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DRAFT ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-2883
Plant ID No.:	051-00140
Applicant:	PVS Technologies
Facility Name:	Natrium Plant
Location:	Natrium, Marshall County
NAICS Code:	325188 (Iron Salts Manufacturing)
Application Type:	Construction
Received Date:	April 19, 2011
Engineer Assigned:	Laura Jennings
Fee Amount:	$1,000
Date Received:	April 22, 2011
Complete Date:	May 16, 2011
Due Date:	August 14, 2011
Applicant Ad Date:	April 20, 2011
Newspaper:	*The Moundsville Daily Echo*
UTM's:	Easting: 512.53 km Northing: 4,400.11 km Zone: 17
Description:	The proposed plant site is located on a currently unused plot within the existing PPG Industries Chemical Manufacturing site and is leased from PPG. The proposed plant will manufacture iron salts (predominantly ferric chloride) using an iron oxide/HCl process. The iron salts are primarily used for industrial water treatment facilities.

DESCRIPTION OF PROCESS

The process to make ferric chloride uses hydrochloric acid (HCl) and iron oxide as raw materials. The hydrochloric acid will be supplied via pipeline from PPG to an HCl storage tank [T101]. The HCl will be pumped through a heat exchanger [HE1] and heated if necessary to a maximum temperature of 100F, and then pumped to one of two mixing reactors [R01, R02]. Once the HCl has reached a level of about five feet, the mixer will be started. Iron oxide, which is shipped to the plant and stored in supersacks, will be lifted with an overhead crane and added to the mixing tank. The iron oxide will immediately begin to react with the HCl to make ferric chloride VI. The chemical reaction is:

$$Fe2P3 + 6HCl \Rightarrow 2FeCl3 + 3H2O.$$

Each batch will use approximately 10,000 gallons HCl and 25,000 - 25,400 lbs of iron oxide. Once the reactor tank is filled with HCl and iron oxide the reactor will be allowed to mix for 4 hours until the reaction is complete. The HCl, iron oxide, and ferric solution can be re-circulated through the heat exchanger to add additional heat until the batch reaches 190F to help push the reaction to completion if necessary. Once the reaction is complete, which is verified by testing the ferric chloride and HCl concentration, the mixer will be turned off and solution allowed to settle any undissolved iron oxide for a minimum of 3 hours. The ferric chloride will be decanted out of the reactor and pumped through a filter [F01] to one of two ferric chloride product storage tanks [T106, T107].

The undissolved iron oxide that remains in the reactor is used in the next production batch. If an operator adds too much iron oxide then there will be more iron oxide left in the reactor when the batch is finished and the operator doesn't need to add as much iron oxide to the next batch. More iron oxide is added than is stoichiometrically needed in order to push the reaction to completion.

HCl fumes from the HCl storage tank and the reactors will be scrubbed through a water scrubber [SC1]. Spent scrubber solution and process water is stored in an on-site storage tank [T109].

After the first reactor has been filled with HCl and iron oxide, the second reactor will be filled in the same manner as the first reactor. On subsequent batches there will be some residual iron oxide in the reactors which will start dissolving when the HCl is added. Also, spent scrubber solution, process washdown water and stormwater will be added to the reactor to dilute the ferric solution to the appropriate concentration for customers as needed.

The HCl storage tank will be filled on the afternoon and/or midnight shifts when the reactors are not operating.

Ferric chloride will be pumped from the storage tanks to either a truck loading rack [L01] or a railcar loading rack [L02] for transport to customers.

Ferric chloride is a coagulant and flocculant used to treat drinking water and waste water.

Process upsets:

If the scrubber fails, the process will be shutdown until the scrubber is repaired. Scrubber repairs may involve replacing a pump, pipe, or motor, which can be replaced in a matter of hours.

If a mixer fails, which is about once every two years, the reactor will shut down and the batch will be transfer to the other reactor to finish the batch if necessary. The mixer will take about 8 hours to replace.

Other upsets could include pump and piping failures. These are rare, happening maybe once a year on the piping and every 7-10 years for a pump failure. There would be negligible emissions since the piping will start to seep and then be repaired within a couple of hours.

The applicant will have a preventive maintenance software system for all equipment which is the same program used at their other plant sites.

The storage tanks and reactors will be placed in secondary liquid containment.

