.7 MMBtu/hr (400 hp) Steam Generator Boiler #1 [Source Code #4] Natural gas fired only	1977	391-3-1-.02(2)(d) 391-3-1-.02(2)(g)	None	None
E-002	16.7 MMBtu/hr (400 hp) Steam Generator Boiler #2 [Source Code #8] Natural gas fired only	1985	391-3-1-.02(2)(d) 391-3-1-.02(2)(g)	None	None
E-005	9.99 MMBtu/hr Hot Oil Heater Natural gas indirect fired only This hot oil heater provides heat energy to the R02 Esterification Kettle and the R04 Quaternary Reactor	2006	391-3-1-.02(2)(d) 391-3-1-.02(2)(g)	None	None
GEN1	536.4 hp (400 kW) Diesel-fired Standby emergency generator	1996	391-3-1-.02(2)(b) 391-3-1-.02(2)(g) 40 CFR 63 Subpart A 40 CFR 63 Subpart ZZZZ	None	None
GEN2	469.35 hp (350 kW) Diesel-fired Standby emergency generator	2016	391-3-1-.02(2)(b) 391-3-1-.02(2)(g) 40 CFR 60 Subpart A 40 CFR 60 Subpart IIII 40 CFR 63 Subpart A 40 CFR 63 Subpart ZZZZ	None	None
FP1	215 hp Diesel-fired Standby Fire Water Pump Engine	1978	391-3-1-.02(2)(b) 391-3-1-.02(2)(g) 40 CFR 63 Subpart A 40 CFR 63 Subpart ZZZZ	None	None
FP2	215 hp Diesel-fired Standby Fire Water Pump Engine	1978	391-3-1-.02(2)(b) 391-3-1-.02(2)(g) 40 CFR 63 Subpart A 40 CFR 63 Subpart ZZZZ	None	None

Storage Tanks						
Equipment Group	**Source Code**	**Capacity (gallons)**	**Contents**	**Control Device**	**Installation Date**	**Maximum True Vapor Pressure (psia)**
--	T-077	10,000	Not a VOL	N/A	1978	--
--	T-9035.2	8,000	Not a VOL	N/A	2014	--
--	T-139	21,300	VOL	N/A	2020	varies
--	T-8592	30,000	Organic Liquid Mixture	N/A	2021	0.0001
--	T-8593	30,000				
--	T-8597	30,000				
--	T-8599	30,000				
--	T-8600	30,000				
--	T-8601	30,000				
--	T-8594	30,000	Organic Liquid Mixture	N/A	2021	0.00002
--	T-8598	30,000				
--	V-2465	7,500	Organic Liquid Mixture	N/A	2021	0.0002
--	V-2485	7,500				
--	V-2486	7,500				
--	V-2487	7,500				
Equipment Group 1: Tanks which contain VOL with a maximum true vapor pressure between 0.19 and 2.2 psia. Each of these storage tanks has a storage capacity less than 151m^3 (39,890 gallons).						
1	T-029	10,000	VOL	N/A	1978	≥ 0.19 psia but < 2.2 psia
1	T-030	10,000	VOL	N/A	1978	≥ 0.19 psia but < 2.2 psia
1	T-058	10,000	VOL	N/A	1979	≥ 0.19 psia but < 2.2 psia
1	T-060	10,000	VOL	N/A	1979	≥ 0.19 psia but < 2.2 psia
1	T-061	10,000	VOL	N/A	1979	≥ 0.19 psia but < 2.2 psia
1	T-073	10,000	VOL	N/A	1978	≥ 0.19 psia but < 2.2 psia
1	T-074	10,000	VOL	N/A	1978	≥ 0.19 psia but < 2.2 psia
1	T-075	10,000	VOL	N/A	1978	≥ 0.19 psia but < 2.2 psia
1	T-076	10,000	VOL	N/A	1978	≥ 0.19 psia but < 2.2 psia
1	T-053	14,000	VOL	N/A	1977	≥ 0.19 psia but < 2.2 psia
1	T-082	25,000	VOL	N/A	2010	≥ 0.19 psia but < 2.2 psia
1	T-012	30,000	VOL	N/A	1989	≥ 0.19 psia but < 2.2 psia
1	T-120	30,000	VOL	N/A	1990	≥ 0.19 psia but < 2.2 psia
1	T-121	30,000	VOL	N/A	1990	≥ 0.19 psia but < 2.2 psia
1	T-130	30,000	VOL	N/A	1995	≥ 0.19 psia but < 2.2 psia
Equipment Group 2: Tanks which contain VOL with a maximum true vapor pressure between 2.2 and 4.0 psia.						
2	T-080	10,000	VOL	N/A	1978	≥ 2.2 psia but < 4.0 psia
2	T-136	10,000	VOL	N/A	2003	≥ 2.2 psia but < 4.0 psia
2	T-137	22,500	VOL	N/A	2008	≥ 2.2 psia but < 4.0 psia
2	T-122	30,000	VOL	N/A	1990	≥ 2.2 psia but < 4.0 psia
2	T-124	30,000	VOL	N/A	1990	≥ 2.2 psia but < 4.0 psia

