

REVISED FLARE MONITORING AND RECORDING PLAN

Facility Information

CONOCOPHILLIPS
ID# 800362
TITLE V: YES
RECLAIM: NOX, SOX
ZONE: COASTAL
CYCLE: 1

Mailing Address

P.O. BOX 758
WILMINGTON, CA 90748

Equipment Address

1520 EAST SEPULVEDA BLVD
CARSON, CA 90745

Contact Information

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BACKGROUND

The ConocoPhillips (CP) refinery in Carson, California (herein referenced as the CP Carson refinery) operates two (2) flares (the 'East' and 'West' flares) that are subjected to the requirements of Rule 1118. These 2 flares used to operate as separate systems but have recently been integrated as one system when the new flare gas recovery system was installed in early 2009.

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 their SOx emission performance targets pursuant to paragraph (d) of Rule 1118. Due to the operational dependency between the CP Carson and Wilmington refineries (Carson plant only processes intermediate streams produced exclusively from Wilmington), flare emissions from both facilities will be combined for compliance determination with Rule 1118 SOx performance target as one facility. However, the CP Wilmington refinery has a separate revised Flare Monitoring and Recording Plan (FMRP) submitted under A/N 484549.

All South Coast refineries confronted technical challenges to comply with the monitoring requirements in Table 1 of Rule 1118(g)(3) by the compliance deadline of July 1, 2007 due to the lack of technologies to continuously monitor total sulfur concentrations and higher heating values of flare vent gases. 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

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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 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.

The CP Carson refinery, along with other South Coast refineries, filed a regular variance petition for relief from Rule 1118 requirements on February 23, 2007. The Hearing Board held a common hearing for all the refineries on April 24 through April 26, 2007 and the CP Carson refinery variance petition, case no. 4900-80, was granted. The CP Carson refinery 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 due by December 29, 2009. CP Carson notified the Hearing Board on December 18, 2009 that final compliance was achieved.

As an affected facility subject to the provisions of paragraph (f) of Rule 1118, the CP Carson Refinery submitted a proposed Revised FMRP dated June 16, 2006 to the District under A/N 458121 for approval. Subsequently, three additional applications (A/N 469783 in 2007 and A/Ns 478011, 484548 in 2008) were submitted to provide supplemental/updated information to the proposed plan as the facility completed the installations of its continuously monitoring equipment and finalized changes to the plan. Therefore, CP Carson Refinery's proposed Revised FMRP consists of the originally proposed plan dated June 16, 2006 and the supplemental information submitted under the three subsequent applications mentioned above. Table 4 below provides application number references for each item of the proposed plan being reviewed for approval. Finally, the complete plan has been consolidated under file folder A/N 484548 and applications A/Ns 458121, 469783, 478011 have been cancelled.

This revised FMRP, as approved, will supersede the amended plan approved on December 14, 2005 under A/N 340624.

The following information was provided by the CP Carson refinery:

Table 1
Flare Information

Flare	Device ID	Type of Service	Pilot Gas	Purge Gas	Flare Gas Recovery
East	C465	General	N.G.	N.G.	yes
West	C469	General	N.G.	N.G.	yes

In the revised plan, CP Carson proposes to use the methods shown in Table 2 for monitoring and recording the operating parameters of the East and West flares.

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Table 2
Vent Gas Monitoring¹ Methods

Flare	Gas Flow Meter	Gas Higher Heating Value (HHV) Analyzer	Total Sulfur (TS) Concentration Analyzer										
East	<table border="0"> <tr> <td><i>Low Flow</i></td> <td><i>High Flow</i></td> </tr> <tr> <td>Type: Ultrasonic</td> <td>Optical Scintillation</td> </tr> <tr> <td>Make: Panametrics</td> <td>OSI</td> </tr> <tr> <td>Model: GF868</td> <td>OFS-2000</td> </tr> <tr> <td>Range: 0.1-1 fps</td> <td>1-250 fps</td> </tr> </table>	<i>Low Flow</i>	<i>High Flow</i>	Type: Ultrasonic	Optical Scintillation	Make: Panametrics	OSI	Model: GF868	OFS-2000	Range: 0.1-1 fps	1-250 fps	Type: Calorimeter Make: COSA Instrument Model: COSA 9600 Range: 0-3000 BTU/scf	Type: PUVF Make: Thermo Model: SOLA II Range: 0-2500 ppm (LR) 0-150,000 ppm (HR)
<i>Low Flow</i>	<i>High Flow</i>												
Type: Ultrasonic	Optical Scintillation												
Make: Panametrics	OSI												
Model: GF868	OFS-2000												
Range: 0.1-1 fps	1-250 fps												
West ²	Type: Ultrasonic Make: Panametrics Model: GF868 Range: 0.1-250 fps												

¹Monitoring and recording are continuous. Additional analyzer specifications and requirements are contained in the approved QAOC Plan.

²The stack configuration at the West flare provided sufficient straight run distance such that a single Panametrics meter was accurate over the entire range of 0.1-250 fps required by R1118, Attachment A.

