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Attachment II

Causal Analysis Report

Chevron Richmond Refinery
Reportable Flaring Events

May 14, 2021
Flaring Due to Pump Malfunction

Refinery Flare Event – Cause Investigation Report

1. Date on which the report was drafted: November 10, 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: Yes

Date of initial report: July 29, 2021

Reason for rescission/modification: Completed investigation

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)**
RLOP (S-6039)	SO2

5. The flaring event duration for each affected flare

Flare (Source Number): RLOP (S-6039)
The Date(s) of the event: May 14, 2021
The start time of the event: 5/14/2021 05:32 AM
The end time of the event: 5/14/2021 06:11 AM

6. A brief description of the flaring event –

On the morning of May 14, 2021, operators at a process unit received audible alarms, and upon investigation, discovered a fire at a pump within the process unit. Operators made immediate notifications to plant personnel and activated in-plant fire suppression systems. The Refinery's Fire Department was notified and responded to extinguish the fire. Operators pulled feed from the impacted unit and placed it in a controlled stable posture. The area safety flares activated at approximately 05:32 during the plant shutdown.

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

See Attachment IIa.

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

Flare	Volume (MMSCF)
RLOP	0.2

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

Flare	Calendar Day	CH4 (lbs.)	NMHC (lbs.)	SO2 (lbs.)
RLOP	May 14, 2021	40.4	160.8	6,988.1

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.

Primary causal factor: The primary cause that initiated this event was the lack of sufficient seal flush to the pump. Lack of seal flush led to seal face damage that opened a leak path. After the seal failed, the pump bearings failed.

Contributing causal factor: The pump vibration trip system was disarmed and thereby did not trip the motor. The vibration trip system would not have avoided the release, but it would likely have tripped the pump earlier during the event, thereby reducing the release.

Contributing causal factor: The pump suction air operated valves remained open for part of the event allowing process fluid to reach the failed pump. Operators attempted to close the valves immediately but were unsuccessful.

Contributing causal factor: A nearby flange leaked during the event. The flange leak was a result of multiple causes: (1) high pipe stress,(2) high heat from the fire combined with stress relaxed and plastically deformed two of the studs at that flange, and (3) high vibrations from the pump running on failed bearings likely contributed to weakening the assembly.

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.

Operators made immediate notifications to plant personnel and activated in-plant fire suppression systems. The Refinery's Fire Department was notified and responded to extinguish the fire. Operators pulled feed from the impacted unit and placed it in a controlled stable posture.

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?

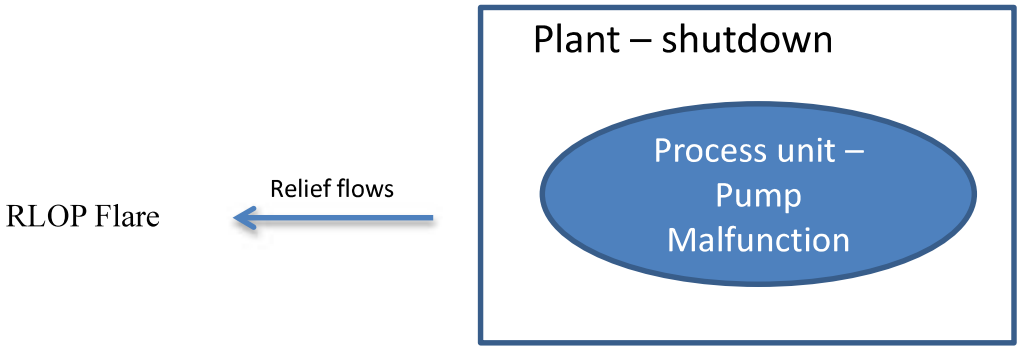
N/A. Flaring was not due to a regulatory mandate.

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. Upgrading of the seal system design.
2. Improving operator rounds pertaining to monitoring of the seal system of the pump.
3. Assuring appropriate groups are communicating (nuisance alarms, operational concerns, pump monitoring) in the proper forums.
4. Reinforcing the use of shift turnovers to document when the vibration trip systems are disarmed.
5. Management actions to reinforce appropriate management of the vibration trip system.
6. Additional training regarding the suction air operated valves.
7. Redesign the piping system using current design tools. This measure is complete as of July of 2021.

Flaring Due to Pump Malfunction



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Chevron Richmond Refinery

Attachment IIa