Valero Energy Ltd
Pembroke Refinery
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Date: 31st January 2023
Your Ref: YP3930EX

Gary Evans,
Technical Specialist Industry Regulation,
Natural Resources Wales,
Plas Gwendraeth,
Heol Parc Mawr,
Cross Hands,
Carmarthenshire,
SA14 6RE

Dear Mr Evans,

EPR – Improvement Programme Requirements

Permit number:	YP3930EX/V007
Company:	Valero Energy Ltd
Installation:	Pembroke Refinery
Reference:	IC35

In response to Improvement Condition 35 (IC35) of the above permit, please find attached our Annual Flaring report which addresses the points made in these Improvement Conditions.

IC35: To reduce emissions to air from flaring, the Operator shall carry out and produce an Annual Flaring report to Natural Resources Wales that details the following:

- *Minimum flare loading (baseload loading)*

And for flaring events above an agreed threshold level (flaring event), it shall detail –

- *Duration of each flaring event*
- *Quantity and nature of material flared at each event, and*
- *Root cause(s) of each flaring event*

The Annual Flaring report shall summarise the frequency of these flaring events and identify ways to reduce the frequency, magnitude and duration of flaring events, considering the techniques identified in BAT 55 and BAT 56 for the refining of mineral oil and gas. The findings of this work is the basis for an annual flare minimisation plan. Pre-notified flaring events do not need to have a root cause investigation. The Operator shall implement the minimisation plan to a timetable agreed with Natural Resources Wales.

If you have any questions or comments, please do not hesitate to contact me.

Yours sincerely,

A.P.Waterman

Andy Waterman
Manager Environmental Engineering

cc: James Greenhalgh
cc: Mark Phair

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Valero Energy Ltd
Annual Flaring Report 2022

This annual flaring report addresses the points made in Improvement Condition IC35. A flaring event is established when the daily average flare flow reading exceeds set values. These values are the 2018 average hourly flare flows, for each of the three flares, plus two standard deviations, shown below in Table 1.

Table 1: 2018 average hourly flare flows, plus two standard deviations

Flaring System	Sour	Sweet	Acid
2018 Flows (Te/h)	1.9	4.0	1.1

The 2022 average hourly flare flows for each flare, excluding flaring events, can be seen below in Table 2.

Table 2: 2022 average hourly flare flows

Flaring System	Sour	Sweet	Acid
2022 Flows (Te/h)	0.8	2.3	0.5

The flaring events recorded in 2022 along with the duration of each flaring event, the quantity and nature of the material flared as well as the root cause can be seen below in Tables 3 and 4. In addition, a graph illustrating the number of flaring events that occurred each month, across the year can be seen below in Figure 1. The Sour Flare did not experience any flaring events during 2022.

Table 2 illustrates a significant reduction in average hourly flaring compared to the 2018 baseline. To reduce the frequency, magnitude and duration of flaring events during 2022 the following have been implemented.

- Raising awareness of flare limits by including them in operator shift logs and refinery leadership team daily reports. Setting expectations with Operations to investigate flaring events in a timely manner.
- Control system improvements identified and implemented to reduce the lag time in the controlled pressure across the fuel gas header and propane vaporisation system.
- Detailed operational review leading to performance improvements on Propane Vapour Recovery Unit (VRU) utilisation.
- Temporary isobutane rundown cooler used in summer months to minimise sphere pressure control valve venting.
- Soda ash washing of overhead fin fans within Refining and C&O units to improve cooling efficiency.

To reduce the frequency, magnitude and duration of the flaring events in 2023 the following will be reviewed.

- Proactive optimization of fuel gas balance through use of discretionary steam turbines when fuel gas long.
- Further advanced control tuning improvements on fuel gas header and propane vaporisation systems.

- Inclusion of flare minimisation in the 2023 business plan.
- Continued operational focus on investigating and minimising flaring events.

Table 3: Flaring events of the Sweet Flare in 2022

Sweet Flare				
Date	Average Flare Flowrate [Te/h]	No of days above threshold	Nature of material flared	Root cause(s) of flaring event
	Limit 4.0			
19/02/2022	4.6	1	Hydrocarbon	Butamer, CCR and RFG header relieving to flare due to high FCCU off gas make/low RFG consumption
15/06/2022	4.6	3	Hydrocarbon	HTU1 off-gas compressor offline due to water contamination of lube oil system
21/06/2022	6.1	3	Hydrocarbon	Excess FCCU off gas to RFG header. Sphere 836 venting for maintenance. Benzene column venting after control valves removed for maintenance.
27/06/2022	4.4	1	Hydrocarbon	Alky shutdown procedure
01/07/2022	8.1	3	Hydrocarbon	CDU, VDU, VBU, HTU1 and HTU2 shutdown procedures
04/07/2022	4.2	1	Hydrocarbon	Black Oils units start up activities
10/07/2022	5.7	2	Hydrocarbon	High ambient temperature. HRU shutdown increasing benzene column venting. Propane spheres 841 and 842 venting.
17/07/2022	4.8	2	Hydrocarbon	High ambient temperature. RFG header venting.
28/07/2022	4.1	1	Hydrocarbon	Benzene unit unstable operation.
03/08/2022	5.4	1	Hydrocarbon	Benzene splitter reflux drum venting. Flaring from propane spheres.
11/08/2022	4.6	1	Hydrocarbon	High ambient temperatures. PSV bypass on the CCR De-but for maintenance work on the fin fans.
12/08/2022	6.1	1	Hydrocarbon	High ambient temperature. CCR De-but start-up and furnace trip.
13/08/2022	5.4	2	Hydrocarbon	High ambient temperatures. Propane VRU compressors at the RTW. Olefin surge drum PC by-pass open to flare.
08/09/2022	4.6	2	Hydrocarbon	Venting from Benzene splitter due to maintenance work on De-eth
23/09/2022	8.1	4	Hydrocarbon	CDU shut down procedures
18/12/2022	4.2	1	Hydrocarbon	Blocked PC causing high pressures on CCR debutaniser overheads