Emissions Summary

Potential emissions of EtO have been reduced as a result of the project. EtO is classified as a hazardous air pollutant (HAP) and a volatile organic compound (VOC). The calculation methods used to review the project as summarized after the facility-wide EtO emissions table.

Facility-Wide EtO Emissions (pounds per year)

Pollutant	**Potential Emissions**	
	Before Mod.	**After Mod.**
Ethylene Oxide	~1,000	76.2

Pre-Modification Calculations

Stepan provided a facility wide emission inventory in support of a permitting action in 2017. Potential controlled emission of EtO were calculated at approximately 1,000 pounds per year.

Post-Modification Calculations

Source Name	Source Type	Potential EtO Emissions (lb/yr)
EtO Unloading	Fugitive	4.21
EtO Storage	Fugitive	38.30
R-01 Alkoxylation	Fugitive	21.09
Pressure Relief Valves	Scrubber Stack	N/A
Railcar Offloading	Scrubber Stack	4.69
R-01 Process	Scrubber Stack	2.45
Line Purges	Scrubber Stack	3.41
	Fugitive	0.12
Tank Cleaning	Scrubber Stack	1.44
	Fugitive	0.48
Total:		76.21

The facility manufactures many products; however only the emissions of EtO are discussed in this narrative. Please see Application No. 27495 for detailed emission calculations.

Alkoxylation Reactor R01 Emissions

When the alkoxylation reaction process ends, the vessel is depressurized after the product has been pumped out of the reactor. The depressurized gas, which contains EtO, is vented to the Scrubber SCR-R01. The facility conducted stack testing for the reactor/scrubber in March 2020. The scrubber had a control efficiency of 99.98% for EtO. The test indicates the proposed scrubber control efficiency of 99.5% can be met, which indicates proper control of emissions. The facility used a scrubber efficiency of 99.5%, along with a four batch per day limit and a 1,200 batch per year limit to calculate potential emissions from the reactor.

EtO Tank T-3400 Emissions

During railcar unloading, liquid EtO is transferred from the railcar to the storage tank in a closed system that allows for balancing of the vapor. In March 2020, the facility conducted performance tests over three tank depressurization events. The test was also designed to match pressures that would occur during a railcar offloading event. The average control efficiency of the scrubber was found to be 99.94%. The facility used a scrubber efficiency of 99.5%, along with railcar unloading limits of one event per day and 110 unloadings per year to calculate controlled emissions.

The facility calculated emissions from the cleaning of the tank using pressure and temperature conditions and equations from the U.S. EPA AP-42 database. For the controlled portion of tank cleaning, Scrubber SCR-R01 will be required to have a 99.5% control efficiency.

Fugitive Equipment Leak Emissions
Piping components, such as valves, connectors, and pump seals, have the potential for fugitive leaks of EtO. Fugitive emissions were calculated by counting the number of fugitive components, utilizing an emission factor based on component type and service, and applying a control efficiency where applicable. Rupture discs have been installed on all pressure relief valves in EtO service as part of the emissions reduction plan. A control efficiency of 100% was applied for these components. The calculations were based on EPA guidance document EPA-453/R-95-017, November 1995, "Table 2-9. SOCMI Leak Rate/Screening Value Correlations."

