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SOLANO COUNTY

Environmental Health Division

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DATE: August 23, 2017 Type of Inspection Routine Follow-up Complaint Other

PROGRAM LEVEL: III SUBSTANCE(S): Anhydrous Ammonia (concentration > 20%), Aqueous Ammonia, Hydrogen, Methane, Ethane, Propane, Butane, Pentane, Hydrogen Sulfide,

SWEEPS # 50-20015-3

BUSINESS NAME: Benicia Valero Refinery ADDRESS: 3400 East Second Street,

CITY, ZIP CODE: Benicia, CA 94510 MANAGER: Kimberly Ronan PHONE: 707-745-7990

RISK MANAGEMENT PLAN (RMP) INSPECTION REPORT

As per Health and Safety Codes (HSC), Division 20, Chapter 6.95, Article 2, -Hazardous Materials Management 25531.2 (b) and 25534.5, the following information was gathered for this report.

May 5, 2017 Valero Benicia Refinery Incident Summary:

The Valero Benicia Refinery (VBR) emergency shutdown started on May 5, 2017 around 6:40 AM. VBR has two independent power sources both of which are operated by PG&E. The 100 Megawatt line originates at Vaca Dixon or Moraga substations. PG&E placed both power sources off line for 18 minutes, causing an immediate and full shut down of the refinery. The 47 megawatt cogeneration plant does not produce sufficient power to fully supply the needs of the refinery and additionally, it must maintain a line to the PG&E power circuit to remain on line.

With the refinery electrical power off all equipment went down, except for system controllers and computers, which are fed from a 500 Kilowatt backup electrical generator and UPS system. Refinery equipment operated as designed with control valves closing and pressure relief valves opening and venting to the flare stack. With the steam boilers shut down the flare stack does not operate as designed and incomplete combustion occurs, producing the formation of soot. The power failure shut down the cooling tower and the lack of cooling water system caused process equipment to heat up, which triggered safety systems including the use of the pressure dump stack to avoid over pressuring equipment. Use of the dump stack bypasses environmental emission control equipment by design. The dump stack ignited and was extinguished during the first hour of the incident. The dump stack vented for approximately 2 hours.

VBR made a recommendation to the City of Benicia Fire Department (BFD) to evacuate the industrial park the east side downwind of the refinery. The Benicia industrial park from Channel Road to Lake Herman Road was evacuated and cordoned off. The BFD issued a shelter in place for the Middle and Elementary schools nearest to the refinery (both of which were upwind and unaffected by the refinery releases.). With assistance from various local, regional and state agencies including Valero and industry, information was provided to the City of Benicia Incident Command Center regarding environmental status. At no time were any regulatory limits for Sulfur Dioxide and Hydrogen Sulfide exceeded at ground level. Onsite Environmental Health staff kept Solano County supervision and Contra County Environmental Health Supervision current on the incident status. Solano County Environmental Health Staff and the County's Health Officer were kept informed of the ground level air contamination levels.

Following environmental evaluation of the school area, the Solano County Health Officer lifted the shelter in place for the two schools.

BFD gave the all clear notice around 6:45 PM

May 8th Valero Benicia Refinery Coker Release Summary

During the restart of the VBR there was an additional release from the refinery. The release was at the Flue Gas Scrubber. The release occurred from approximately 3:30 to 9:00 pm on May 8th. Initially, Valero thought the release was from the Cat Cracker that was receiving a catalyst recharge during the release period. Subsequently the release was identified as coming from the Coker Unit. The non-conventional re-start of a Coker Unit that had previously experienced an emergency shutdown (versus a planned shutdown) left the Coker charged with unburned hydrocarbon fines that overloaded the flue gas scrubber, which released Coker fines to the downwind business park area.

May 15th Valero Benicia Refinery Coker Relief Valve Release Summary

During the continuation of the VBR restart, the Coker pressure relief valves vented to the atmosphere and the pressure control valves vented to the flare stack system causing flaring. The Cause of the release was trapped condensate water in the piping system as a result of the emergency Coker shut down on May 5th.

