

Attachment VI

Causal Analysis Report

Chevron Richmond Refinery Reportable Flaring Events

May 28, 2019 – May 29, 2019
Shutdown and Start-up of Hydrogen Plant Train 2
(S-4450)

Refinery Flare Event – Cause Investigation Report

1. Date on which the report was drafted: July 30, 2019

2. The refinery name and site number:

Refinery: Chevron Richmond Refinery

Refinery Site Number: A0010

3. The assigned refinery contact name and phone number:

Contact Name: Laura Kurt

Contact Phone Number: (510) 242-5219

Is this a rescission/modification of a previous report: No.

Date of initial report: N/A

Reason for rescission/modification: N/A

4. Identification of flare (s) at which the reportable event occurred by reviewing water seal monitoring data to determine which seals were breached during the event

| Flare | Reportable Event (SO2 or Vent Gas Volume) |
|--------------|---|
| H2 (S-6021)* | Vent Gas Volume |

**Note: The Hydrogen Plant (H2) flare does not have a water seal.*

5. The flaring event duration for each affected flare

Flare (Source Number): H2 (S-6021)

The Date(s) of the event: May 28, 2019 – May 29, 2019

The start time of the event: 3:29PM on May 28, 2019

The end time of the event: 9:47AM on May 29, 2019

The net duration of event: 18 hours and 16 minutes

6. A brief description of the flaring event –

At approximately 3:29 PM on May 28, 2019, Train 2 tripped offline when a valve/actuator coupling came loose. Operations took immediate actions to safely posture the plant, initiated repair of the malfunctioning valve, and then commenced start-up of Train 2. Start-up of Train 2 continued into the morning of May 29, 2019.

Both start-up and shutdown procedures include routing flows, comprised mostly of hydrogen gas, to relief. The Hydrogen Plant does not have flare gas recovery or a water seal, and therefore all relief flow results in flaring. The vent gas volume exceeded 500,000 scf on May 28 and May 29, 2019.

7. A process flow diagram showing the equipment and process units that were the primary cause of the event.

See Attachment VIa

8. The total volume of vent gas flared (MMSCF) throughout the event

| Flare | Volume (MMSCF) |
|-------|----------------|
| H2 | 18.0 |

9. The emissions associated with the flaring event per calendar day

| Flare | Calendar Day | CH4 (lbs.) | NMHC (lbs.) | SO2 (lbs.) |
|-------|--------------|------------|-------------|------------|
| H2 | May 28, 2019 | 242.0 | 94.7 | 0.9 |
| H2 | May 29, 2019 | 2,441.4 | 285.5 | 1.1 |

Assumptions used to calculate emissions – consistent with the reporting under Reg. 12-11.

10. A statement as to whether or not the gas was scrubbed to eliminate or reduce any entrained compounds and a list of the compounds for which the scrubbing was performed.

The vent gas was not scrubbed to eliminate or reduce any entrained compounds.

11. The primary cause of the flaring event including a detailed description of the cause and all contributing factors. Also identify the upstream process units that contributed vent Gas flow to the flare header and provide other flow instrumentation data where available.

The Train 2 shutdown and subsequent flaring occurred when a valve/actuator coupling came loose and allowed a PSA tail gas valve to open, resulting in the automatic shutdown of Train 2.

Flaring also occurred during Train 2 start-up per procedure.

Vent gas originated from Hydrogen Plant Train 2 (S-4450) and associated equipment, including S-4472.

12. Describe all immediate corrective actions to stabilize the flaring event, and to reduce or eliminate emissions (flare gas recovered or stored to minimize flaring during the event). If a decision was made not to store or recover flare gas, explain why.

Operations took immediate actions following the Train 2 shutdown to stabilize the plant. Operations used shutdown and start-up procedures.

13. Was the flaring the results of an emergency? If so, was the flaring necessary to prevent an accident, hazard or release to the atmosphere?

The flaring was not due to an Emergency (defined in Regulation 12-12-201) as interpreted by the BAAQMD.

14. If not the result of an emergency and necessary to prevent an accident, hazard or release to the atmosphere, was the flaring consistent with an approved FMP? If yes, provide a citation to the facility's FMP and any explanation necessary to understand the basis for this determination.

The flaring was consistent with Chevron's FMP Section 2.1 Table 2-4. Table 2-4 identifies the vent before PSA 2 (S-4450) and PSA 2 as sources that may flare in non-emergency events (e.g. start-up, shutdown). Additionally, the flaring was consistent with Chevron's FMP Section 5.4 Figure 5-1. The shutdown was unplanned. Causes for the flaring were analyzed through an investigation and the corrective actions have already been or will be implemented to reduce the likelihood of a recurrence of flaring resulting from the same causes.

15. If the flaring was due to a regulatory mandate to vent to flare, why couldn't the gas be recovered, treated, and used as fuel gas?

N/A. Flaring was not due to regulatory mandate.

16. Identify and describe in detail each prevention measure (PM) considered to minimize flaring from the type of reportable flaring event that occurred.

a) State whether the PM is feasible (and will be implemented), or not feasible

b) Explain why the PM is not feasible, if applicable

1. Inspect valve to actuator couplings on all Pressure Swing Absorber (PSA) valves. If identified, repair any coupling issues.

Projected Completion Date: September 30, 2019

Note: Flaring cannot be prevented during plant start-up or shutdown due to facility and relief system design.

Shutdown and Start-up of Hydrogen Plant Train 2

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