Emission Units Table:

Emission Unit ID	Emission Point ID	Emission Unit Description	Year Installed	Design Capacity	Control Device
F01	None	Process Filter	2011	50-200 gpm	NA
HE1	None	Heat Exchanger	2011	90 - 200 gpm	NA
L01	L01E	Truck Loading Rack	2011	100 - 300 gpm	NA
L02	L02E	Railcar Loading Rack	2011	100 - 300 gpm	NA
R01	SC1E	Reactor 1	2011	11,278 gal	SC1
R02	SC1E	Reactor 2	2011	11,278 gal	SC1
T101	SC1E	HCl Storage Tank	2011	30,157 gal	SC1
T106	T106E	Ferric Chloride Storage Tank	2011	30,157 gal	NA
T107	T107E	Ferric Chloride Storage Tank	2011	30,157 gal	NA
T109	T109E	Spent Scrubber Solution & Process Water Storage Tank	2011	30,157 gal	NA

Control Device		
Control Device ID	**Control Device Description**	**Minimum Control Efficiency**
SC1	Water Scrubber (Salco FRP packed tower followed by Amistco FRP tray system)	99.96% HCl capture

SITE INSPECTION

The writer met with Andrew Yaksic, Director of Manufacturing for PVS Technologies at the Natrium Plant on Tuesday, July 12, 2011.

The site was being cleared and prepared for foundations at the time of the visit. We walked through were the placement of the equipment will be including the loading facilities. The building that will house the control room and wet laboratory is an existing building that was also in the process of being updated for its future intended use.

There is also space for expansion in the future should that business decision be made down the road.

PVS Technologies is located within the fence line of PPG's Natrium facility. There were no concerns as a result of the site inspection.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

Emission estimates for the Hydrochloric Acid Storage Tank [T101], the Ferric Chloride Storage Tanks [T106 and T107], and the spent scrubber solution and process water tank [T109] were calculated using EPA's emissions modeling program TANKS 4.0.

The writer has reviewed the basis for the data used in the calculations for the Hydrochloric Acid storage tank [T101], for the Ferric Chloride loading and storage tanks [L01, L02, T106 and T107], for the scrubber solution and process water tank [T109], and accepts the basis provided by the applicant.

The annual throughput of T101, T106, and T107 will be 8.5 MM gal/yr and the maximum number of tank turnovers will be 287. The annual throughput of T109 will be 2.5 MM gal/yr and the maximum number of turnovers will be 82.

Reactor emissions were calculated using mass and energy balances.

The reactors [R01 and R02] and the HCl storage tank [T101] will vent to a water scrubber system [SC1]. There will be a packed tower scrubber followed by a packed tray system scrubber. The guaranteed minimum collection efficiency is 99.96%.

Truck and Railcar loading calculations are also based on mass balances.

Fugitive emissions of HCl to the air from valves and fittings are estimated at 0.137 lbs per year.

Emission Pt ID	Emission Unit ID	Control Device ID	Regulated Pollutant	Maximum Potential Uncontrolled Emissions		Maximum Potential Controlled Emissions	
				lb/hr	tpy	lb/hr	tpy
SC1E	R01 R02 T101	SC1	Hydrochloric Acid*	282.5	533.92	0.12	0.22
T106E	T106	n/a	Hydrochloric Acid*	0.01	0.01	0.01	0.01
T107E	T107	n/a	Hydrochloric Acid*	0.01	0.01	0.01	0.01
T109E	T109	n/a	Hydrochloric Acid*	0.01	0.01	0.01	0.01
L01E	L01	n/a	Hydrochloric Acid*	0.01	0.01	0.01	0.01
L02E	L02	n/a	Hydrochloric Acid*	0.01	0.01	0.01	0.01

*Hydrochloric acid (HCl) is a listed Hazardous Air Pollutant (HAP) and is also considered to be particulate matter (PM) per 45CSR7.

REGULATORY APPLICABILITY

STATE REGULATIONS

The following state regulations have been reviewed for applicability.

45CSR7 TO PREVENT AND CONTROL PARTICULATE MATTER AIR POLLUTION FROM MANUFACTURING PROCESSES AND ASSOCIATED OPERATIONS

45CSR7 applies to the applicant because they emit hydrochloric acid which is a mineral acid.

Section 4.2 states that mineral acid emissions shall not be in excess of the quantity given in Table 45-7B. The allowable stack gas concentration in mg/dscm is 210. Based on the emissions provided in the application, the applicant will be in compliance with this requirement. Maximum hydrochloric acid emissions from the scrubber emission point SC1E will be 15.1 mg/dscm and the total maximum hydrochloric acid emissions will be 61.5 mg/dscm which is within the allowable rate demonstrating compliance

with the requirement.

HCl vapor “fog” coming out of reactors will be removed by the mist eliminator in the packed bed tower.

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.

45CSR13 applies because the potential emissions are above 6 lb/hr and 10 tpy of any regulated air pollutant and because they have the potential to emit more than 2 lb/hr or 5 tpy of hazardous air pollutants (HAP) considered on an aggregated basis. Hydrochloric Acid is classified as a HAP. Compliance will be demonstrated by meeting the permit requirements.

