

MEMORANDUM

TO: Angela D. Marconi, P.E., BCEE

FROM: Lindsay Rennie

DATE: January 17, 2017

**SUBJECT: Delaware City Logistics Company
Delaware City Refining Company
Proposal for Ethanol Marketing Project**

Permit: APC-1988/0125-C (A6)(MACT)(VOC RACT)(NSPS) – Terminal

Permit: APC-1995/0471-C/O (A5)(LAER)(MACT)(NSPS) – MVRs

Permit: APC-1980/0868-C/O (A5)(MACT)(VOC RACT) – Tank 206

Permit: APC-1980/0869-C/O (A7)(MACT)(VOC RACT) – Tank 225

Background

The facility submitted an application for the Ethanol Marketing Project, received August 19, 2016 to utilize existing tanks, existing marine loading equipment, and to modify truck loading operations to enable denatured ethanol handling, storage and loading at both the Delaware City Refinery Marine Piers and the Delaware City Sales Terminal. The Delaware City Refining Company owns and operates a Marketing Terminal in conjunction with the Delaware City Refinery. The Facilities are located in New Castle County which is presently classified as a marginal non-attainment area for ozone. Both Facilities are a major source because their potential to emit (PTE) Volatile Organic Compounds (VOCs) is greater than 25 tons per year (TPY). The Delaware City Refining Company was issued **Permit: AQM-003/00016 - Part 1(Renewal2)**, **Permit: AQM-003/00016 – Part 2 (Renewal1)** and **Permit: AQM-003/00016 – Part 3 (Renewal2)** on May 28, 2015. The Marketing Terminal was issued **Permit: AQM-003/00404 (Renewal 3)** on May 25, 2016.

The Ethanol Marketing Project centers on increasing the ethanol throughput at Tank 206, repurposing Tank 225 for ethanol service, installing lines to allow for ethanol loading at the Refinery Marine Vapor Recovery (MVR) system, and modifying the Terminal Truck Loading Rack operations for ethanol loading. DCRC intends to receive up to 10,000 BPD on an annual average basis of additional ethanol via railcar. Existing unloading equipment at the East Rack will be modified to receive ethanol via rail car as described in the registration application for **Permit: APC-2016/0092-REGISTRATION**.

Permit amendments of several existing permits become necessary as described in the following pages. This memorandum provides the technical and regulatory evaluation conducted by DAQ in support of the issuance of the relevant permits.

A coastal zone hearing was held on October 26, 2016 and a coastal zone permit for this operation was issued on December 27, 2016.

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Delaware City Ethanol Marketing Project

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Project Description

Proposed changes associated with the Delaware City Ethanol Marketing Project include the following:

- Increase of ethanol throughput at Tank 206 to allow for storage of ethanol, up to 12,300 BPD and adding capability to deliver ethanol to the piers for marine vessel loading and the Terminal Rack for truck loading. **Permit: APC-1980/0868-CO/O (A5)**
- Modification of Tank 225 to allow for storage of ethanol, up to 10,000 BPD and adding capability to deliver ethanol to the Marine Piers for marine vessel loading and the Terminal Rack for truck loading. **Permit: APC-1980/0869-C/O(A 7)**
- A combined total loading of up to 10,000 BPD, on an annual average basis, of ethanol onto trucks at the Terminal. **Permit: APC-1988/0125-OPERATION (A6)(MACT)**
- Addition of four (4) additional loading arms and fugitive collection components will be installed to each of Lanes 4, 10, and 11 at the Terminal Rack. **Permit: APC-88/0125-OPERATION (A6)(MACT)**
- To control Terminal Rack fugitive emissions, the facility will install a vapor vacuum control system. The installation of the vacuum assist system will require upgrades to the existing vapor control system. **Permit: APC-1988/0125-OPERATION (A6)(MACT)**
- A combined total loading of up to 10,000 BPD, on an annual average basis, of ethanol onto marine vessels at the marine loading facility. **Permit: APC-95/0471-CONSTRUCTION/OPERATION (A5)**
- Installation of lines to allow for ethanol loading at the Marine Vapor Recovery System at the piers to ensure proper control of ethanol vapors being loaded to these units. **Permit: APC-95/0471-CONST/OPERATION (A5)**

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Technical Review

Storage Tanks

Tank 206

Tank 206 is an internal floating roof tank which currently has an ethanol throughput of 2,374 BPD. The 10,000 BPD increase would bring the throughput to approximately 12,300 BPD. Increased throughput will result in increases in withdrawal losses. The total expected increase in emissions is 0.258 tons/year as estimated using the USEPA Tanks 4.0.9D software.

Table 1: Tank 206 Emission Potential

	Material	Throughput	VOC Emissions (lb/yr)	VOC Emissions (TPY)
Current	3% Denatured Ethanol	2,374 bbl/day	1,122 lb/yr	0.561 TPY
Proposed	5% Denatured Ethanol	12,300 bbl/day	1,638 lb/yr	0.819 TPY

Tank 225

Tank 225 is an Out Of Service external floating roof tank that will be equipped with a fixed roof thereby converting it to an internal floating roof tank. Emissions from the tank were estimated using the USEPA Tanks 4.0.9D software. Losses include, rim seal loss, withdrawal loss and deck fitting loss.