...The following sections summarize the multiple meetings that took place at the Valero Benicia Refinery with VBR staff. In some instances, information was being provided with information VBR staff had at the time of the meeting and was later further clarified or updated at subsequent meeting.

May 9th Meeting with Valero Benicia Refinery (Meeting Notes)

At Solano County EH and Cal-OSHA's request, VBR organized the first incident review meeting on May 8th and it was continued to May 9th for Solano County Environmental Health (EH). The meeting participants include Solano County, Cal OSHA, BFD and City of Benicia building representative, including VBR operations and legal staff. VBR provided a site tour for the participants. The dump stack did have some darkened paint areas near the top as a result of the fire but no other damage to the dump stack was identified by the Valero staff at this time. The VBR staff provided an overall gross review of the May 5th events and the current equipment and personnel status. Cal-OSHA commented that their review of the VBR employee's emergency response actions was appropriate. Cal-OSHA did not need to return. Solano County EH requested a greater explanation of Flare Stack operations to which VBR agreed could be explained on May 10th.

Information Requested by Solano County on May 9th

1. Information relating to Valero's investigation into the May 5, 2017 power outage, including a timeframe for completion of the investigation, and information regarding preliminary areas of interest, specifically as relates to:
 - a. Flares;
 - b. Dump stack fire;
 - c. Steam failure;
 - d. Flue gas scrubber abnormal operations; and

- e. Cogeneration (“Cogen”) load and capacity, and the ability of the Cogen to be kept running to supply critical services when PG&E goes off.
- 2. Is there a failsafe shutdown of the flue gas scrubber to ensure oxygen does not migrate backward?
- 3. Can nitrogen or air replace steam in the flare?
- 4. Were there any metallurgical failures associated with the May 5, 2017 outage?
- 5. Was there any pressure relief valve (“PRV”) damage as a result of the outage, specifically, did any of the following occur?
 - a. Safety valve failure to lift or
 - b. Safety valve plugging.
- 6. Did Valero review the atmospheric PRVs that released during the May 5, 2017 power outage before recommissioning them?
- 7. Provide a copy of a process flow diagram (“PFD”) of the dump stack (*i.e.*, the FCCU and Coker pressure relief device)
- 8. Provide a copy of a piping and instrumentation diagram (“P&ID”) of the dump stack
- 9. Provide aerial views of the South Flare.

May 10th Meeting with Valero Benicia Refinery (Meeting Notes)

On May 10th the manager of the Equipment Reliability explained the cause of the soot generation and provided detailed Flare Stack drawings and a close up picture of the flare stack burner tip nozzle. The flare stack burner tip nozzle was damaged in the incident and the spare flare burner tip nozzle was ready to be installed.

Additionally, on May 10th, VBR staff was able to answer some of the above listed questions. Due to limited availability of staff time during the refinery restart, VBR requested some additional time to perform a more detailed incident investigation in order to prepare a more comprehensive response to Solano County EH’s questions. Solano County EH decide to delay the Flare Stack review with subject matter experts until May 26. Solano County EH decided to review the May 5th Dump Stack Fire and the May 8th Flue Gas Scrubber release at June 19th meeting.

Solano County EH did review the independent operation of the Co-Generation (Cogen) Unit. Even though the steam is produced in a Cogen Unit that could be considered to operate independently from the electrical grid, the Cogen Unit cannot operate independently from the grid. The Cogen Unit must have PG&E power to start up and continue to operate.

Regarding the steam system failure, without electrical power, the steam pressure gradually dropped and a corresponding change in the Flare Stack plume resulted from a white, nearly smokeless discharge to an orange flame and black soot formation coming from both flare tops. Without adequate steam to properly atomize the unburned hydrocarbons flowing to the flare stack, the flare stack did not properly burn the petroleum hydrocarbons, which resulted in a release of soot to the atmosphere. Without continued production of steam, the existing steam condensed in the steam system supply lines. When the boilers were restarted, VBR gradually increased the steam system pressure to allow the condensate in the steam system supply lines to be evacuated from the steams lines in a controlled manner to avoid damage to the steam lines. Once the steam pressure was fully restored to the flare stack around 3:30 PM on May 5th, the orange flames and black soot ceased and “normal” flare operations resulted in a light white smoke exiting the flare stacks.