Line Purging Emissions
Lines containing EtO need to be purged prior to maintenance. A portion of these emissions are purged to Scrubber SCR-R01. Where emissions are controlled, the scrubber efficiency will be 99.5%. The facility calculated fugitive emissions from line purging based on pressure and temperature conditions and equations from the U.S. EPA AP-42 database.

Regulatory Applicability

This analysis focuses on equipment that handles ethylene oxide and ethylene oxide emissions.

State Rules
The facility is subject to Georgia Rule (b) – Visible Emissions, which limits opacity from the manufacturing processes to less than 40%. The facility meets this requirement through use of wet scrubbers and proper operation of the equipment.

The facility is subject to Georgia Rule (e) – Particulate Emission from Manufacturing Processes, which limits the emission of particulate matter from the process lines to a pound per hour rate based on the weight input rate of the line. The facility meets these requirements through use of scrubbers and proper operation of the equipment.

The facility is subject to Georgia Rule (vv) – Volatile Organic Liquid Handling and Storage, for the operation of storage tanks with a capacity greater than 4,000 gallons while storing volatile organic liquids (other than gasoline). Such tanks must be equipped with submerged fill pipes. The EtO storage tank is subject to this rule and is equipped with the proper fill pipes.

New Source Performance Standards
The facility is subject to 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 for the operation of several tanks, including the EtO storage tank. The EtO storage tank is subject because it has a capacity greater than 75 m^3 (~19,813 gallons) and was constructed after the applicability date. The facility complies with the regulation by operating a closed vent system with control device (Scrubber SCR-R01) as required by 40 CFR 60.112b(a)(3). The paragraph requires the facility to have a minimum of 95 percent control of emissions from the tank. The March 2020 performance testing yielded an average control efficiency of 99.94%. The facility has requested a minimum control efficiency of 99.5% for this permitting action. The facility is and will continue to be in compliance with the regulation. The facility is also subject to 40 CFR 60 Subpart A – General Provisions as a result of being subject to Subpart Kb.

National Emission Standards for Hazardous Air Pollutants (NESHAP)
The facility is classified as an area source for hazardous air pollutants. There are no area source NESHAPs that apply to the use of EtO at facility.

Emission Caps
Stepan is subject to an emission cap of less than 100 tpy of VOC from the entire facility. EtO is classified as a VOC; therefore, the emissions are included in the cap calculations.

Permit Conditions

The conditions from the existing permits have been consolidated and additional requirements for EtO have been added.

Conditions 1.1 through 1.5 are general requirements that apply to all facilities.

Condition 2.1 is an existing VOC cap for the entire facility. The facility demonstrates compliance by keeping records and calculating VOC emissions on a monthly and 12-month rolling basis.

Conditions 2.2. through 2.5 are existing emission limits for sulfur dioxide (SO_2) and sulfuric acid mist (SAM) from the Sulfonation process lines. The SO_2 limits are used to keep the facility below major source thresholds and the SAM limits are based on toxic impact assessments.

Conditions 2.6 and 2.7 have been added to the permit. The language limits the number of EtO railcar unloading events to one per 24-hour period and 100 EtO railcars per consecutive 12-month period. The limits are used to ensure potential EtO emissions are minimized.

Condition 2.8 and 2.9 have been added to the permit. The language limits the venting of EtO from Reactor R01 to no more than 4 batches during any 24-hour period. The facility will also be subject to a production limit of 1,200 batches of ethylene oxide products per consecutive 12-month period. The limits are used to ensure potential EtO emissions are minimized.

Condition 2.10 has been added to the permit. The condition establishes a minimum control efficiency of 99.5% for Scrubber SCR-R01. The limit is used to ensure potential EtO emissions are minimized.

Conditions 2.11 and 2.12 are existing requirements that subject the facility to Georgia Rule (b) for opacity and Georgia Rule (e) for particulate matter.

Conditions 2.13 through 2.16 are existing requirements under 40 CFR 60 Subparts A, NNN, and RRR, which regulate VOC emissions from synthetic organic chemical manufacturing. The language does not apply to the EtO handling equipment.

Condition 2.17 is an existing condition that states Boiler BLR is subject to 40 CFR 60 Subpart A and Subpart Dc.