Table 2: Tank 225 Emission Potential

	Material	Throughput	VOC Emissions (lb/yr)	VOC Emissions (TPY)
Current	Out of Service	0	0	0
Proposed	5% Denatured Ethanol	10,000 bbl/day	816 lb/yr	0.41 TPY

Marine Vessel Loading

Existing dock facilities including the Refinery MVR system will be utilized to load up to 10,000 BPD of ethanol on an annual average basis. Minor modifications of the MVR system will be required to control ethanol loading. The permit amendment is to allow the loading of ethanol at the piers and to allow the installation of lines to allow ethanol loading. Permit limit increases for the MVR system have not been requested. The expected 3.34 TPY VOC increase will be covered by the current 75 TPY VOC limit identified in the MVRS permit. The 1.27 TPY increase of NOx will be covered by the 1,650 TPY Facility-Wide NOx Cap.

Truck Loading

Emissions from ethanol loading occur from the release of residual material in the loading lines after loading has been completed. Loading losses are estimated using the yearly liquid throughput, and the use of the vapor vacuum recovery system. Fugitive emissions from the valves, pump seals, fittings and other piping components are estimated using emission factors for vapor service from the U.S. EPA protocol for Equipment Leak Emission Estimates and engineering estimates from on-site monitoring.

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The marketing terminal consists of fifteen truck loading racks as follows:

- Lanes 1 through 6 for loading diesel
- Lanes 8 through 11 for bottom loading of gasoline
- Lanes 12 through 15 for loading pressurized gas
- Lane 14 also loads propylene
- Lane 7 is not in service

In order to handle the loading of ethanol to the trucks, four (4) additional loading arms and fugitive components will be installed to each of Lanes 4, 10, and 11 at the Terminal Rack.

During bottom loading operations (which occur for all gasoline loading and will occur for ethanol loading), vapors containing VOCs are displaced. These vapors are controlled either by a High Efficiency Adsorption Absorption (HEADAB) Vapor Recovery Unit (VRU) or by a backup Vapor Combustion Unit (VCU). A Continuous Emissions Monitoring System (CEMS) is installed in the VRU stack and the flare serves as a backup unit during periods when the VRU is down. It is possible to load diesel either through bottom loading or top loading lanes. When loaded through bottom loading lanes, the emissions are controlled through the VRU and VCU; when top loaded the emissions are uncontrolled. For this project the emission reductions from distillate are negligible and are not considered.

To control increased Terminal Rack fugitive emissions from gasoline and ethanol loading, the facility will install a vapor vacuum control system with a capture efficiency of 100%. The installation of the new vapor vacuum control system will require upgrades to the existing VRU system. The control system works by maintaining a slight negative pressure in the control spool near each truck during loading operations. By reducing the pressure of vapors displaced during material loading, the hydrocarbon vapor which would otherwise escape to the atmosphere through leaks in the truck compartment, vapor hose and other connections are instead delivered to the VRU or backup VCU. This is expected to reduce the emissions from the Marketing Terminal resulting in an overall reduction in VOC emissions. The facility intends to use this equipment during all gasoline and ethanol loading but has requested a downtime of no more than 10% of annual throughput to account for any malfunctions or necessary maintenance. This is reflected in the reduced VOC emissions limit in the Marketing Terminal permit.

The following information is the basis for the VOC emissions estimate at the Truck Rack.

Table 3: Product Parameters

Parameter	Ethanol	Gasoline	
Saturation Factor	1.00	1.00	
Vapor Molecular Weight, MW	50.65	63.10	lb/lb mol
True Vapor Pressure, P	2.49	5.70	psia
Liquid Temperature, T	54.0	54.0	°F
Loading Loss Factor, L_L $12.46*(S*P*MW)/T$	3.06	8.72	lb/1000 gal
VRU Rating	0.083	0.083	lb/1000 gal

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Table 4: Loading Rack Emissions – Without Vacuum Assist

Variable	Ethanol	Gasoline	
Liquid Throughput	15,330	69,372	1000 gal/yr
Loading Loss L _i * Throughput	46,936	604,844	lb/yr
Diverted to VRU (98.7%)	46,326	596,981	lb/yr
VRU Emissions Throughput*VRU Rating	1279	5789	lb/yr
Fugitive Emissions Loss*Capture Efficiency	610 ~0.4	7863 ~4.0	lb/yr TPY
VOC Emissions	1,889	13,652	lb/yr
	0.94	6.83	TPY

