cc 7/6/23

AG 07/06/23

DF 07/06

FLARE CAUSAL ANALYSIS REPORT

Flaring Associated with #1 H2 Plant Shutdown – Public Copy
April 5, 2023

1) **Date on which the report was drafted.**
   June 20, 2023

2) **The refinery name and site number.**
   Tesoro Martinez Refinery, Plant # B2758, wholly owned subsidiary of Marathon Petroleum

3) **The assigned refinery contact name and phone number.**
   Sharon Lim, Senior Environmental Specialist, (925) 335-3467

4) **Identification of the flare(s) at which the reportable event occurred by reviewing the water seal monitoring data to determine which seals were breached during the event.**
   West Air Flare, **S1012** and Coker Flare, **S1517**

5) **The flaring event duration for each affected flare:**
   a. **The date(s) of the event**
      April 5 to May 1, 2023
   b. **The start and end time of the event**
      Starting time 9:00
      Ending time 15:44
   c. **The net duration of the event (in hours and minutes)**
      25 days, 18 hours and 44 minutes

6) **A brief description of the flaring event**

   Flaring resulted from the loss of fin fans at the #1 H2 Plant (S-1005) due to a faulty switch. #3 HDO (S-850) and Isom (S-1007) were shutdown due to the loss of hydrogen. Flaring continued due to the damage of the compressor valves at 5 Gas Plant (S-1526).

7) **A process flow diagram showing the equipment and process units that were the primary cause of the event.**
   Process Flow Diagrams are redacted.

8) **The total volume of vent gas flared (MMSCF) throughout the event.**
   Based on the Regulation 12 Rule 11 Flare Monitoring report, the net gas flow to the flare was ~78,545,000 SCF.

9) **The emissions associated with the flaring event per calendar day:**
   a. # methane emitted
   b. # non-methane hydrocarbon emitted
   c. # SO_2 emitted

   See Table 1 for summary

Table 1

Date	Methane (lbs/D)	Nonmethane (lb/D)	SO2 (lbs/D)
4/5/2023	164	65	11
4/6/2023	973	459	6
4/7/2023	938	437	9
4/8/2023	851	386	11
4/9/2023	885	403	13
4/10/2023	911	521	14
4/11/2023	728	514	14
4/12/2023	870	383	10
4/13/2023	776	356	10
4/14/2023	931	522	10
4/15/2023	889	649	9
4/16/2023	830	688	8
4/17/2023	887	863	11
4/18/2023	1235	935	17
4/19/2023	1372	457	9
4/20/2023	1429	403	12
4/21/2023	1216	414	9
4/22/2023	1011	503	9
4/23/2023	1011	533	8
4/24/2023	1005	536	8
4/25/2023	1020	483	9
4/26/2023	999	470	10
4/27/2023	885	427	7
4/28/2023	797	475	6
4/29/2023	895	486	6
4/30/2023	859	585	6
5/1/2023	545	307	4

Also provide the assumptions used to calculate emissions associated with the flaring event if they are different from those used for reporting under Regulation 12 Rule 11.
The emissions associated with this flaring event were based on the methodology used for reporting under Regulation 12 Rule 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 scrubbing was performed.**
The vented gas which was flared was not scrubbed.

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.

On April 5, 2023, flaring resulted from the loss of fin fans at the #1 H2 Plant (S-1005) due to a faulty switch. Operations quickly and safely shutdown units. Maintenance identified the cause, worked to correct the faulty switch, and restored power to the fin fans.

The loss of hydrogen caused the #3 HDO and Isomerization Units to shutdown. After the units were safely shutdown and the cause was determined to be the loss of power, the facility began the sequence of starting up. Flaring continued through the startups as hydrogen is produced first. When Operations attempted to switch the gases from the flare and increased the amount of flare gas recovery compressor flows, the 5 Gas Plant compressor valves ramped up in temperature.

Prior to the #1 H2 Plant shutdown, we had damaged both 5 Gas Plant brand new compressors (CP-565/566) due to the high hydrogen content and hot valves. One compressor was inoperable due to the large amount of damage and was waiting on parts delivery. We could not add flow from the flare system as that was driving the remaining compressor to become excessively hot each time we attempted to increase flow from the flare gas recovery compressors. We could not risk further damage of the one 5 Gas Compressor as the loss of the remaining compressor would result in a 5 Gas Plant shutdown and more flaring. Additionally shutting down every unit would also result in more flaring as the 1 Gas Plant Temporary Envent Thermal Oxidizer was removed from service. Therefore, we felt the most appropriate action was to continue to operate while trying to keep H2 at low rates and recover as much as we could without damaging the 5 Gas compressor. After the repair of the second compressor at 5 Gas Plant, we increased the flare gas recovery compressor and stopped flaring.

Our incident investigation team later determined the likely cause of the premature failure of the 5 Gas Plant compressor valves was due to the type of lubricant used and the reactions/contaminants from the process gas. The analysis of the used lubricant determined we needed to switch the type of lube oil.

12) Describe all immediate corrective actions to stabilize the flaring event, and to reduce or eliminate emissions (flared 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 investigated all sources going to flare to minimize flows and fixed everything that was possible while in operation. Items that required shut down were assembled for the turnaround list.

H2 Plant rate was kept at low rates to decrease the vent gases to flare. We used the flare gas recovery compressor to recycle vent gas to 5 Gas Plant when 5 Gas compressor temperatures and BTU content of the fuel gas allowed.

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 the result of an "emergency" as defined by the BAAQMD.

"Emergency: 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 is caused by sudden, infrequent and not reasonably preventable equipment failure, natural disaster, act of war or terrorism or external power curtailment, excluding power curtailment due to an interruptible power service agreement from a utility."

14) **If not the result of an emergency and necessary to prevent an accident, hazard or release to 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.**
Yes, this is consistent with our FMP. Please see Section 3.4.1 Startup and Shutdown of Process Units and page 23 for hydrogen imbalance.

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

16) **Identify and describe in detail each preventative measure (PM) considered to minimize the flaring from the type of reportable flaring event that occurred:**
    a. **State whether the PM is feasible (and will be implemented), or not feasible**

    The following prevention measures were feasible and executed:

    The faulty switch was repaired and locked to prevent another simultaneous shutdown of the #1 H2 Plant fin fans.

Sources to flare header were isolated. An example included the Flow Valve 0068:F0007 was blocked in. Other items, such as a PSV leaking to the flare header, were added to turnaround lists.

Minimum hydrogen was produced until #3 HDO started up to minimize hydrogen to the flare and fuel gas systems. Some hydrogen was sent to the fuel gas and combusted in heaters.

Lubricant for the 5 Gas Plant Compressors was reformulated and is expected to improve performance of the compressors.

At the end of this year two additional hydrogen users (#1 and #2 HDO) will be started up. Construction is ongoing and will help with hydrogen imbalances. No. 2 H2 Plant will also be running and will increase hydrogen reliability.

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

Not applicable.

Signature: audrey galimba
Email: audreygalimba@baaqmd.gov

Signature: Danny Fung
Email: dfung@baaqmd.gov