Public Version

Regulation 12 Rule 12 Reportable Flaring Event Causal Analysis Report

1. **Report Date:** August 28, 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:** Flexigas Flare S-1771

5. **Flaring Event Duration:**
   a. **Start Date:** 6/12/19 7:15 PM **End Date:** 6/28/19 10:00 PM
   b. **Total Duration of Event:** 16 days 2.75 hours
   Note: Based on unit conditions, as of 6/26 at 3:15 PM the material being routed to the flare was no longer flexigas. This is supported by sample results which show primarily nitrogen and carbon dioxide.

6. **Brief Description of Flaring Event:** Flexigas (FXG) is a low-BTU fuel gas made in the Flexicoker and burned in the refinery heaters along with refinery fuel gas. Due to a loss of condensate, FXG was removed from the heaters, resulting in flaring of >1 MMSCFD and >500 lbs of SO2.

7. **Process Flow Diagram:** see attached process flow diagram

8. **Volume of Gas Flared:** 304.3 MMSCF

9. **Total Emissions due to flaring based on Regulation 12 Rule 11 Methodology:**
   a. 7,108 lbs of methane
   b. 791 lbs NMHC
   c. 2,565 lbs of sulfur dioxide

10. **Was the Gas Scrubbed?** No, as allowed by Shell's Title V permit, the Flexsorb Unit, used to remove sulfur during normal operations, was bypassed during the initial shutdown of the Flexicoker. For compliance with this permit condition shutdown is defined as the period of time between the cessation of normal operation of the Flexsorb Unit and when flexigas production at the Flexicoker ends.

11. **Primary Cause of Flaring Event including Detailed Description of the Cause and Contributing Factors:**

On 6/7/19, the turbine of [redacted], which is normally used to transfer condensate from [redacted] to [redacted] seized due to a bolt failure. To complete the transfer of condensate from [redacted] to [redacted], operations opened a valve (valve P on the attached diagram) to line up [redacted], a spare pump, to [redacted]. Following the transfer, the valve was closed. When the valve was re-opened sometime prior to the incident, the MOV (motor operated valve) at [redacted] was closed and there was no condensate flowing from [redacted] to [redacted]. On 6/12 at 15:55 the MOV at [redacted] was opened creating an open path between the discharge of [redacted] and [redacted] through the manual valve and the MOV. [redacted] is an atmospheric tank and this open path created a loss of discharge pressure at [redacted]. This caused [redacted], which is the turbine driven spare condensate pump, to autostart, as well as the flow through [redacted] to increase significantly and trip the electric motor. The discharge pressure dropped below the pressure at [redacted] and [redacted] and due to the failure of two

check valves at these vessels, this loss of pressure allowed for light hydrocarbon material to backflow into the condensate system.

Condensate is commonly used for seal purges on pumps. The contamination of the condensate resulted in issues with both BFW pumps and the coke gas cooler pump in the Flexicoker, all of which are critical for providing cooling to the unit. Without the necessary cooling, feed was immediately removed from the unit. In order to avoid exceeding the maximum allowable temperature, Flexsorb was bypassed at which point flexigas was also removed from the refinery heaters and sent to the Flexigas Flare. The Flexicoker Unit was placed in re-circulation to determine whether a restart of the unit was feasible. This mode keeps the unit hot to prevent coke spalling, which would force a unit shutdown. Ultimately, attempts to re-start the unit proved unsuccessful and the unit was fully shutdown.

12. Immediate Corrective Actions Taken:

a. Feed was removed from the unit and the Flexicoker went on hot circulation.
b. Steam was added to heater and gasifier and air was removed from heater and reduced to the gasifier to reduce flexigas production.

13. Was the Flaring the Result of an Emergency?

Yes. The flaring was the result of the loss of condensate resulting in feed and air being removed from the Flexicoker unit.

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

a. Install 2 additional check valves on the [redacted] condensate supply line to [redacted] **Complete**
b. Install 1 additional check to the [redacted] condensate supply line to [redacted] (low pressure condensate) and [redacted] (high pressure condensate) **Complete**
c. Install 2 flanged check valves upstream of [redacted] [redacted] condensate to [redacted]. Provide block valves and bleeder to allow check valves to be serviced on the run.
Completion date: 12/31/2019

[The figure has been redacted from the Public Version as it contains Business Confidential Information]