

ENGINEERING EVALUATION REPORT

REVISED FLARE MONITORING AND RECORDING PLAN

Facility Information

ULTRAMAR INC. VALERO WILMINGTON REFINERY
ID# 800026
TITLE V: YES
RECLAIM: NOX, SOX
ZONE: COASTAL
CYCLE: 1

Mailing Address

2402 EAST ANAHEIM STREET
WILMINGTON, CA 90744-4081

Equipment Address

(SAME AS ABOVE)

Contact Information

JON ELLIOTT
(562) 491-6797

BACKGROUND:

The Ultramar Valero refinery in Wilmington, California (herein referenced as the Valero Wilmington refinery) operates four (4) flares that are subjected to the requirements of Rule 1118. These 4 flares make up two separate flare systems within the refinery. The first system consists of three elevated flares (Phase 0, Phase 1 and Phase 2) that are classified as general service flares. These three flares normally receive vent gases from designated areas of the refinery but can also operate as an integrated system whenever there is an emergency due to an electrical power outage or an inoperable vapor recovery system. The second system consists of one elevated flare (the 'LPG' flare) which operates by itself to serve the refinery LPG storage and loading unit exclusively. The LPG flare has been redesignated as a clean service flare based on the fixed composition of the liquefied petroleum gas this flare services. Previously, this flare was inadvertently classified as an emergency service flare.

The District amended Rule 1118 on November 4, 2005 in an effort to further control and minimize flare emissions. Stricter requirements for monitoring, recordkeeping, and reporting of flare activities were imposed in this latest rule amendment in order to better quantify flare emissions. Reliable and accurate flare emissions data are crucial in ensuring petroleum refineries do not exceed the performance targets for SOx emissions pursuant to paragraph (d) of Rule 1118.

Due to technical challenges and the complexity of technologies feasible to continuously monitor total sulfur concentrations and higher heating values of flare vent gases, all South Coast refineries, including the Valero Wilmington refinery, was unable to comply with the monitoring requirements in Table 1 of Rule 1118(g)(3) by the compliance deadline of July 1, 2007. The AQMD Governing Board foresaw this difficulty and adopted a resolution with the November 4, 2005 amendment of Rule 1118 that directed District staff to work closely with the Western States Petroleum Association (WSPA) and its member to develop the technologies. Two test trials were conducted at two separate South Coast refineries to demonstrate the feasibilities of commercially available analyzers. BP volunteered to conduct a pilot test for a total sulfur analyzer while Chevron agreed to conduct a demonstration project for a higher heating value (HHV) analyzer. Completion of these pilot projects

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and obtaining District approvals for the technologies did not happen until March 2008 for the HHV analyzer and May 2008 for the total sulfur concentration analyzer.

Ultramar, along with other refineries, filed a regular variance petition for relief from Rule 1118 requirements on March 6, 2007. The Hearing Board held a common hearing for all the refineries on April 24 through April 26, 2007 and Ultramar's variance petition, case no. 3845-69, was granted. Ultramar was ordered to comply with an Increment of Progress for the variance that specified a schedule for installing and testing of the analyzers on their flares. Final compliance with the variance order was achieved on September 10, 2009.

The Wilmington refinery is an affected facility subject to the provisions of paragraph (f) of Rule 1118. As such, a revised Flare Monitoring and Recording Plan was required to be submitted to the District by 6-30-06 for approval pursuant to Rule 1118(f)(1)(A). The Wilmington refinery submitted this application along with the revised plan for approval on 6-30-06. This revised plan, as approved, will supersede the amended plan approved under A/N 341682 on December 2, 2005.

The following information was provided by Ultramar:

TABLE 1: Flare Information

Flare	Flare Capacity (lbs/hr)	Type of Service	Pilot Gas	Purge Gas	Vent Gas Vapor Recovery
Phase 0	200,000	General	N.G.	N.G.	Common VRS (See page 3, Section E of the proposed plan)
Phase 1	383,700	General	N.G.	N.G.	
Phase 2	536,600	General	N.G.	N.G.	
LPG	26,718	Clean	Propane	Propane	None

Note: Type of service is defined by Rule 1118(b) - clean service of LPG

In the revised plan, The Wilmington refinery proposes to use the following methods to monitor and record the operating parameters of the flares:

TABLE 2: Vent Gas Monitoring Methods

Flare ID	Gas Flow	Gas Higher Heating Value (HHV)	Total Sulfur (TS) Concentration
Phase 0	Flow Meter Type: Ultrasonic Make: GE Panametrics Model: GF868	HHV Analyzer Type: TCD Make: Rosemount Model: 1000A	Total Sulfur Analyzer Type: PUVF Make: Thermo Fisher Model: SOLA II
Phase 1	Flow Meter Type: Ultrasonic Make: GE Panametrics Model: GF868	HHV Analyzer Type: TCD Make: Rosemount Model: 1000A	Total Sulfur Analyzer Type: PUVF Make: Thermo Fisher Model: SOLA II
Phase 2	Flow Meter Type: Ultrasonic Make: Panametrics Model: GF868	HHV Analyzer Type: TCD Make: Rosemount Model: 1000A	Total Sulfur Analyzer Type: PUVF Make: Thermo Fisher Model: SOLA II
LPG	Flow Meter Type: Ultrasonic Make: GE Panametrics Model: GF868	Use Propane HHV of 3500 Btu/Scf in Attachment B of Rule 1118	Use default emission factor for Propane in Attachment B of Rule 1118

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TABLE 3: Pilot, Purge Gas and Visible Emissions Monitoring Methods

Flare ID	Pilot Gas (type)	Pilot Gas Flow (typical), Scfm	Purge Gas (type)	Purge Gas Flow (typical), Scfm	Pilot Flame	Visible Emissions
Phase 0	Natural Gas	2.25	Natural Gas	25	Thermo-couples	Color video
Phase 1	Natural Gas	2.5	Natural Gas	25	Thermo-couples	Color video
Phase 2	Natural Gas	2.5	Natural Gas	25	Thermo-couples	Color video
LPG	Refinery Propane	1.67	Refinery Propane	1.67	Thermo-couples	Color video

FLARE OPERATIONS

The Phase 0 flare has a segregated relief system for all of the hydrogen sulfide (H₂S) and ammonia (NH₃) gas streams that feed the Sulfur Plant at the refinery. This acid gas is routed through a designated flare header that is separate from the main refinery process flare header. During Sulfur Plant emergencies, the Phase 0 flare is used to safely dispose of the acid gas until Sulfur Plant operation is stabilized. All flow to this flare is managed through control valves that indicate acid gas flare events (monitored by the valve 40-PV-28). During acid gas flare events, the total sulfur concentration is estimated to be 95% by volume with a HHV of 615 BTU/SCF based on historical data and engineering analysis. These values will be used during the entire duration of an acid gas flare event to calculate emissions because sampling under such high concentration of H₂S is detrimental to personnel as well as analytical equipment. In addition to handling the acid gas streams from the Sulfur Plant, excess hydrogen production from the Hydrogen plant and the Platformer unit can be relieved directly to the Phase 0 flare.

The Phase 1 and Phase 2 flare has a capacity of 383,700 lbs/hr and 536,600 lbs/hr, respectively. Vent gas flow to the Phase 1 and Phase 2 flares must pass through water seal drums, 89-V-9003 and 75-V-1, respectively, immediately upstream of the flares. The water seal prevents gas from flowing to the flare at low pressures. Typically, the flare/vapor recovery header pressure must exceed 2.5 psig before gas begins to break the water seal. At normal refinery operations, when the header pressure is below 2.5 psig and the water seal is intact, no vent gas flow to the flare and all flow into the flare header is drawn into the vapor recovery compressor. When the flow to the flare/vapor recovery header increases beyond the vapor recovery compressor's capacity, the header pressure increases to the point the seal is lost and vent gas flows to the flare.

The LPG flare is a dedicated flare system for the LPG storage and loading unit. It is operated independently of the other three general service flares discussed earlier.

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PLAN COMPLETENESS

A Revised Flare Monitoring and Recording Plan shall contain, at minimum, all of the information specified by paragraphs (f)(3)(A) through (f)(3)(Q) of Rule 1118. As shown in Table 1, Ultramar's proposed plan has the required information specified by paragraph (f)(3) of the rule.

