



REGION 5
CHICAGO, IL 60604

MEMORANDUM

SUBJECT: CLEAN AIR ACT INSPECTION REPORT
PVS Chemical Solutions, Inc., 12260 S. Carondolet Ave., Chicago, IL

FROM: Matthew Walters, Environmental Engineer
AECAB (MN/OH)

THRU: Brian Dickens, Section Supervisor
AECAB (MN/OH)

TO: File

BASIC INFORMATION

Facility Name: PVS Chemical Solutions, Inc.

Facility Location: 12260 S. Carondolet Ave., Chicago, IL

Date of Inspection: October 26-27, 2023

EPA Inspector(s):

1. Patrick Miller, Environmental Engineer
2. Matthew Walters, Environmental Engineer

Other Attendees:

1. Sean Dunkle, Plant Manager, PVS Chemical Solutions
2. Jason Dunlap, Safety Manager, EHSS, PVS Chemical Solutions
3. Alex Graika, Project Engineer, PVS Chemical Solutions
4. Erik Rosner, Process Engineer, PVS Chemical Solutions
5. John Bozick, Supervisory Environmental Manager, PVS Chemical Solutions
6. Brandon Davis, Lead Operator and Union Representative, PVS Chemical Solutions
7. John Nicholson, Executive Vice President, PVS Chemical Solutions
8. Peter Onyskiw, Environmental Manager, PVS Chemical Solutions
9. Dale Price, Technical Manager, PVS Chemical Solutions

Contact Email Address: sdunkle@pvschemicals.com

Purpose of Inspection: Compliance with the Prevention of Accidental Releases found in Section 112(r) of the Clean Air Act (CAA), 42 U.S.C. § 7412(r)

Facility Type: Oleum, liquid sulfur dioxide, and ammonium thiosulfate manufacturing plant

Regulations Central to Inspection: Chemical Accident Prevention Provisions at 40 C.F.R. Part 68

Arrival Time: 10/26/23: 9:00 a.m.; 10/27/23: 8:50 a.m.

Departure Time: 10/26/23: 3:45 p.m.; 10/27/23: 11:30 a.m.

Inspection Type:

- ☐ Unannounced Inspection
- ☒ Announced Inspection

OPENING CONFERENCE

- ☒ Presented Credentials
- ☒ Stated authority and purpose of inspection
- ☒ Small Business Resource Information Sheet not provided. Reason: Not a small business.
- ☒ Provided CBI warning to facility

The following information was obtained verbally from PVS Chemical Solutions personnel unless otherwise noted.

Process Description:

The facility has three RMP covered processes: oleum manufacturing, liquid sulfur dioxide (SO₂) manufacturing, and ammonium thiosulfate (ATS) manufacturing. The primary raw materials used at the facility are molten sulfur, anhydrous ammonia (NH₃), air, and water. The facility burns molten sulfur in air to produce SO₂ gas, which is further oxidized in the Converter to sulfur trioxide (SO₃). The process gas from the Converter can be routed to either the #2 Absorption Tower to produce high quality sulfuric acid or to the Oleum Absorption Tower to produce approximately 30% oleum. The facility either pumps the oleum product to storage or uses oleum as a starting material for the liquid SO₂ process.

The first step in liquid SO₂ production is the heating of oleum in the Vaporizer to generate SO₃. The vaporized SO₃ reacts with a mixture of sulfuric acid and molten sulfur in the Primary and Secondary Reactors to form SO₂ gas, which is then purified, cooled, compressed, and condensed. The liquid SO₂ product is stored in one of four 30,000-gallon storage tanks located in a diked tank farm. The facility maintains at least one of the liquid SO₂ tanks as a spare for emergency unloading of another storage tank.

The facility receives NH₃ for the ATS process via railcar. The NH₃ railcar directly supplies the process from the railcar unloading station. An adjacent 12,000 gallon tank provides additional NH₃ storage capacity and receives the heel of the empty railcar prior to switching. NH₃ is reacted with SO₂ in the Gassing Tank to produce ATS.