*Vacuum assist downtime - 10%

Table 5: Loading Rack Emissions – With Vacuum Assist

Variable	Ethanol	Gasoline	
Liquid Throughput	137,970	624,348	1000 gal/yr
Loading Loss L _i * Throughput	422,427	5,443,596	lb/yr
Diverted to VRU (100%)	422,427	5,443,596	lb/yr
VRU Emissions Throughput*VRU Rating	11,513	52,098	lb/yr
Fugitive Emissions Loss*Capture Efficiency	0	0	lb/yr
VOC Emissions	11,513	52,098	lb/yr
	5.76	26.05	TPY

*Vacuum assist operating time – 90%

Table 6: Total Potential Loading Rack Emissions

Variable	Ethanol	Gasoline	
Liquid Throughput	153,300	693,720	1000 gal/yr
Loading Loss L _i * Throughput	469,363	6,048,440	lb/yr
Diverted to VRU (100%)	468,753	6,040,577	lb/yr
VRU Emissions Throughput*VRU Rating	12,792	57,887	lb/yr
Fugitive Emissions Loss*Capture Efficiency	610	7,863	lb/yr
VOC Emissions	13,402	65,750	lb/yr
	6.7	32.9	TPY

In addition to controlling new ethanol loading operations, the new vapor capture system will reduce fugitive emissions from loading of all materials at the Terminal Truck Loading Rack. The actual fugitive

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emissions from 2014 and 2015 averaged to 18.9 TPY. The installation of the vacuum assist at 90% operation will reduce actual facility emissions by an estimated 17.04 TPY. The existing Title V permit prescribes a limit of 68.1 tons of VOCs per year. The facility has requested a revised permit limit of 41.2 TPY to reflect the potential reduction. The permit limits the fugitive emissions from ethanol and gasoline to 4.4 TPY as shown in Table 4 to reflect the 10% downtime of the vapor vacuum system.

Total Emissions Increases

Table 7: Total Project Potential Emissions

Unit	Expected Ethanol Emissions	Change in VOC Emissions
Tank 206	0.82	+0.26
Tank 225	0.50	+0.50
Terminal Truck Loading Rack Loading Arm Fugitives	0.05	+0.05
Terminal Truck Loading Rack Vapor Control System	6.7	-17.0
Marine Vessel Loading MVR System	3.4	+3.4

Since ethanol will be loaded at either the Terminal Truck Loading Rack or the Refinery Marine Piers up to a maximum 10 MBPD annual average; the Project VOC emissions include the sum of:

- The greater of the Tank 206 versus Tank 225 emissions;
- The greater of the MVR System versus the Truck Rack Loading Arm Fugitives and Vapor Control System; and
- The Terminal Truck Loading Rack Fugitive Reductions.

This results in a total decrease of 9.8 TPY of VOC emissions. Under the Non-Attainment New Source Review Program, the project is considered a major modification for ozone if the VOC or NOx emissions exceed 25 TPY, or by aggregating with increases over a five year time period. None of the units individually result in an increase of 25 TPY however, without the use of the vacuum vapor control system; the Project would incur a 10 TPY increase. In the last five years, the Refinery has already increased their VOC emissions by 23.1 TPY through various projects. The addition of another 10 TPY of VOCs would put them over the 25 TPY threshold. The vacuum control system is therefore necessary to avoid triggering Major New Source Review. Furthermore, because the system reduces the PTE of the project to -9.8 TPY it also avoids triggering the 5 TPY applicability threshold for Minor New Source Review.

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Regulatory Review

7 DE Admin. Code 1102: Permits

An air emission permit is required since permitted equipment is being modified and new equipment is being installed. A construction permit is required before this equipment can be installed.

7 DE Admin. Code 1124: Control of Volatile Organic Compound Emissions

The facility is subject to these requirements; the project will not affect the applicability of, or DCRC's compliance with this regulation.

7 DE Admin. Code 1125: Requirements for Preconstruction Review

The facilities are classified as major sources. The uncontrolled emissions from this project would result in an aggregate increase greater than 25 TPY of VOC. The inclusion of the vapor vacuum recovery system results in a total project emission potential of -9.4 TPY avoiding both Major and Minor New Source Review. It is then necessary to make the use of the vapor vacuum system Federally Enforceable as a practical matter.

7 DE Admin. Code 1130: Title V State Operating Permit Program

The facility holds a Title V operating permit that will need to be amended to incorporate the changes.

40 CFR 60 Subpart XX: Standards of Performance for Bulk Gasoline Terminals

The Sales Terminal is subject to the requirements of these standards. The construction permit cross references those applicable requirements contained in the Title V permit.

40 CFR 63 Subpart R: National Emission Standard for Gasoline Distribution Facilities

The Sales Terminal is subject to the requirements of these standards. The construction permit cross references those applicable requirements contained in the Title V permit.

Recommendation

DCRC has applied for and received the necessary Coastal Zone permit to authorize these changes. I recommend that the Ethanol Marketing Project application and attached draft permits be sent to EPA for concurrent review. The permit was submitted for legal notice for Sunday, January 15, 2017. The legal notice lists a reduction of 9.16 TPY. The actual reduction is 9.8 TPY.

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