

Regulation 12 Rule 12 Reportable Flaring Event Causal Analysis Report

1. **Report Date:** December 6, 2019
2. **Refinery Name and Site Number:** Shell Martinez Refinery - BAAQMD Site # A0011
3. **Refinery Contact and Phone Number:** Rick Shih (925) 313-0586
4. **Flare Identification:** Delayed Coking Unit (DCU) Flare S-4201 and OPCEN HC Flare S-1772
5. **Flaring Event Duration:**
 - a. **Start Date:** 10/14/2019 **End Date:** 10/15/2019
 - b. **Time:** 10:35 PM– 12:05 AM
 - c. **Total Duration of Event:** 1.5 hours
6. **Brief Description of Flaring Event:** Hydrocarbon flaring resulting in more than 500 lbs of SO₂ in a 24-hour period occurred when the DCU compressor [REDACTED] tripped due to an earthquake.
7. **Process Flow Diagram:** see attached process flow diagram
8. **Volume of Gas Flared:** 0.16 MMSCF at S-4201 and 0.01 MMSCF at S-1772
9. **Total Emissions due to flaring based on Regulation 12 Rule 11 Methodology:**
 - a. 0.35 lbs of methane (S-4201) and 0.82 lbs (S-1772)
 - b. 41 lbs NMHC (S-4201) and 12.6 lbs (S-1772)
 - c. 562 lbs of sulfur dioxide (S-4201) and 0.71 lbs (S-1772)
10. **Was the Gas Scrubbed?** The vent gas went to the flare could not be scrubbed.
11. **Primary Cause of Flaring Event including Detailed Description of the Cause and Contributing Factors:**

The DCU flare gas compressors [REDACTED] receive various vent streams from units in the Delayed Coking area, as well as the Operations Central (OPCEN) area. The two compressors receive the vent gases, compress them, and ultimately send these vent gases to the [REDACTED] where the gases are treated prior to going to either hydrogen plant feed or to fuel. This system is known as the Flare Gas Recovery System (FGR), as shown in the attached process flow diagram.

Both compressors are equipped with a safety shutdown system that will shut down the compressor if there are high vibrations detected. The intent of this shutdown system is to prevent mechanical damage of the compressor and/or release of process gas in high vibration scenarios where the compressors are not designed to run. In normal operation both compressors are operated in parallel, recovering vent gases.

On the evening of October 14th 2019, there was a magnitude 4.5 earthquake centered near Pleasant Hill, CA. At the time, [REDACTED] was down for maintenance. This earthquake caused the vibration probes on [REDACTED] to read a high vibration and resulted in the safety system to shutdown the compressor. As part of the safety feature, the vent gas was sent to the flare system, initiating the flaring event.

12. **Immediate Corrective Actions Taken:**
 - a. Following the trip of [REDACTED] operations established safe distance from operating equipment until it was deemed safe to enter. This involved checking for odors, checking available gas readings in

the area, and looking/listening for any signs of damage from the earthquake on operating equipment.

- b. Once it was deemed safe, operations entered the flare gas recovery area and restarted [REDACTED]. This reduced the seal pot pressure and allowed the water seal to be re-established. This ended the flaring event.

13. Was the Flaring the Result of an Emergency?

Yes. The flaring was the result of a safety feature that shut down the compressor during high vibration conditions caused by an earthquake.

14. Was the Flaring Consistent with an Approved FMP?

Yes, the flaring was consistent with Shell's approved FMP. As stated in the FMP on page 3-1, Shell believes the key to flare minimization is careful planning to avoid flaring coupled with evaluation of any flaring events that do occur and incorporation of lessons learned back into the planning process to further reduce flaring. As part of the FMP we developed procedures to implement this process. As stated on page 3-1 of the FMP, "when these procedures are followed, any flaring is consistent with the FMP." Operations followed procedure C(F)-20 – Unanticipated Flaring. This procedure addresses flare events caused by process upsets or unplanned events.

15. Was the Flaring due to a Regulatory Mandate to Vent to a Flare?

The flaring was not due to a regulatory mandate to vent to the flare.

16. Prevention Measures Considered to Minimize Flaring from this Type of Flaring Event

Vibration sensors and trips are activated on the compressors to prevent damage and potential loss of containment when the compressor is operating outside of its intended design. The safety system reacted as designed and no preventative measures were identified.

FIGURE 1: Process Flow Diagram

[The figure has been redacted from the Public Version as they contain Business Confidential Information]