Oleum, liquid SO₂, and ammonia thiosulfate products are loaded into trucks or railcars and transported off-site.

Staff Interview:

Inspectors obtained the following information based on interviews with PVS Chemical Solutions management and operators:

- The ATS process initially started up in 2021. There is a plan to add an ultra-high purity sulfuric acid process to the facility.
- The control room is staffed with two operators 24/7. Maintenance employees are onsite for one 8-hour shift Monday through Friday.
- Initial operator training typically takes 4 to 6 months and consists of classroom training, on the job training, and a written test. Refresher training occurs approximately quarterly and covers a review of initial training material, lessons learned, and recent changes.
- Prior to conducting maintenance activities, LOTO is performed by both the equipment owner and the maintenance technician. Operators do not perform line breaks, but maintenance personnel check in at the control room prior to performing a line break.
- Operators are 40-hour OSHA certified, but there is no onsite emergency response team. In the event of an accidental release, facility personnel attempt to isolate equipment if possible but rely of the Chicago Fire Department (CFD) HAZMAT unit for emergency response. Responding operators are equipped with a respirator, personal gas monitor, and ammonia solution spray for leak detection. The last coordination activity with CFD was November 2022. PVS Chemical Solutions also has national contracts with emergency response contractors.
- Ambient SO₂ and NH₃ detectors are alarmed and interlocked in the control room. The detectors are not locally alarmed in the field except at the entrance to the SO₂ compressor building.
- Mechanical integrity tasks are tracked through a computerized maintenance and monitoring system. Tank inspection cycles follow API specifications and PRVs are serviced on a five-year cycle. There is no regular inspection schedule for the SO₂ piping system.

TOUR INFORMATION

EPA Tour of the Facility: Yes

Data Collected and Observations:

- 40 C.F.R. § 68.69(b) requires operating procedures to be readily accessible to employees who work in or maintain a process. Operating procedures were available to operators electronically in the control room, and checklists were available as hard copies.
- Inspectors traced piping for the liquid SO₂ process from the Vaporizer to the 30,000-gallon storage tanks and made the following observations:
 - 40 C.F.R. § 68.65(a) requires written process safety information to be compiled, including information pertaining to the equipment in the process. Inspectors found the P&IDs to be generally consistent with the process equipment. Inspectors noted that

- carbon steel pipe spools and piping components were installed on certain lines indicated as stainless steel material of construction on the P&IDs.
- 40 C.F.R. § 68.73(b)(1) requires inspection and tests to be performed on process equipment. Inspectors observed external corrosion on carbon steel process equipment, including piping, flange bolts, and valves. Inspection and testing records were requested from the facility for later review.
 - The process contained multiple small-diameter lines for draining, venting, or bleeding that were isolated from the atmosphere by a single closed valve.
 - Inspectors viewed the truck and railcar loading stations for liquid SO₂, as well as the railcar loading station for oleum. The entrance to the SO₂ vent system at both railcar loading stations is equipped with a flow switch for detecting liquid flow into the vent system.
 - Inspectors traced piping for the ATS process from the NH₃ railcar unloading and storage area to the Gassing Tank:
 - The definition of stationary source at 40 C.F.R. § 68.3 includes transportation containers used for storage not incident to transportation and transportation containers connected to equipment at a stationary source for loading or unloading. The NH₃ railcar feeding the ATS process was disconnected from its mode of transport at the loading station.
 - Ammonia feed piping to the Gassing Tank contained an open line isolated by a single valve and an open line isolated by two valves.

Photos and/or Videos: were taken during the inspection.

See Digital Image Log at Appendix A

Field Measurements: were not taken during this inspection.

RECORDS REVIEW

The facility provided the following documents to EPA in advance of the inspection:

- General Visitor Presentation
- Oleum Process Description
- Liquid Sulfur Process Description
- ATS Process Description
- 2019 Liquid SO₂ and Oleum HAZOP Worksheet¹
- 2020 ATS HAZOP Worksheet

During the inspection, Inspectors reviewed the following records (printed records that were retained by Inspectors are indicated with an asterisk):

¹ The PHA provided to EPA prior to the inspection was dated 2018. The facility provided documentation to Inspectors demonstrating that the correct date is 2019.