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TABLE 1: Checklist for a Revised Flare Monitoring and Recording Plan

Requirements	Rule 1118 (f)(3)	Yes	Comment
A facility plot plan showing locations of flares	(A)	√	See Appendix A of the proposed plan
Flare information: (1) type of service (2) design capacity (3) operation and maintenance	(B)	√ √ √	See Page 1 of the proposed plan
Pilot and purge gas information: (1) type of gas used (2) actual set operating flow rate (3) Expected maximum total sulfur content (4) Expected average higher heating value	(C)	√ √ √ √	See Page 2 of the proposed plan.
As built process flow diagrams and drawings identifying flare header, flare stack, flare tip/ burners, purge gas system, pilot gas system, ignition system, assist system, knockout drum, water and molecular seal, etc...	(D)	√	See Appendix B of the proposed plan
Flow diagrams showing the interconnections of the flares to vapor recovery system and process unit	(E)	√	See Appendix C of the proposed plan
Descriptions of the assist system process control, flame detection system and pilot ignition system.	(F)	√	See Page 3 of the proposed plan
Description of the gas flaring process if an integrated gas flaring system is being operated.	(G)	√	See Page 4 of the proposed plan
Description of the vapor recovery system: (1) type of compressor (2) design capacity of each compressor (3) design capacity of vapor recovery system (4) method to record amount of vapors recovered	(H)	√ √ √ √	See Page 5 of the proposed plan
Drawings with dimension showing: (1) location of sampling equipment (2) locations of HHV, Ts analyzers (3) location of flow meter (4) location of on/off indicator	(I)	√ √ √ ---	See Appendix B of the proposed plan. On/off indicator not used for any of Ultramar's flares
Manufacturer's specifications for existing and proposed flow meters and on/off flow indicator, HHV and Ts analyzers: (1) make, model and type (2) range, precision and accuracy (3) calibration, maintenance and quality assurance procedures	(J)	√ √ √	See Page 6-7 of the proposed plan and follow-up AI response

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Requirements	Rule 1118 (f)(3)	Yes	Comment
Description and data used to determine actuating and de-actuating settings for on/off flow indicator , and method to verify these settings.	(K)	---	On/off flow indicators are not used for any of Ultramar's flares
Description of analytical and sampling methods or estimation method, if applicable, to determine high heating value and total sulfur content of vent gases.	(L)	√	See Page 8 of the proposed plan
Description of data recording, collection and management system.	(M)	√	See Page 8 of the proposed plan
Description of proposed method to determine, monitor and record total gas volume, HHV and total sulfur concentrations of vent gases.	(N)	√	See Section 11 of the proposed plan
Schedule for installation and operation of flare monitoring system.	(O)	√	See Table 8 of the proposed plan. Flares have been placed on modified schedule in accordance with District variance, Case No. 3845-69.
Description of any proposed alternative criteria to determine a sampling event for each specific flare.	(P)	√	See response to AI request (N) dated 2-27-09.
A request to use an alternative sampling program pursuant to paragraph (g)(4)(C)	(Q)	--	No alternative is being proposed.

RECOMMENDATIONS:

The revised Flare Monitoring and Recording plan, along with the supplemental information, submitted by the Valero Wilmington refinery contains all of the requirements pursuant to Rule 1118 (f)(3). Therefore, the plan is recommended for approval with the following conditions:

1. The owner/operator shall perform monitoring and recording of the operating parameters for the following flares in accordance with this approved compliance plan and other applicable requirements of Rule 1118(g). The monitoring and recording shall be performed at all times except when the flare monitoring system is out of service for reasons described in Rule 1118(g)(5)(A).

Flare	Phase 0	Phase 1	Phase 2	LPG
Service Type	General	General	General	Clean

2. A flare event occurs when the flow velocity of vent gas in a flare equals to 0.10 feet per second or greater. The flare event ends when the flow velocity drops below 0.12 feet per second. The owner/operator may use monitoring records of the flare water seal level and closures of control valves to demonstrate that no more vent gas was combusted in the flare for the purpose of determining when the flare event ends.