Table 4: Flaring events of the Acid Flare in 2022

Acid Flare				
Date	Average Flare Flowrate [Te/h]	No of days above threshold	Nature of material flared	Root cause(s) of flaring event
	Limit 1.1			
29/09/2022	1.2	1	Hydrocarbon, nitrogen	De-pressuring activity taking place on the Butamer Unit

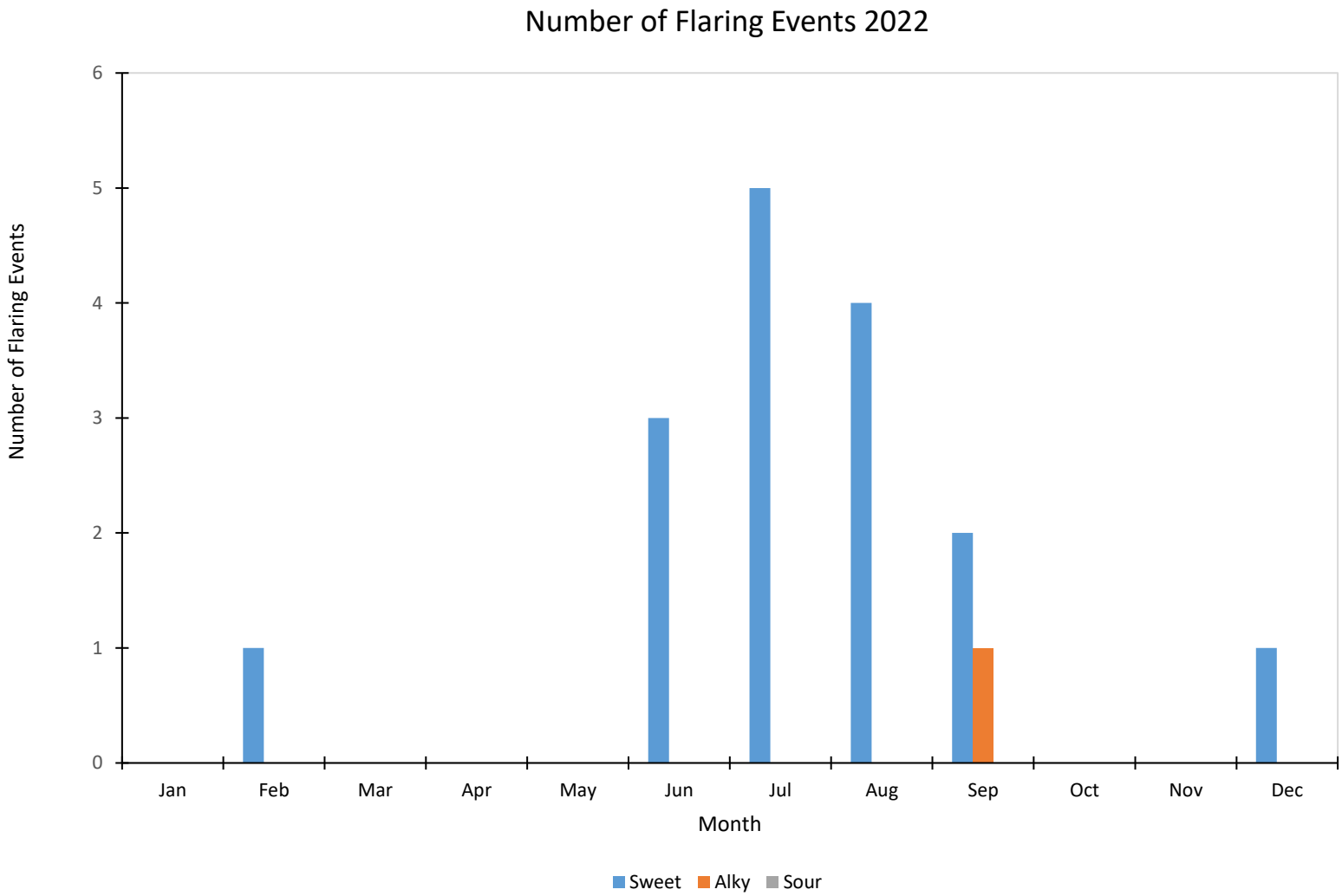

Figure 1: Number of flaring events for each flare during 2022