Attachment IV

Causal Analysis Report

Chevron Richmond Refinery
Reportable Flaring Events

February 24, 2019
Pressure Safety Valve Malfunction in the TKC Unit

1. Date on which the report was drafted: April 25, 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

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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)	**SO2**
SISO (S-6012)	**None**
FCC (S-6016)	**None**
RLOP (S-6039)	**None**

5. The flaring event duration for each affected flare

Flare (Source Number): NISO (S-6013)
The Date(s) of the event: February 24, 2019
The start time of the event: 22:44
The end time of the event: 23:56
The net duration of event (in hours and minutes): 0 Hours, 58 Minutes (intermittent)

Flare (Source Number): SISO (S-6012)
The Date(s) of the event: February 24, 2019
The start time of the event: 22:44
The end time of the event: 23:05
The net duration of event (in hours and minutes): 0 Hours, 21 Minutes

Flare (Source Number): FCC (S-6016)
The Date(s) of the event: February 24, 2019
The start time of the event: 22:42
The end time of the event: 23:26
The net duration of event (in hours and minutes): 0 Hours, 28 Minutes (intermittent)

Flare (Source Number): RLOP (S-6039)
The Date(s) of the event: February 24, 2019
The start time of the event: 22:44
The end time of the event: 23:04
The net duration of event (in hours and minutes): 0 Hours, 6 Minutes (intermittent)

6. A brief description of the flaring event –

On February 24, 2019 at approximately 22:42, a pressure safety valve failed open in the Taylor Katalytic Cracking (TKC) unit of the Hydroprocessing Area Business Unit. Process gases entered the relief system through the failed pressure safety valve and flaring began at the RLOP, North Isomax (NISO), South Isomax (SISO), and Fluid Catalytic Cracking (FCC) flares. The primary source of vent gas flared during this event was process material from TKC process equipment. Flaring ceased on February 24, 2019 at approximately 23:56. The sulfur dioxide (SO2) emissions from only the NISO flare exceeded 500 pounds (lbs) within a 24-hr period.

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

See Attachment IVa

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

Flare	Volume (MMSCF)
NISO	0.15
SISO	0.007
FCC	0.03
RLOP	0.0001

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

Flare	Calendar Day	CH4 (lbs.)	NMHC (lbs.)	SO2 (lbs.)
NISO	February 24, 2019	22	66	7,949
SISO	February 24, 2019	3	8	46
FCC	February 24, 2019	24	4	3
RLOP	February 24, 2019	0.01	0.09	0.32

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.

Root Cause:

- Pressure safety valve IX-478A experienced a mechanical failure and failed open.

Contributing Causes:

- Mechanical failure could have been caused in part by valve chatter that is not detectable.

The main contributor of vent gas flow during this event originated from TKC process equipment.

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 by isolating the failed pressure safety valve and stabilizing the unit. The failed pressure safety valve resulted in a decrease in system pressure and to stabilize the unit Operations removed process feed from the unit.

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. However, the root cause of the flaring was due to malfunction, which resulted in the sudden flow of gas to relief.

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 5.4 Figure 5-1. This event was unplanned. Causes for the flaring were analyzed through a TapRoot® 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?

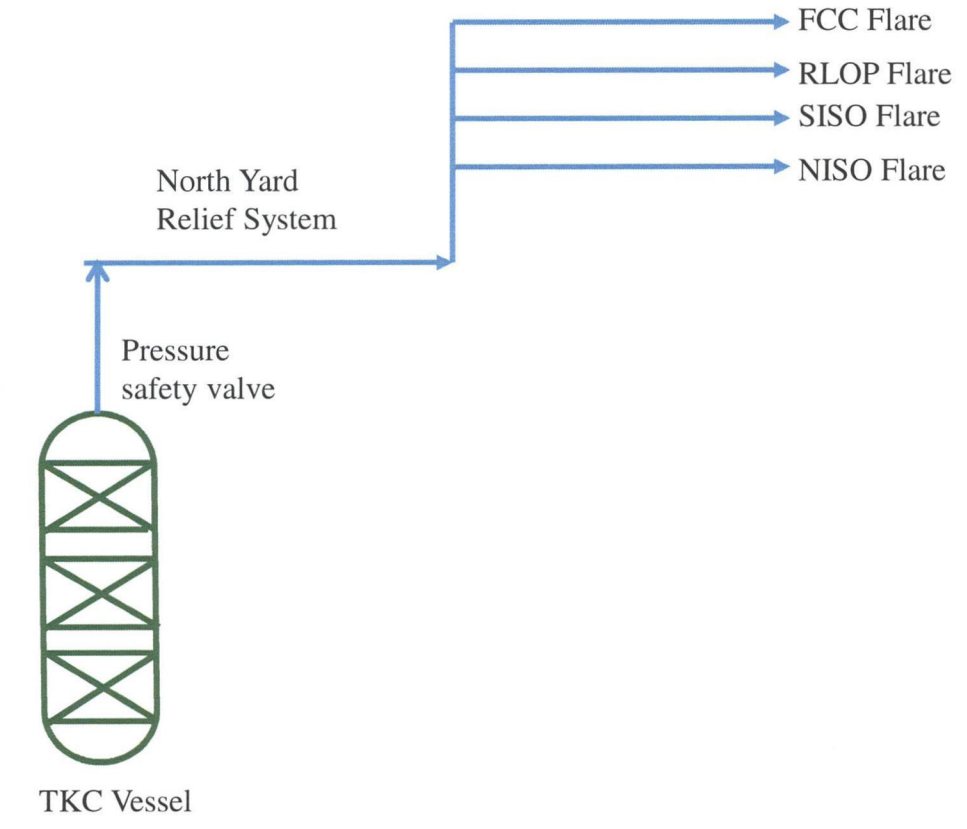
N/A. Flaring was not due to regulatory mandate.

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

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

1. Change pressure safety valve design from pilot operated type to standard spring type

   Projected Completion Date: October 1, 2019

Pressure Safety Valve Malfunction in the TKC Unit

At approximately 22:42 on February 24, 2019, a pressure safety valve failed open in the TKC unit. Process gases entered the relief system through the failed pressure safety valve and flaring began at the RLOP, NISO, SISO, and FCC flares.