

Attachment I

Causal Analysis Report

Chevron Richmond Refinery
Reportable Flaring Events

May 2, 2021

Flaring Due to Compressor Shutdown

Refinery Flare Event – Cause Investigation Report

1. Date on which the report was drafted: July 29, 2021

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: Brandon Sutter

Contact Phone Number: (925) 394-8773

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

Date of initial report: Not Applicable

Reason for rescission/modification: Not Applicable

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) |
|---------------|---|
| NISO (S-6013) | Vent Gas Volume and SO ₂ |

5. The flaring event duration for each affected flare

Flare (Source Number): NISO (S-6013)

The Date(s) of the event: May 2, 2021

The start time of the event: 5/2/2021 4:15 PM

The end time of the event: 5/2/2021 8:16 PM

6. A brief description of the flaring event –

On May 2nd, 2021, an intermittent water wash was conducted at a heat exchanger as part of a routine preventative maintenance activity. During this time, a temperature spike in the heat exchanger occurred, leading to excessive liquid into a compressor knockout drum and a shutdown of the compressor. Flows sent to the Flare Gas Recovery (FGR) system exceeded FGR capacity, and gas was routed to the flare relief system. Operations immediately responded, troubleshooting the cause of the compressor shutdown and restarting the compressor. This stopped the flow to the relief system, and the flaring ceased.

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

See Attachment Ia.

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

| Flare | Volume (MMSCF) |
|-------|----------------|
| NISO | 1.2 |

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

| Flare | Calendar Day | CH4 (lbs.) | NMHC (lbs.) | SO2 (lbs.) |
|-------|--------------|------------|-------------|------------|
| NISO | May 2, 2021 | 129.3 | 402.8 | 7,217.2 |

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.

Primary causal factor: Wash water procedure did not clarify plant posture required and amount of wash water needed to conduct water wash.

Contributing causal factor: Insufficient process monitoring procedures at the heat exchanger related to frequency of water washes.

Contributing causal factor: Inoperative dP instrumentation at the heat exchanger.

Contributing causal factor: Foaming mitigation measures were not implemented.

A compressor knockout drum in the Hydroprocessing ABU was the primary contributor of the vent gas flow to the flare.

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 immediately responded, troubleshooting the cause of the compressor shutdown. The compressor was able to restart once the high level in the knockout drum was resolved. This stopped the flow to the relief system, and the flaring ceased.

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

The flaring was the result of an emergency, as defined in Regulation 12-12 (a condition at a petroleum refinery beyond the reasonable control of the owner or operator requiring immediate corrective action to restore normal and safe operation that was caused by a sudden, infrequent and not reasonably preventable equipment failure). The flaring was necessary to prevent an unabated release to the atmosphere.

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 the result of an emergency. The flaring is also consistent with Chevron's FMP Section 5.4 Figure 5-1. This event was unplanned. Causes for the flaring were investigated 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 a 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

All prevention measures have been considered and have or will be implemented.

1. Improve process monitoring at the heat exchanger by updating procedure and providing recommendations for frequency of water wash.
2. Improve process indications at the heat exchanger by evaluating instruments and providing recommendations to improve heat exchanger instrument reliability and accuracy.
3. Improve wash water procedure by addressing plant posture required and amount of wash water needed to conduct a water wash.
4. Review incident with crews to implement mitigations to aid in the prevention of a recurrence.

Flaring Due to Compressor Shutdown

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