



**Valero Refining Company-California, Benicia Refinery**

**Incident Investigation**

**Vapor Release at C4 Rail Rack**

**January 22, 2022**

**Report Completion Date: April 20, 2022**



## **I. OVERVIEW**

The evening of January 21, 2022, a Post 12 (night shift) operator began offloading butane (C4) railcars to the butane storage tank.

At approximately 00:15 the next morning, while connecting a railcar on the adjacent rack, the Post 12 (night shift) operator and a coworker identified a vapor release coming from the rail rack Spot 3 liquid arm on the C4 rail rack (Incident). The Post 12 (night shift) operator immediately radioed the unit Control Board Operator (CBO) to notify him of the issue.

In response to the radio call, the CBO remotely closed the west end manifold valves to isolate the C4 rail rack away from the receiving tank. Simultaneously, the Post 12 (night shift) operator manually isolated cars upwind. Shortly thereafter, fixed monitors were directed toward the release and an Incident Command system was initiated. Valero Fire Department responded with an engine, and applied additional suppression with water spray. Another operator, isolated the remaining railcars. When the Post 12 (night shift) operator reached the area of the release, he saw that the jog valve switch was in the "On/jog" position and that the upstream twin seal valve was in the open position. Upon discovery, both the jog valve and twin seal were closed, isolating the vapor release. An estimated 38,000 pounds of C4 were released as a result of the Incident.

Further investigation identified that, after offloading cars during the prior day shift, rail rack Spot 3's twin seal valve was inadvertently left open and its jog valve was also left in the "jog/auto" position. The next set of railcars did not deliver to Spot 3, and when the next rack of cars began offloading, liquid in the header triggered the jog valve to open, resulting in the release.

## **II. INVESTIGATION METHOD AND TEAM**

On January 22, 2022, the investigation into the incident began. Valero convened an inspection team to investigate the incident using a CauseMapping method consistent with the Refinery's Incident Investigation Reporting Procedures. Due to the potential and not actual consequence of the event, Valero is treating the Incident as a Major Incident per 8 C.C.R. § 5189.1 and CalARP Program 4.

The investigation team consisted of refinery personnel with expertise in operations, process safety and safety. It also included a health and safety representative as well as hourly personnel. The team reviewed process data, interviewed involved personnel, and reviewed process safety information (including the 2019 Oil Movements PHA), training, and procedures, and other information in connection with its analysis of the event.

### III. HIGH LEVEL PROCESS OVERVIEW

The Valero Benicia Tank Car Rack is designed to load and unload butane, isobutane, and propane directly from the various tanks or production streams in Post 12. It is capable of handling up to 15 light ends cars of up to 85-feet in length.

### IV. INCIDENT TIMELINE

The timeline below provides a high-level chronology of events that were considered by Valero’s Incident investigation team in connection with this investigation. This information was gathered by the team following the Incident and during the course of the investigation. Information contained in the table below may not have been available as the events occurred.

Date	Time	Description
01/21/22	05:24	Nine (9) railcars finish offloading to the butane tank.
01/21/22	06:20	Post 12 operator (day shift) began depressuring nine (9) butane railcars after offloading to the butane tank. Afterwards, he responded to a request for assistance at another unrelated work task.
01/21/22	09:46	Post 12 operator (day shift) returned to the butane rail rack, saw that the tank cars appeared to be depressured, and called for assistance to begin disconnecting the cars.
01/21/22	09:51	While isolating and venting each hose, Post 12 operator (day shift) noticed rail rack Spot 3 liquid arm was still pressured.
01/21/22	09:53	Post 12 operator (day shift) made a radio call, informing Complex 3 teammates that rail rack Spot 3 liquid arm was still pressured.
01/21/22	day shift	Post 12 operator (day shift) continued working to disconnect other tank cars, ultimately returning back to Spot 3, where several others were working. Spot 3 had been disconnected, and Post 12 operator (day shift) took additional disconnection steps by installing the loading hose plug and attaching the hose's retainer cable to the handrail. The jog valve and twin seal valve positions were not verified at this time because it was assumed that, as is normal process, those valves were closed before disconnecting the hose during the earlier disconnection steps.  Remaining cars were disconnected and moved to the outbound tracks.
01/21/22	night shift	Post 12 operator (night shift) spotted seven (7) full tank cars at the butane rack Spots 1, 2, and 6-10, leaving rail rack Spot 3 with no car.
01/21/22	night shift	Post 12 operator (night shift) connected all tank cars with support from operations.
01/21/22	23:41	Post 12 operator (night shift) began offloading and verified flow through each offloading hose.

Date	Time	Description
01/22/22	00:15	Post 12 operator (night shift) and a teammate moved three empty propane tank cars and three full propane tank cars. As they were starting to connect the cars to the propane rail rack, they heard what sounded like a release at the butane rack and called it in on the radio.
01/22/22	00:17	The CBO remotely closed the rack's isolation motor operated valves (MOVs) at the west end of the rack.
01/22/22	~00:20	The Operations Supervisor (OS) responded and gas tested the area. An operator, in bunker gear, isolated the remaining railcars.

## V. CAUSAL ANALYSIS

In connection with identifying initiating and contributing causes, the investigation team analyzed the information described above. The team also considered any management system and/or organizational cultural factors, as appropriate.

The team identified four initiating (direct) causes that led to the C4 release:

- 1) The Spot 3 twin-seal isolation valve was inadvertently left in the open position;
- 2) The Spot 3 jog valve was inadvertently left in the jog/auto position;
- 3) The Spot 3 loading hose end-cap fell off when the jog valve opened; and
- 4) The C4 offloading began with the Spot 3 valves incorrectly positioned.

Three contributing (indirect) factors were identified:

- 1) Damage to the loading hose's plug prevented full thread engagement, allowing the otherwise pressure-containing plug to become dislodged.
- 2) While on the job training generally includes training on verification of valve position during loading and offloading, OM12-NP-706 / 707 procedures did not explicitly specify the position of the jog valve for a car at an unoccupied rail rack spot before allowing offloading to begin.
- 3) Rail rack valve isolation was not verified before progressing other tasks, which led to incorrect valve positioning during offloading.

## VI. Recommendations

The investigation team developed the following recommendations and interim measures below.

Recommendation	Target Date
<b>Interim measure:</b> Replace damaged Spot 3 LPG loading hose plug.	Completed January 23, 2022
<b>Interim measure:</b> Inspect other rail rack loading hose plugs for damage and replace as necessary.	Completed January 24, 2022

Recommendation	Target Date
Add end-cap fitting and plug replacement to annual LPG loading hose PM task, and add as a warehouse stock item.	June 1, 2022
Update loading/offloading procedures and checklists to further clarify proper valve positioning before loading and offloading.	May 1, 2022
Perform human factors analysis of updated railcar offloading and loading procedures to help identify any additional ways to improve clarity of the procedures.	June 1, 2022
After completing procedural updates, conduct review of Post 12 responsibilities with each team, and reinforce expectations for safe railcar loading and offloading.	July 1, 2022
Evaluate whether installation of an instrument air dump valve which could close all jog valves remotely is appropriate for this process.	July 15, 2022