Table 3
Pilot, Purge Gas and Visible Emissions Monitoring Methods

Flare ID	Pilot/Purge Gas Flow	Pilot Flame	Visible Emissions
East	Common orifice type flow meter	Thermocouple ¹	Color video
West			

¹ This information is not contained in Section F of the proposed plan but was provided on 10-8-09 in an email response to additional information (AI) request under A/N 484548.

Flare Gas Recovery System and Flaring Operations

The East and West flares became an integrated flare system and no longer operate as independent flares after the new Flare Gas Recovery (FGR) system was installed in 2009. During normal operation, the water seal in the flare seal drums allow vent gases to be recovered by the FGR system, which is comprised of two (2) flare gas compressor trains composed of liquid-ring type compressors and associated equipment. However, flaring can still occur whenever venting exceeds the FGR capacity during emergencies, shutdowns, startups, turnarounds, or essential operational needs. Each flare is sealed in a staged design to preferentially direct heavy vent gas flow first to the East flare which has the greatest smokeless capacity or to the West flare with the greatest smokeless control at low flare volumes. When

flow exceeds the first flare's smokeless capacity, excess flow will spill over to the second flare as needed.

Depending on the circumstances and properties of venting that causes flaring, one of the flares may exceed its smokeless capacity before the other flare. By-pass lines with control valves around the two seal drums were added to allow shifting flow to the flare stack that is under utilized to provide better control over the distribution of such releases between the two flares. The individual seal drum by-pass valves were sized to approximately the smokeless capacity of its associated flare.

The FGR is designed to function automatically. Normally one compressor is in service with a net forward flow of about half of its rated capacity. The compressors are liquid ring type, which are essentially constant volume machines. Spillback gas flow from the discharge side of the compressor to the suction inlet header of the compressor is used to keep the machine operating at constant volume. The second compressor starts and stops automatically as the amount of release gas varies.

As gas released to the flare increases above normal, the pressure in the inlet header will begin to increase and the pressure controller will begin to close off the control valve in the spillback line. This increases the net forward flow capacity of the compressor to match the increased release to the flare system. If flare releases continue to increase, the spillback valve will eventually reach the fully closed position. At this point, the capacity of the first compressor is fully utilized. If releases continue to increase to the flare system beyond the capacity of the first compressor, the pressure in the inlet header will continue to rise and the pressure controller logic will startup the second compressor. As this compressor begins to take more of the flow, the pressure in the inlet header begins to level out and start to drop. As the pressure drops, the spill back valve begins to open to match the net forward flow of the two compressors to the amount of release going into the flare systems. As releases to the flare decreases, reverse logic will shutdown the second compressor.

When gas released to the flare system exceed the capacity of the two compressors, the inlet header pressure will continue to rise. When the pressure begins to approach a value close to that imposed by the water height in the two flare seal drums, the inlet header pressure controller will open the bypass control valves around the seal drums. Excess gas above the capacity of the compressors will be combusted at the flare stack(s). Note that the certified Rule 1118 continuous flow meters, shown in Table 2 above, are installed downstream of the flare seal drums to accurately measure the vent gas flow that are not recovered by the FGR system and combusted at the flare stack.

Pursuant to Rule 1118 (b)(6), CP Carson requested approval to use monitoring records of the flare water seal and header pressure to determine that no more vent gas is combusted at the flare stack for the purpose of identifying the end of a flare event. Digital flare images along with flare header pressure, water seal pressure and vent gas flow monitoring data were submitted to the District for evaluation of this proposed method. However, the data presented contain too many inconsistencies for the District to deem the proposed monitoring method effective and reliable for determining the end of flare event at the East and West flares in lieu of of using the flow parameter of <0.12 fps pursuant to Rule 1118(b)(6). Therefore, this proposed method cannot be generically accepted without a case by case in depth analysis of the data for each flare event.

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PLAN COMPLETENESS

A revised FMRP 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 4, the Carson refinery's proposed plan has the required information specified by paragraph (f)(3) of the rule.

Table 4
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 Section A of the proposed plan submitted under A/N 458121.
Flare information: (1) type of service (2) design capacity (3) operation and maintenance	(B)	√ √ √	See Section B of the proposed plan submitted under A/N 458121.
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 revised Section C dated June 18, 2008 submitted under A/N 484548.
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 Section D of the proposed plan. Note that the West flare water seal was modified and a new East flare water seal was added when both flares (East & West) were integrated into one flare system and the latest dwgs are contained in AI response letter dated 10-30-09 submitted under A/N 484548.

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Requirements	Rule 1118 (f)(3)	Yes	Comment
Flow diagrams showing the interconnections of the flares to vapor recovery system and process unit.	(E)	√	See revised flow diagrams and description to Section E of the proposed plan in an AI response letter dated 10-30-09 submitted under A/N 484548.
Descriptions of the assist system process control, flame detection system and pilot ignition system.	(F)	√	See Section F of the proposed plan submitted under A/N 458121 and Table 3 for description of flame detection system.
Description of the gas flaring process if an integrated gas flaring system is being operated.	(G)	√	See revised description to Section G of the proposed plan in an AI response letter dated 10-30-09 submitted under A/N 484548.
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 revised description to Section H of the proposed plan in an AI response letter dated 10-30-09 submitted under A/N 484548. Facility currently has no method to determine the amount of vapors recovered.
Drawings with dimension showing: (1) location of sampling equipment (2) locations of HHV, TSC analyzers (3) location of flow meter (4) location of on/off indicator	(I)	√ √ √ --	See a revised drawing to Section I of the proposed plan in an AI response letter dated 10-30-09 submitted under A/N 484548. No on/off indicator used.