Condition 2.18 is existing language that requires Boiler BLR to comply with a specific nitrogen oxide (NO_X) during the ozone season.

Condition 2.19 is existing language that requires Boilers E-001, E-002, and BLR and Hot Oil Heater E-005 to burn only natural gas. This limits combustion related emissions and allows the facility to be exempt from area source Boiler MACT.

Conditions 2.20 and 2.21 are existing Georgia Rule (d) language that limits particulate matter from the boilers based on their size. The facility complies with these limits by burning natural gas.

Condition 2.22 is an existing Georgia Rule (d) requirement that limits opacity from the boilers. The facility complies by burning natural gas.

Condition 2.23 is existing language that requires the facility to comply with 40 CFR 60 Subparts A and Kb for tanks that meet the applicability thresholds. EtO Storage Tank T-3400 is subject to this provision.

Condition 2.24 is existing language that specifies the control requirements for Storage Tanks T-3300 and T-3400 under 40 CFR 60 Subpart Kb. The facility maintains compliance by operating Scrubber SCR-R01.

Condition 2.25 requires the facility to comply with Georgia Rule (vv) for subject tanks. This applies to the EtO Storage Tank and has been added for completeness purposes.

Condition 2.26 is an existing requirement that limits the diesel fuel burned in the emergency generators and water pump engines to 0.0015 weight percent of less. This serves to minimize emissions from the unit through use of a clean fuel.

Condition 2.27 is an existing requirement under Georgia Rule (mmm) that limits the operation of the emergency generators and fire water pump engines less than 200 hours during any consecutive 12-month period.

Condition 2.28 is an existing condition that limits the opacity from the emergency generators and fire water pump engines under Georgia Rule (b).

Condition 3.1 is a standard fugitive emission requirement that applies to all sources.

Conditions 4.1 through 4.3 are standard air pollution control equipment requirements that apply to all sources.

Conditions 4.4 through 4.7 are existing language that has been updated to refer specifically to batches produced in Reactor R01 that use ethylene oxide and/or propylene oxide. The conditions require the facility to route the emissions from the reactor, railcar unloading, and tank depressurization to Scrubber SCR-R01 during all times of operation. The language also specifies the percent acid, flow rate, and gas flow rate to the scrubber that the facility must comply with in order to ensure proper operation of the control device. The Georgia Rule 391-3-1-.02(2)(a)(3)(ii) citation has been added to the conditions.

Conditions 4.8 through 4.14 are existing language for the batch equipment that does not process material that includes ethylene oxide. The conditions state which control device each process exhaust stream shall be directed to during operation. The condition also includes scrubber parameter requirements.

Conditions 4.15 through 4.18 are existing requirements that specify the control devices and operating parameters for the Sulfonation Process Lines.

Condition 4.19 is an existing requirement that specifies the facility must take corrective action if any control device parameters fall out of the operational ranges.

Condition 5.1 is a standard monitoring condition that applies to all sources.

Conditions 5.2 and 5.3 are existing conditions that specify the recording frequency of each parameter for each control device.

Condition 5.4 has been added to the permit for handling of EtO. The facility must develop and implement a Leak Detection and Repair (LDAR) program for components (valves, connectors, seals, flanges, fitting, etc.), the scrubber, and the reactor that are in EtO service. The program will ensure that fugitive emissions are minimized and any leaks are repaired quickly.

Condition 5.5 has been added to the permit for handling of EtO. The facility must develop and implement a maintenance program for clean out of the EtO tank and purging of EtO lines prior to maintenance activities. The purpose of the program is to ensure that emissions from tank cleaning and maintenance are minimized.

Conditions 5.6 and 5.7 are existing requirements that specifies monitoring for equipment subject to 40 CFR 60 Subparts NNN and RRR.

Condition 5.8 is existing language that specifies the NO_X monitoring requirements for operation of Boiler BLR during ozone season.

Condition 5.9 is an existing requirement of 40 CFR 60 Subpart Kb for the operation of Storage Tanks T-3300 and T-3400. No changes are needed to address the storage of EtO.

Condition 5.10 is existing language that requires the facility to operate a monitoring system for hours of operation of the emergency generators and fire water pump engines.

Condition 6.1 lists standard test requirements that apply to all sources.