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3. A flare event lasting 24 hours or less shall be considered a single flare event even when the vent occurs in two consecutive days. When a flare event continues for more than 24 hours, each calendar day shall be a separate flare event.
4. The continuous HHV analyzer, total sulfur analyzer and gas flow meter used in this flare plan shall meet the requirements of Rule 1118 Attachment A and shall be certified by the AQMD. The owner/operator shall also comply with the requirements specified in the Quality Assurance and Quality Control Plan (QAQCP) approved by the AQMD on November 2009 for the flare monitoring equipment.
5. When the maximum range of a flow meter is exceeded, the flow rate shall be assumed to be the maximum design capacity of the flare.
6. Volumetric flow rates of vent gases shall be corrected to standard conditions of 14.7 psia and 68°F.
7. Whenever the flow meter, HHV and/or TSC analyzer(s) is down due to breakdowns or maintenance, the owner or operator shall use the data substitution method referenced in Attachment B of Rule 1118 to calculate and report flare emissions. Analyzer(s) downtime shall be limited pursuant to Rule 1118(g)(5)(A).
8. The owner/operator shall calculate emissions of criteria pollutants from each flare and each flare event using the methods described in Attachment B of Rule 1118.
9. For the Phase 0 flare only, emissions calculations for acid vent gas from the Sulfur Recovery Unit shall be calculated using a default total sulfur concentration of 95% (950,000 ppmv) and HHV of 615 Btu/scf in lieu of analyzer results or sampling. An acid vent gas flare event occurs whenever control valve 40-PV-28 is not in the closed position. A valve position indicator shall be maintained to continuously monitor the valve's open or close position.
10. The owner or operator shall install and maintain a flow meter to monitor and record the pilot and purge gas flow to the general service flares.
11. For the LPG flare only, the pilot gas and purge gas flow shall be based on the maximum design capacity of 390 SCFH each.
12. The owner/operator shall monitor the flares at all times for presence of a pilot flame using a thermocouple that will alarm the owner or operator in the event of a flame out. The owner or operator shall re-ignite the pilot immediately after a pilot flame out occurs.
13. The owner/operator shall notify the Executive Officer within one hour of any unplanned flare event with emissions exceeding either 100 pounds of VOC or 500 pounds of sulfur dioxide, or exceeding 500,000 standard cubic feet of flared vent gas. The owner/operator shall also notify the Executive Officer by telephone at least 24 hours prior to the start of a planned flare event with emissions exceeding either 100 pounds of VOC or 500 pounds of sulfur dioxide, or 500,000 standard cubic feet of combusted vent gas.

14. The owner/operator shall conduct a Specific Cause Analysis for any flare event, excluding planned shutdown, planned startup and turnaround, resulting in any of the followings: (a) 100 pounds of VOC emissions. (b) 500 pounds of sulfur dioxide emissions. (c) 500,000 standard cubic feet of vent gas combusted. The analysis shall identify the cause and duration of the flare event and describe any mitigation and corrective action taken to prevent recurrence of a similar flare event in the future. Unless an extension is granted, the owner/operator shall submit Specific Cause Analysis to the Executive Officer within 30 days of the event.
15. The owner/operator shall conduct an analysis and determine the relative cause for a flare event that results in combustion of more than 5,000 standard cubic feet of vent gas. A Specific Cause Analysis may be submitted to satisfy this condition.
16. The owner/operator shall submit a complete Flare Minimization Plan for approval of the Executive Officer no later than 90 days from the end of a calendar year in which flare emissions exceeding the annual performance targets set by Rule 1118(d)(1). The plan shall comply with the requirements of Rule 1118(e).
17. The owner or operator shall maintain records in a manner approved by the Executive Officer for the following.
 - a. Flare event data collected pursuant to paragraph (g)(3), (g)(4), (g)(5), (g)(6) and subparagraph (g)(8)(C) of Rule 1118 as applicable.
 - b. Total daily and quarterly emissions of criteria pollutant from each flare and each flare event along with all information specified by Rule 1118(i)(5)(B).
 - c. Monitoring records of water seal levels and closures of control valves.
 - d. Pilot flame failure report.
 - e. Planned and unplanned flare monitoring system downtime report that include date and time and explanation for taking the system out of service.
 - f. Information to substantiate any exemptions taken under Rule 1118(k).
 - g. Monitoring records of valve position for control valve 40-PV-28 pursuant to Condition No. 9.
 - h. Specific Cause Analysis completed pursuant to Condition No. 14.
 - i. Relative Cause Analysis completed pursuant to Condition No. 15.
 - j. Annual acoustical pressure relief device leak survey.
 - k. Annual sulfur dioxide emissions for all flares at the refinery normalized over the crude oil processing capacity in calendar year 2004.
 - l. Video records pursuant to Rule 1118(g)(7).

Within 30 days after the end of each calendar quarter, the owner/operator shall submit a quarterly report to the AQMD Refinery Compliance Team to the below address. Items (a) through (i) shall be submitted quarterly in electronic format. Hard copy of item (j) shall be submitted with the quarterly report for the quarter which the survey was conducted. Hard copy of item (k) shall be submitted with the last quarterly report for the year. Item (l) shall be made available to the Executive Officer upon request.

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All records required by this condition shall be certified for accuracy in writing by the responsible facility official and maintained for at least five years.

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18. The owner/operator shall comply with all provisions of this approved Revised Flare Monitoring and Recording Plan unless the plan is suspended, revoked, modified, reissued, or denied, as well as all other applicable requirements of Rule 1118. Violation of any of the terms of the plan is a violation of Rule 1118.