- EHS-500: Process Safety Management/Risk Management Plan Management program
- Oleum P&IDs (Drawing Nos. 11CHI-12-PR-0001 to 11CHI-12-PR-0003)*
- Liquid SO₂ P&IDs (Drawing Nos. 11CHI-13-PR-0001 to 11CHI-13-PR-0012)*
- Ammonia rail unloading and ammonia storage tank P&ID (Drawing No. 11CHI-20-PR-0001)*
- Select operating procedures and operator checklists
- Blank confined space, hot work, line break, and LOTO permits
- Sample employee training records
- Blank hazard reporting card
- 2021 incident investigation report
- Sample of completed management of change documents with supporting packages
- EHS-200: Emergency Response Plan
- Dakota EHS software for tracking action items and incidents

The following observations were made during the records review process:

Management System for Implementing Elements of Risk Management Program

40 C.F.R. § 68.15(a) requires the development of a management system for implementing elements of the Risk Management Program. The facility developed procedure EHS-500, which outlines the facility's management system for its Process Safety Management and Risk Management Program.

Process Hazard Analysis (PHA)

40 C.F.R. § 68.67(a) requires an initial PHA to be conducted that identifies, evaluates, and controls the hazards of the process. The facility conducted an initial PHA on the ATS process on December 15, 2020. Six nodes were evaluated using the HAZOP method. Node descriptions are not provided in the ATS PHA report.

40 C.F.R. § 68.67(f) requires the PHA to be updated and revalidated at least every five years. The facility conducted a PHA update and revalidation for the liquid SO₂ and oleum processes in 2019. Twenty-two nodes were evaluated using the HAZOP method, and human factors and facility siting were evaluated using a checklist.

Operating Procedures

40 C.F.R. § 68.69(d) requires safe work practices to be developed and implemented to provide for the control of hazards during operations such as lockout/tagout, confined space entry, and opening process equipment or piping. The facility has developed a permit system for hazardous operations, including job hazard analysis, lockout/tagout, and line break permits.

Training

40 C.F.R. § 68.71(c) requires the owner or operator to ascertain that each employee involved in operating a process has received and understood the required training. Inspectors reviewed sample operator training records that included a written competency test.

Mechanical Integrity

40 C.F.R. § 68.73(b) requires written procedures to be established and implemented to maintain the on-going integrity of process equipment. The facility manages inspection and testing of equipment through e-Maintenance software, but the facility did not provide a written mechanical integrity procedure at the time of the inspection. 40 C.F.R. § 68.73(d)(1) requires inspections and tests to be performed on equipment. Inspectors reviewed samples of inspection and testing records for items including pressure vessels, interlocks, and gas detectors.

Management of Change (MOC)

40 C.F.R. § 68.75(a) requires written procedures to be established and implemented to manage changes. Inspectors reviewed sample MOC packages that included completed MOC authorization forms, documentation of training, updated procedures, and updated process safety information.

Pre-Startup Safety Review (PSSR)

40 C.F.R. § 68.77(a) requires a PSSR to be performed for significant modifications. The facility includes PSSR documentation with the MOC package. Inspectors reviewed a sample MOC package that contained a completed PSSR form.

Incident Investigation

40 C.F.R. § 68.81(a) requires the investigation of each incident which resulted in, or could reasonably have resulted in a catastrophic release, and 40 C.F.R. § 68.81(d) requires a report to be prepared at the conclusion of the investigation. Inspectors reviewed an incident report prepared for an SO₂ leak from a blinded nozzle on the Make Tank that occurred in June 2021.

Emergency Response

40 C.F.R. § 68.95(a)(1) requires an emergency response program to include an emergency response plan. The facility developed emergency response plan EHS-200, which establishes procedures and mitigative steps for handling emergencies.