Solano County EH reviewed the potential for reverse flow from the flue gas scrubber to the Coker or Craker. Valero personnel explained the safe guards in place to prevent this from occurring to the satisfaction of Solano County EH.

Solano County EH was informed that the flare stack system was designed for the use of steam as the petroleum hydrocarbon atomizing agent; and nitrogen or another compressed gas could not be substituted to replace the steam even temporarily.

VBR responded to our metallurgical failure request stating that no equipment metallurgical damage failure mechanisms were found during their inspection of the units prior to the refinery restart. Additionally, the pressure safety relief valves functioned as designed and subsequent inspection of the relief valves that were activated, no plugged lines in the pressure relief valve piping was found. The requested process flow diagrams and piping and instrument diagrams were provided during the equipment discussion period. All VBR documents were left on site.

May 26th Meeting with Valero Benicia Refinery (Meeting Notes)

Solano County EH staff met with Valero environmental staff to obtain updated information regarding their May 5, 2017 release and subsequent events following the 18-minute PG&E power failure.

The operation of the North and South Flare stacks were discussed and Solano County EH was informed that they were both inspected by VBR staff. Both flare stacks are operating as designed.

The operation of the dump stack release on May 5th was discussed. Solano County EH reviewed the purpose and operation of the dump stack. The dump stack functions as an emergency pressure relief for the Coker and Catalytic Cracker. VBR staff confirmed that the dump stack was fully operational and that no subsequent reportable releases had occurred following the May 5th unanticipated shutdown.

The May 8th flue gas scrubber release was discussed on site on May 8th. The flue gas scrubber is designed to reduce releases of Sulfur Oxides, Nitrogen Oxides and particulates to the environment. VBR continues to investigate the source and cause of this release and will have more information in a follow-up meeting when the VBR subject matter experts will be available to discuss the flue gas scrubber operations in detail.

There will be a follow-up meeting with subject matter experts to discuss the May 15th Coker relief valve release. Topics that will be covered at the follow-up meetings will include dump stack operations, flue gas scrubber operations, and Coker relief valve release incident.

Solano County EH remains in contact with the VBR environmental staff, the City of Benicia Fire Department and with the Bay Area Air Quality Management District. Valero Benicia Refinery is providing notifications of flaring events due to equipment start-up following planned maintenance events to Solano County EH Staff

June 19th Valero Benicia Refinery discussion of May 8 Coker Fines Release and Dump Stack release on May 5th(Meeting Notes)

With the Coker subject matter expert (SME), present Solano County EH reviewed the cause of the Coker fines release. The SME explained that during the emergency Coker shutdown on May 5th, unburned hydrocarbons remained in the Coker. The Coker system batch transfer was started at 400 degrees Fahrenheit versus 800 degrees Fahrenheit. The new Flue Gas Scrubber has a low resonance time and was quickly overloaded, which resulted in a release of unburned hydrocarbons.

The dump stack has a water seal leg that acts as a pressure relief to protect the Coker and cat cracker in addition to providing the backpressure differential to force the exhaust gases from the two units to the Flue Gas Scrubber system.

July 26 Valero Benicia Refinery Discussion of May 15th Coker Relief Valve Release (Meeting Notes)

The Coker subject matter expert, explained that the cause of the release was trapped condensate water in the piping system as a result of the emergency Coker shut down on May 5th. The Coker system must be maintained at elevated temperatures to avoid piping pluggage problems. Following several days of operation, the plugged line suddenly cleared and the condensate water flowed to areas of elevated temperatures, and instantly turned into steam with a great thermal expansion, which then caused system over pressure and operation of the system pressure relief valves to the atmosphere and pressure control valves to vent to the flares stack causing the flaring.

By October 15th, Solano County EH requests the beginning of a scheduled a step by step review of the 6 Root Cause Analysis investigation currently in progress following the May 5, 8 and 15 release incidents.

Solano County EH has no CUPA program violations to date, but following the Root Cause Analysis discussions, recommendations may be developed and proposed.

RECEIVED BY:  INSPECTOR: Colby S Laplace DATE: 8-23-2017