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DEPARTMENT OF RESOURCE MANAGEMENT



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Environmental Health Division

Valero Benicia Refinery August 2019



Overview

Valero acquired the Benicia Refinery from Exxon Mobil in 2000. The refinery was originally built in 1968 and has undergone significant modifications and upgrades. Valero Benicia Refinery is located within the city boundaries of City of Benicia. Valero Benicia Refinery is located on industrial property and the land use surrounding the refinery is a combination of commercial/ industrial, open space, and residential uses. Valero Benicia Refinery, operates a variety of processes to produce petroleum products (e.g., propane, butane, gasoline products, jet fuels, diesel fuels, asphalt, and coke) from raw crude oil. Valero Benicia Refinery's total feedstock throughput is 170,000 barrels per day, (1 barrel = 42 gallons). Approximately 70 % of the refinery production is gasoline. Valero Benicia Refinery produces enough gasoline to fill 249,000 cars per day.

Hazardous Substances Stored or Produced Onsite and their Immediate Health Effects

Substances

Valero Benicia Refinery has regulated flammable substance such as propane, butane, etc. In addition, the refinery uses and processes other chemical listed below:

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Immediate Health Effects

- Anhydrous Ammonia: Colorless, corrosive, irritating gas. It has a sharp suffocating odor. Inhalation can cause irritation in nose, throat, and lungs. May cause shortness of breath, headache, nausea, and vomiting.
- Aqueous Ammonia: Colorless liquid with pungent odor. May cause nausea, breathing difficulty, and convulsions. Made by dissolving Anhydrous Ammonia in water
- Benzene: Colorless, Clear, highly flammable, characteristic odor. Symptoms of overexposure may be dizziness, headache, vomiting, loss of consciousness.
- Carbon Monoxide: Colorless, odorless, tasteless, flammable, poisonous gas. Symptoms of overexposure may be: headache, mental dullness, dizziness, increased then decreased pulse and respiratory rates.
- Flammable Gases: May be a mild irritant to throat, nose and lungs. May cause discomfort to the eyes.
- Hydrogen Sulfide: Colorless, rotten egg smelling, corrosive and toxic gas. May irritate nose, throat, and lungs. Causes, headaches dizziness, and difficulty in breathing.
- Particulate matter (PM2.5): Mixture of liquid droplets and solids such as dust, dirt, soot and smoke in the air. Particles with a diameter of 2.5 micrometers (PM2.5) travel into deep areas of the lungs. Symptoms of overexposure may be: eye, nose and throat irritation, reduce lung function, asthma attacks, and increased respiratory symptoms, such as, coughing wheezing or shortness of breath. Chronic exposure may lead to increased incidence of heart and lung problems.
- Sulfuric Acid: Colorless to brown in appearance. May cause digestive and respiratory tract burns and irritations.
- Sulfur Dioxide: Colorless, corrosive gas with burnt match odor. May irritate nose, throat, and lungs. May cause asthma – like reaction when inhaled.

Valero Benicia Refinery is subject to the California Accidental Release Prevention Program 4 provisions which apply to the entire facility except administration, warehouses, and the laboratory.

5-year Accident History (Last updated in July 2019)

- On May 5, 2017, there was a sudden, immediate loss of 230 Kilovolts of power from PG&E that resulted in the immediate, unplanned shutdown of the entire refinery that resulted in a flaring release of Sulfur Dioxide until the refinery was safely shutdown. Additionally, two units had atmospheric safety valves lifted releasing combustible mixtures. The nearby business park was evacuated as a precaution and the nearby elementary schools performed a shelter in place. Solano County CUPA, Bay Area Air Quality Management District, and state and federal agencies were notified. Contract Team from US EPA Region 9, Bay Air Quality Management District personnel, and California Air Resources Board personnel in conjunction with Solano County CUPA conducted air monitoring during this event and found air quality within regulatory limits.

- On March 24, 2019, the Flue Gas Scrubber (FGS) carbon monoxide (CO) release increased above 1,000 ppm and the carbon fines emissions produced a dark brown color smoke plume that drifted over the Benicia industrial center on the east side of the refinery. The Benicia Fire Department in coordination with the Solano County Health Officer, issued a public health warning recommending people with chronic respiratory conditions such as asthma to remain indoors. The refinery shut down several units to correct/reduce the FGS emissions. By 11:00 AM the emissions were remarkably reduced and about 3 hours later in the day the public health advisory was lifted. Solano County CUPA, the Bay Area Air Quality Management District (BAAQMD), Valero Certified Industrial Hygienist were taking air quality readings throughout various areas of the City of Benicia. All three sampling teams noticed the reduction in emissions that led to lifting of the public advisory in the early afternoon following 2-3 hours of reduced emissions.

Post March 2019 incident investigation at Valero:

The Solano County CUPA opened an investigation into the FGS incident on March 13, 2019 with US EPA and the BAAQMD. Initially the source of the excess CO was thought by Valero to be the Coker Unit. Operational adjustments were made to the Coker Unit that appeared to have a positive effect and reduced the solids exiting the FGS but did not substantially reduce the quantity of CO. On March 24, 2019 the emissions increased dramatically by releasing large solids and a substantial spike in CO emissions. Following a multi-unit shut down and subsequent examination of units that discharge to the FGS, it was determined that multiple furnace heating pipes in the Crude Unit furnace/waste heat recovery unit had failed.

Valero initiated a Root Cause Analysis (RCA) of the incident and on July 12, 2019 produced a completed report. The report explained how the pipestill/crude unit furnace heating pipes were damaged in November 3, 2018 following a restart of the Pipestill/Crude Unit and its subsidiary units. During the restart process a hydraulic surge caused a safety relief valve to lift, which allowed the crude oil to by-pass the waste heat furnace and flow directly to the Crude Unit. With no or little crude oil flow through the waste heat furnace piping, the furnace pipes overheated and built up an insulating coke layer from the baked on crude. The high temperatures experienced by the furnace pipes caused thermal expansion or stretching (creep). The damage to the furnace pipes was initiated in November 2018. The furnace continued to be operated with the internal walls of the furnace pipes now having a baked-on insulating coke layer. The operation of the furnace pipes with a coke layer resulted in overheating and weakening of the furnace pipes. The furnace pipes finally began to fail around March 13, 2019 with a larger failure around March 23-24, 2019-time frame.

Root Cause Analyses (RCA) are comprehensive, complex documents, Valero has completed the RCA for the March 2019 FGS Incident. Please review the July 12, 2019 RCA submitted by Valero Benicia Refinery for more details.

Solano County continues a joint inspection on the Valero Benicia Refinery with US EPA, Cal-OSHA and the Bay Area Air Quality Management District.

- Valero Benicia Refinery implemented safety features to their Pipestill/Crude Unit furnace operations prior to the restarting of the furnace.
- Solano County CUPA has received the RCA submitted by Valero Benicia Refinery and will make the public document available on the Solano County Web Site.

Further Information

- Solano County Refinery Definitions page
- Valero July 12, 2019 FGS Root Cause Analysis Report
- Solano County CUPA information is at www.solanocounty.com/depts/rm/environmental_health/hazmat/default.asp