45CSR14 PERMITS FOR CONSTRUCTION AND MAJOR MODIFICATION OF MAJOR STATIONARY SOURCES OF AIR POLLUTION FOR THE PREVENTION OF SIGNIFICANT DETERIORATION

45CSR14 does not apply to PVS Technologies. They will not meet the definition of a major stationary source having the potential to emit 250 tpy or more of any regulated pollutant. Potential to emit means the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Physical or operational limitation on the capacity of the source including air pollution control equipment is treated as part of its design if it enforceable in any permit.

45CSR22 AIR QUALITY MANAGEMENT FEE PROGRAM

PVS Technologies is subject to Rule 22 fee program because it is not subject to the Rule 30 fee program.

45CSR30 REQUIREMENTS FOR OPERATING PERMITS

The source is not subject to Rule 30 because it will not have the potential to emit, in the aggregate, ten (10) or more tpy of any hazardous air pollutant or twenty-five (25) tpy of any combination of hazardous air pollutants. The potential to emit of hydrochloric acid will be less than one (1) tpy when permit R13-2883 is issued.

FEDERAL REGULATIONS

The following federal regulations have been reviewed for applicability.

40 CFR PART 60 STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES

All NSPS Subparts were reviewed for applicability to the inorganic iron salts manufacturing plant owned and operated by PVS Technologies, Inc. There are no NSPS requirements applicable to the applicant.

40 CFR PART 63 NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR SOURCE CATEGORIES

Subpart VVVVVV GACT Standards for Chemical Manufacturing Area Sources

The applicant is not subject to the requirements of this subpart because they do not use as feedstock, generate as byproducts, or produce as products any of the hazardous air pollutants listed in Table 1 to this subpart. [§63.11494 (a)(1)]

Subpart BBBBBBB GACT Standards for Chemical Preparations Industry Area Sources

The applicant is not subject to the requirements of this subpart because they do not meet the definition of a chemical preparations facility as defined in §63.11588. There are no target HAP metal compounds for chromium, lead, manganese, or nickel.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

Hydrochloric acid is the only classified Hazardous Air Pollutant emitted from the facility.

Hydrochloric acid has many uses. It is used in the production of chlorides, fertilizers, and dyes, in electroplating, and in the photographic, textile, and rubber industries. Hydrochloric acid is corrosive to the eyes, skin, and mucous membranes. Acute (short-term) inhalation exposure may cause eye, nose, and respiratory tract irritation and inflammation and pulmonary edema in humans. Acute oral exposure may cause corrosion of the mucous membranes, esophagus, and stomach and dermal contact may produce severe burns, ulceration, and scarring in humans. Chronic (long-term) occupational exposure to hydrochloric acid has been reported to cause gastritis, chronic bronchitis, dermatitis, and photosensitization in workers. Prolonged exposure to low concentrations may also cause dental discoloration and erosion. EPA has not classified hydrochloric acid for carcinogenicity.

AIR QUALITY IMPACT ANALYSIS

PVS Technologies does not meet the definition of a major stationary source according to 45CSR14 and therefore, no air modeling is required.

MONITORING OF OPERATIONS

- HCl emissions from the HCl storage tank [T01] and Reactors [R01 and R02] will be controlled by the water scrubber [SC1].
- HCl scrubber will be maintained and operated to achieve 99.96% minimum efficiency
- Testing will be conducted on the scrubber to verify the efficiency.
- Scrubber MRRT:
  - PVS Technologies will monitor and test daily the scrubber solution to maintain below 5.3% HCl
  - Scrubber solution will be maintained at or below 95° F, will be monitored and recorded continuously, and will have alarm set points warning if the temperature is too high.
  - Scrubber water flow rate will be continuously monitored during reactor operation to maintain a 50 gpm daily average to the packed bed tower and a 52 gpm daily average to the tray tower, based on a rolling 365 days average.
  - Maintenance procedures and operating ranges including liquid and gas flow rates that are required by the manufacturer to maintain warranty will be followed
  - test records, operating parameters and maintenance activity records will be maintained.
- Reactors shall not be started less than 15 minutes apart. (The reaction is exothermic and most of the HCl vapor is generated in the first 15 minutes of reaction time)
- There will be no open ended lines in HCl service.
- Record reactor batch starting times and ending times [R01 and R02].
- Annual throughput records for the production and loading of Ferric Chloride loading [L01 and L02] will be maintained.
- Annual throughput records for the hydrochloric acid storage tank [T101], for the ferric chloride storage tanks [T106 and T107], and for the spent scrubber solution & process water storage tank [T109] will be maintained.

CHANGES TO PERMIT

Permit R13-2883 is a new construction permit.

RECOMMENDATION TO DIRECTOR

It is the recommendation of the writer that permit R13-2883 be issued to PVS Technologies, Inc., Natrium Plant located in New Martinsville, Marshall County, WV. Based on the information provided in the application and observed during the site visit, the applicant will meet all state and federal requirements by complying with the permit conditions.

Laura Jennings
Permit Engineer

Date