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Attachment IV

Causal Analysis Report

Chevron Richmond Refinery
Reportable Flaring Events

March 09 - 11, 2023
Flaring Due to Faulty Feedwater Boiler Pump Motor

May 30, 2023

Refinery Flare Event – Cause Investigation Report

1. Date on which the report was drafted: May 24, 2023

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: Duy Nguyen
Contact Phone Number: (510) – 242 - 3132

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)	SO2; Vent Gas Volume
SISO (S-6012)	SO2; Vent Gas Volume

5. The flaring event duration for each affected flare

Flare (Source Number): NISO (S-6013)
The Date(s) of the event: March 09, 2023 – March 10, 2023
The start time of the event: 03/09/2023 7:43 PM
The end time of the event: 03/10/2023 09:25 PM

Flare (Source Number): SISO (S-6012)
The Date(s) of the event: March 09, 2023
The start time of the event: 03/09/2023 7:43 PM
The end time of the event: 03/09/2023 9:37 PM

Note: Flaring was intermittent during the times listed above.

6. A brief description of the flaring event –

On March 9, 2023, while Hydrogen Plant Train 1 was offline for maintenance, Hydrogen Plant Train 2 lost power due to a ground fault on a boiler feedwater pump motor. The ground fault caused a loss of power to the two electrical buses located in the common substation, resulting in the loss of critical equipment and an operator-initiated emergency shutdown of Hydrogen Plant Train 2. In response, hydrogen consumers in the Hydroprocessing Area used emergency procedures to pull feed and depressurize systems, which resulted in flows to the Flare Gas

Recovery (FGR) system. Flows to the FGR system exceeded FGR capacity, and flaring occurred. The faulty motor was isolated from the rest of the system. Per procedure, personnel verified the safe condition of all other electrical equipment at the Hydrogen Plant and determined that Hydrogen Plant Train 2 was safe to restart. The other impacted refinery process units subsequently started up after hydrogen production was available.

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	4.07
SISO	0.44

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

Flare	Calendar Day	CH4 (lbs.)	NMHC (lbs.)	SO2 (lbs.)
NISO	March 09, 2023	28.8	232.4	2588.5
NISO	March 10, 2023	215.3	1770.7	2308.4
SISO	March 09, 2023	26.6	408.3	958.4

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: Faulty boiler feedwater pump motor. This was due to corrosion from water intrusion, as well as incorrectly ranged pressure gauge on the motor and excessive air filter pressure.

Contributing Factor: Inadequate design of electrical backup systems.

The primary contributor of the vent gas to the flare was the SDA unit to the SISO flare and NISO units to NISO 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.

The faulty motor was isolated from the rest of the system. Per procedure, personnel verified the safe condition of all other electrical equipment at the Hydrogen Plant and determined that

Hydrogen Plant Train 2 was safe to restart. The other impacted refinery process units subsequently started up after hydrogen production was available.

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?

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 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?

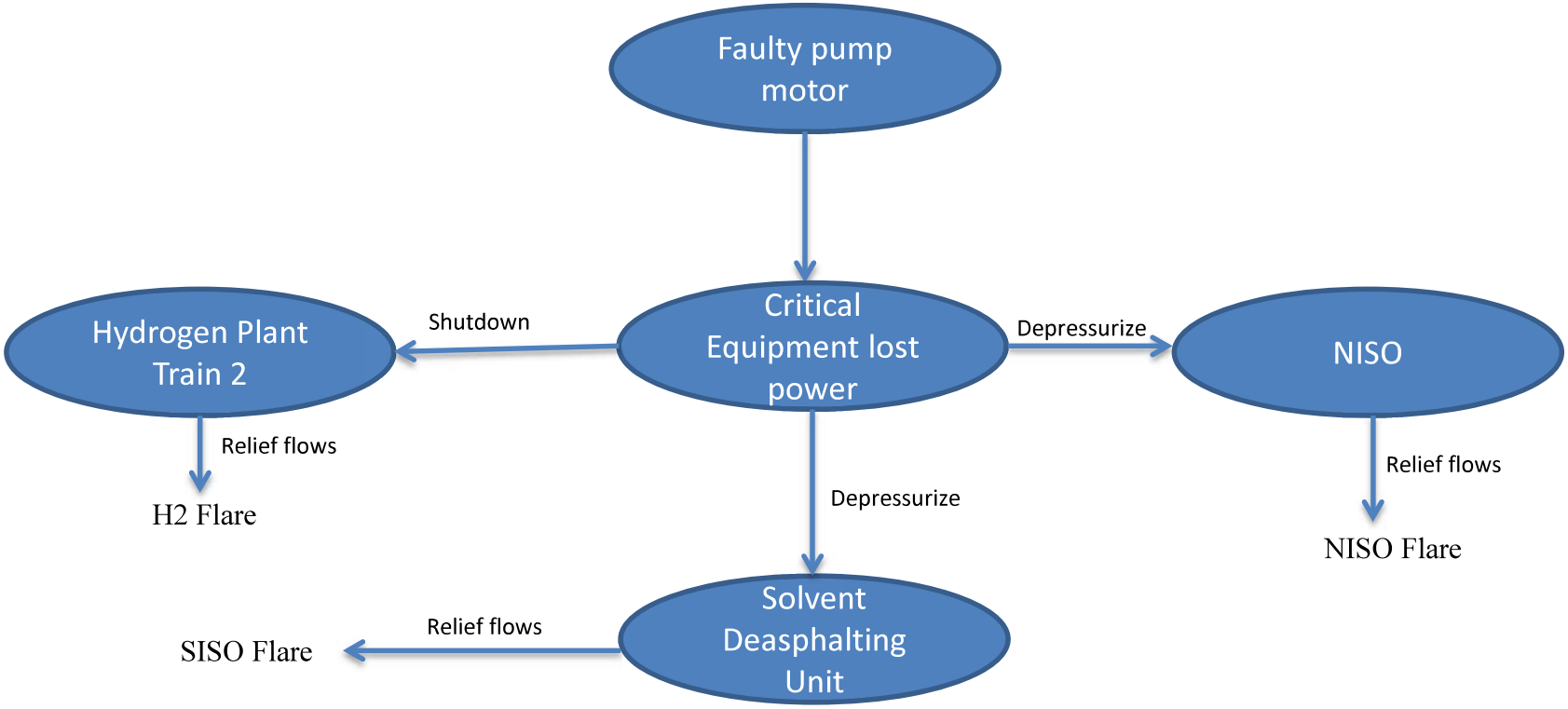
N/A. Flaring was not due to a regulatory mandate.

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

Prevention measures have been considered and have or will be implemented.

1. Evaluate the potential for undervoltage on hydrogen plant motors.
2. Validate gauges are correctly ranged for all motors.
3. Share lessons learned from event with applicable refinery personnel.
4. Replace boiler feedwater pump motor.
5. Identify potential solutions for backup power from critical equipment fed from common buses.
6. Consider updating electrical protection mechanisms.

Flaring Due to Faulty Boiler Feedwater Pump Motor



Signature: Ed Giacometti (Jun 14, 2023 15:03 PDT)

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