CLOSING CONFERENCE

☒ Provided U.S. EPA point of contact to the facility

Requested documents:

- EHS-500 (Management Program)
- Process Safety Information electronic folder
- Operating Procedures electronic folder

- PHA documentation, including the latest ATS PHA and the list of PHA recommendations with completion date
- MOC/PSSR electronic folder
- Inspection, Testing, and Repairs electronic folder
- Emergency Response Plan electronic folder
- Incident Investigation electronic folder
- Two copies of completed JSA permits with associated LOTO, Line Break, and other associated permits

Compliance Assistance: Inspectors informed facility personnel that the 1" valve upstream of pressure relief device PSV 780.102 was missing a car seal.

Concerns:

- Numerous small-diameter drain, vent, and bleed lines that discharge to atmosphere were not plugged and instead relied on a single valve to contain regulated and other extremely hazardous substances.
- Facility personnel identified portions of covered processes as being outside the RMP boundary.
- The piping system for the liquid SO₂ process had a mix of stainless and carbon steel construction.

DIGITAL SIGNATURES

Report Author: **MATTHEW WALTERS**  Digitally signed by MATTHEW WALTERS
Date: 2023.12.06 15:59:23 -06'00'

Section Supervisor: **BRIAN DICKENS**  Digitally signed by BRIAN DICKENS
Date: 2023.12.07 08:47:13 -06'00'

Facility Name: PVS Chemical Solutions, Inc.

Facility Location: Chicago, IL

Date of Inspection: October 26, 2023

APPENDICES

A. Digital Image Log

APPENDIX A: DIGITAL IMAGE LOG

1. Inspector Name: Matthew Walters	2. Archival Record Location: R5 Electronic Record Center (AECAB Library/Enf_PVSChemicals_IL_24/Inspection 2023.10.26/Photos)
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Image Number	File Name	Date and Time (CDT)	Description of Image
1	MSW_2023.10.27 (1).JPG	2023:10:27 09:15:44	SO ₃ Vaporizer
2	MSW_2023.10.27 (2).JPG	2023:10:27 09:16:38	SO ₃ Vaporizer outlet piping and 13DM3 Demister
3	MSW_2023.10.27 (3).JPG	2023:10:27 09:18:53	Blind flange on SO ₃ feed piping to Primary Reactor
4	MSW_2023.10.27 (4).JPG	2023:10:27 09:19:46	SO ₃ inlet to Primary Reactor
5	MSW_2023.10.27 (5).JPG	2023:10:27 09:21:03	PSE 360.102 rupture disc on Primary Reactor
6	MSW_2023.10.27 (6).JPG	2023:10:27 09:22:38	PI 360.107 pressure gauge with open 1/2" line isolated by single valve
7	MSW_2023.10.27 (7).JPG	2023:10:27 09:25:11	Outlet piping and 13DM4 Demister from Secondary Reactor
8	MSW_2023.10.27 (8).JPG	2023:10:27 09:28:37	Pressure gauge on Secondary Reactor outlet piping to SO ₂ scrubber with plugged 1/2" valve
9	MSW_2023.10.27 (9).JPG	2023:10:27 09:31:50	PI 460.106 pressure gauge with plugged 1/2" valve and open 1/2" line isolated by single unplugged valve on SO ₂ piping to Brinks 13DM1 Demister
10	MSW_2023.10.27 (10).JPG	2023:10:27 09:32:00	PI 460.106 pressure gauge with plugged 1/2" valve
11	MSW_2023.10.27 (11).JPG	2023:10:27 09:34:46	PI 480.101 and PI 480.102 pressure gauges each with an open 1/2" line isolated by a single valve on Brinks 13DM1 Demister
12	MSW_2023.10.27 (12).JPG	2023:10:27 09:36:56	Check valve on SO ₂ outlet piping from Brinks Demister
13	MSW_2023.10.27 (13).JPG	2023:10:27 09:38:14	Connection of carbon steel and stainless steel pipe sections on SO ₂ piping to compressor building with plugged 1/2" valve
14	MSW_2023.10.27 (14).JPG	2023:10:27 09:40:31	Vent line and open 1/2" line isolated by a single valve on SO ₂ piping to compressor
15	MSW_2023.10.27 (15).JPG	2023:10:27 09:40:58	Closed 1" valve to vent system from SO ₂ piping to compressor
16	MSW_2023.10.27 (16).JPG	2023:10:27 09:42:29	SO ₂ alarm at entrance to compressor building
17	MSW_2023.10.27 (17).JPG	2023:10:27 09:44:45	6" valve (arrow in opposite direction as flow) and vent line on SO ₂ feed piping to Knock-Out Pot