Condition 6.2 has been added to the permit. The condition requires the facility to conduct performance testing for Scrubber SCR-R01 within 6 months of the issuance of the permit and once every 24 months afterwards. The purpose of the testing is to demonstrate compliance with the EtO control efficiency for the scrubber for emissions from the reactor and from the storage tank/railcar unloading operations.

Conditions 6.3 through 6.9 are existing language that specify testing and calculation requirements for equipment subject to 40 CFR 60 Subparts NNN and RRR.

Conditions 7.1 and 7.2 are standard record keeping requirements that apply to all sources.

Condition 7.3 is an existing requirement to keep and updated equipment list. The purpose of the condition is to capture changes that may not have changed the permit language.

Conditions 7.4 through 7.7 are existing requirements used to demonstrate compliance with the facility wide VOC emissions cap. The facility must use their calculation protocol to determine VOC emissions on a monthly basis, then use that data to calculate 12-month rolling totals. The facility must report those 12-month rolling totals in the semiannual report. The facility is also required to submit a written report if a monthly total exceeds $1/12^{th}$ of the limit or if the facility exceeds the 12-month rolling limit.

Condition 7.8 has been added to the permit. The condition requires the facility to calculate ethylene oxide emissions on a monthly basis using the calculation protocol submitted to the Division. Total emissions shall include all process and maintenance/cleaning emissions and emissions from malfunctions, leaks, and spills.

Condition 7.9 through 7.11 have been added to the permit. The language requires the facility maintain records of the number of EtO railcars unloaded. These records are used to demonstrate compliance with the one railcar per 24-hour period and 100 railcars per 12-month rolling period. The facility must provide written notification if the number of railcars unloaded per month exceed $1/12^{th}$ of the permit limit and if the number of railcars unloaded exceeds 100.

Condition 7.12 through 7.14 have been added to the permit. The language requires the facility maintain records of the number of batches using EtO produces each day. These records are used to demonstrate compliance with the 1,200 batches per 12-month rolling period limit. The facility must provide written notification if the number of batches per month exceed $1/12^{th}$ of the permit limit and if the number of batches exceeds 1,200 batches per consecutive 12-month period.

Condition 7.15 has been added to the permit. The condition requires the facility to submit EtO emission totals, railcar unloading records, and EtO batch records with the semiannual report required by Condition 7.29.

Condition 7.16 has been added to the permit. The condition requires the facility to maintain records of EtO tank cleaning and line purge/break activities. These records are used to determine EtO emissions that must be included in the monthly and yearly totals.

Condition 7.17 has been added to the permit. The language requires the facility to notify the Division of all unpermitted releases, in accordance with recent revisions to Georgia Code O.C.G.A. § 12-9-7(a).

Conditions 7.18 through 7.23 are existing requirements that list the record keeping and reporting under 60 CFR Subparts NNN and RRR.

Conditions 7.24 and 7.25 are existing record keeping and reporting requirement for the construction and operation of Boiler BLR.

Conditions 7.26 and 7.27 are existing record keeping requirements under 40 CFR 60 Subpart Kb.

Condition 7.28 is the existing fuel record keeping requirement for the emergency generators and fire water pump engines. The information is used to determine compliance with the fuel sulfur limit in Part 2 of the permit.

Condition 7.29 is an existing semiannual report requirement. The facility must report when control device parameters are out of range.

Condition 7.30 is an existing condition requiring start up notification of equipment specified in Application No. 27794.

Condition 8.1 is a standard requirement that applies to all sources.

Condition 8.2 requires the facility to pay annual fees.

Condition 8.3 revokes the permit previously issued to the source.

Toxic Impact Assessment

Application No. 27495 was the basis for the EtO emission reduction project. A Toxic Impact Assessment was not required. The Permittee conducted modeling for the emission reduction project. Results of that modeling were reviewed by EPD. See the EPD Modeling Memorandum for more information.

Summary & Recommendations

A public advisory was not required for Application No. 27495 because the application resulted in a reduction in emissions from the source. The facility continues to be classified as a synthetic minor source. Compliance responsibility is maintained by the Stationary Source Compliance Program of the Air Protection Branch. I recommend the issuance of Air Quality Permit No. 2843-013-0001-S-03-0 to Stepan Company.