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Requirements	Rule 1118 (f)(3)	Yes	Comment
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 Table 2 above, revised Section J dated June 18, 2008 submitted under A/N 484548, and QAQC plan submitted on 11-12-09 and approved by AQMD on December 9, 2011.
Description and data used to determine actuating and de-actuating settings for on/off flow indicator , and method to verify these settings.	(K)	--	There are no flare gas on/off flow indicators on either the East or West flare
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 Section L of the proposed plan submitted under A/N 458121 for grab sample analysis prior to installation of inline HHV and TSC analyzer(s). Consideration to use grab samples to determine HHV and TSC in lieu of the data substitution method in Rule 1118 during analyzer(s) downtime will be made and approved by the AQMD on a case-by-case basis.
Description of data recording, collection and management system.	(M)	√	See revised Section M dated June 18, 2008 submitted under A/N 484548.

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Requirements	Rule 1118 (f)(3)	Yes	Comment
Description of proposed method to determine, monitor and record total gas volume, HHV and total sulfur concentrations of vent gases.	(N)	√	See revised Section J under A/N 484548 for the gas flow meter and analyzers used to monitor and record total gas volume, HHV and TS of vent gases and the QAQC plan submitted on 11-12-09 and approved by AQMD on December 9, 2011.
Schedule for installation and operation of flare monitoring system.	(O)	√	See revised Section O dated June 18, 2008 submitted under A/N 484548. Flares were placed on a modified schedule in accordance with District variance, Case No. 4900-80.
Description of any proposed alternative criteria to determine a sampling event for each specific flare.	(P)	√	Sampling flare events was an intermediate definition effective prior to the installation of continuous monitors for HHV and total sulfur concentration. Defining sampling event is not relevant in approving of the proposed plan.
A request to use an alternative sampling program pursuant to paragraph (g)(4)(C)	(Q)	--	No alternative is being proposed during the interim period.

RECOMMENDATIONS

The revised FMRP submitted by CP Carson contains all of the requirements pursuant to Rule 1118 (f)(3). Therefore, the plan is recommended for approval with the following conditions:

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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 ID	East	West
Service Type	General	General

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 unless the Executive Officer approves in writing, on a case by case basis, the use of water seal, header pressure, closure of control valve and digital flare image monitoring to demonstrate that no more vent gas was combusted in the flare for the purpose of determining when a flare event ends.
3. A flare event lasting 24 hours or less shall be considered a single flare event even when the event 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(s), total sulfur analyzer(s) and gas flow meter(s) used in this flare plan shall meet or exceed the minimum specifications described in Attachment A of Rule 1118. The flare monitoring system shall also be certified by the AQMD. For quality assurance procedures, the owner/operator shall follow the Guidelines for Rule 1118 Flare Monitoring System Quality Assurance and Quality Control Plan published by the AQMD.
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 continuous flow meter, HHV and/or TSC analyzer(s) for the flare is out of service 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 except when an alternative data substitution procedure has been approved in writing by the Executive Officer. Flow meter and 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. The owner or operator shall install and maintain a flow meters to monitor and record the pilot and all process gas flows to the general service flares.
10. 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.
11. 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.
12. 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.
13. The owner/operator shall conduct an analysis and determine the relative cause of 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.
14. For the purpose of Rule 1118(d)(1) compliance determination, flare emissions from this facility and ConocoPhillips Wilmington Refinery (facility ID #800363) shall be considered as flare emissions from a single petroleum refinery.
15. 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).
16. 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), (g)(7) 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).

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- c. Pilot flame failure report.
- d. Planned and unplanned flare monitoring system downtime report that includes date and time and explanation for taking the system out of service.
- e. Information to substantiate any exemptions taken under Rule 1118(k).
- f. Specific Cause Analysis completed pursuant to Condition No. 12.
- g. Relative Cause Analysis completed pursuant to Condition No. 13.
- h. Annual acoustical pressure relief device leak survey conducted pursuant to Rule 1118(c)(1)(C).
- i. Combined annual sulfur dioxide emissions for all flares at ConocoPhillips Carson (ID 800362) and ConocoPhillips Wilmington (ID 800363) normalized over the combined crude oil processing capacity in calendar year 2004 pursuant to Condition 14.
- j. 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 Enforcement Team to the below address. Items (a) through (g) shall be submitted quarterly in electronic format. Hard copy of item (h) shall be submitted with the quarterly report for the quarter which the survey was conducted. Hard copy of item (i) shall be submitted with the last quarterly report for the year. Item (j) shall be made available to the Executive Officer upon request.

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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- 17. 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 and all other applicable requirements of Rule 1118 that are not specified in this approved plan. Violation of any of the terms of the plan is a violation of Rule 1118.