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Image Number	File Name	Date and Time (CDT)	Description of Image
18	MSW_2023.10.27 (18).JPG	2023:10:27 09:46:13	STR-201 Y-strainer at inlet to Sullair SO ₂ Compressor
19	MSW_2023.10.27 (19).JPG	2023:10:27 09:47:39	13PT-150 pressure transmitter and plugged 1/2" line on 13V4 Pressure Vessel
20	MSW_2023.10.27 (20).JPG	2023:10:27 09:48:42	PT 202 pressure gauge on piping from SO ₂ Final Filters to SO ₂ Product Cooler
21	MSW_2023.10.27 (21).JPG	2023:10:27 09:50:18	LOTO equipment in compressor building
22	MSW_2023.10.27 (22).JPG	2023:10:27 09:54:54	Open 3/4" line isolated by a single valve on Make Tank liquid SO ₂ discharge piping
23	MSW_2023.10.27 (23).JPG	2023:10:27 09:57:39	Open vent valve on Liquid Transfer Pump (13P4) discharge piping (not car sealed)
24	MSW_2023.10.27 (24).JPG	2023:10:27 09:59:06	SO ₂ Sample Station
25	MSW_2023.10.27 (25).JPG	2023:10:27 10:04:03	PSV 450.101 and 450.104 pressure relief valves on the 450 SO ₂ Storage Tank
26	MSW_2023.10.27 (26).JPG	2023:10:27 10:04:09	Nozzles A, B, C, E, and F on the 450 SO ₂ Storage Tank
27	MSW_2023.10.27 (27).JPG	2023:10:27 10:09:18	Open 3" valve on vent line from 450 SO ₂ Storage Tank (car sealed)
28	MSW_2023.10.27 (28).JPG	2023:10:27 10:11:45	Open 2" valves on vent line from SO ₂ storage tanks (car sealed and chain locked)
29	MSW_2023.10.27 (29).JPG	2023:10:27 10:11:57	Pressure relief discharge from SO ₂ tank vent line to open 3" valve (car sealed)
30	MSW_2023.10.27 (30).JPG	2023:10:27 10:20:01	FS 442.01 liquid flow switch on SO ₂ truck loading station vent line
31	MSW_2023.10.27 (31).JPG	2023:10:27 10:21:02	SO ₂ truck loading station
32	MSW_2023.10.27 (32).JPG	2023:10:27 10:23:22	SO ₂ railcar loading and storage area
33	MSW_2023.10.27 (33).JPG	2023:10:27 10:25:33	FS 443.01 liquid flow switch on SO ₂ rail car loading station vent line
34	MSW_2023.10.27 (34).JPG	2023:10:27 10:37:29	XV-12TK1-06 automatic valve on oleum rail car loading line and 12LSAHH-105 liquid flow switch on rail car vent line
35	MSW_2023.10.27 (35).JPG	2023:10:27 10:37:36	Flexible hoses for connection to oleum rail car
36	MSW_2023.10.27 (36).JPG	2023:10:27 10:42:02	Anhydrous ammonia rail car connected to ATS process
37	MSW_2023.10.27 (37).JPG	2023:10:27 10:42:11	Anhydrous ammonia storage tank
38	MSW_2023.10.27 (38).JPG	2023:10:27 10:43:08	ATS process connection to anhydrous ammonia rail car

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Image Number	File Name	Date and Time (CDT)	Description of Image
39	MSW_2023.10.27 (39).JPG	2023:10:27 10:48:13	Ammonia feed piping to ATS process with an open line isolated by a single valve and an open line isolated by two valves
40	MSW_2023.10.27 (40).JPG	2023:10:27 10:48:32	Ammonia feed piping to 19TK4