

REVISED FLARE MONITORING AND RECORDING PLAN

Facility Information

CONOCOPHILLIPS
ID# 800363
TITLE V: YES
RECLAIM: NOX, SOX
ZONE: COASTAL
CYCLE: 2

Mailing Address

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BACKGROUND

The ConocoPhillips (CP) refinery in Wilmington, California (herein referenced as the CP Wilmington refinery) operates five (5) flares that are subject to the requirements of Rule 1118. These 5 flares make up two separate flare systems within the refinery. Three elevated flares (the North, UK, and South flares) operate as an integrated flare system while the elevated LPG flare (and its portable spare unit) operates by itself.

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 are crucial in ensuring petroleum refineries do not exceed the performance targets for SOx emissions pursuant to paragraph (d) of Rule 1118. Due to the operational dependency between the CP Carson and Wilmington refineries (Carson only processes intermediate streams produced exclusively from Wilmington), flare emissions from both facilities will be combined for compliance determination with the Rule 1118 SOx performance target as one facility. However, the CP Carson refinery has a separate revised Flare Monitoring and Recording Plan submitted under A/N 484548.

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 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

ENGINEERING EVALUATION REPORT

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 Wilmington 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 Wilmington refinery variance petition, case no. 4900-79, was granted. The CP Wilmington 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 9, 2010. CP Wilmington notified the Hearing Board on December 2, 2010 that final compliance was achieved.

The CP 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 (FMRP) was required to be submitted to the District by 6-30-06 for approval pursuant to Rule 1118(f)(1)(A). A revised FMRP was submitted for approval by the CP Wilmington refinery under A/N 458034 on 6-20-06. Subsequently, three additional applications (A/N 469782 in 2007 and A/Ns 477987, 484549 in 2008) were submitted to provide supplemental/updated information to the proposed plan as the facility completed the installation of its continuously monitoring equipment and finalized changes to the plan. Therefore, CP Wilmington 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 484549 and applications A/Ns 458034, 469782 and 477987 have been cancelled.

This approved revised FMRP will supersede the amended plan approved on December 16, 2005 under A/N 400212.

The following information was provided by the CP Wilmington refinery:

Table 1: Flare Information

Flare	Device ID	Type of Service	Pilot Gas	Purge Gas	Flare Gas Recovery
North	C706	General	N.G.	N.G. or Propane	yes
UK	C748	General	N.G.	N.G. or Propane	yes
South	C723	General	N.G.	N.G. or Propane	yes
LPG	C736	Clean	Butane	Butane	No
LPG (spare)	C735	Clean	Butane	Butane	No

In the revised plan, CP Wilmington proposes to use the methods shown in Table 2 for monitoring and recording the operating parameters of the flares:

ENGINEERING EVALUATION REPORT

TABLE 2: Vent Gas Monitoring¹ Methods

Flare	Gas Flow	Gas Higher Heating Value (HHV) Analyzer	Total Sulfur (TS) Concentration
North	<i>Low Flow</i> Type: Ultrasonic Make: Panametrics Model: GF868 Range: 0.1 – 1 fps	Type: Calorimeter Make: COSA Instrument Model: COSA 9600 Range: 0-3000 BTU/scf	Type: PUVF Make: Thermo Model: SOLA II Low Range: 0-2500 ppm High Range: 1-150,000 ppm
UK	<i>High Flow</i> Type: Optical Scintillation Make: OSI Model: OFS-2000 Range: 1 – 250 fps		
South			
LPG (and portable spare unit)	Type: Ultrasonic Make: Panametrics Model: GF868	Use Higher Heating Value of Butane in Attachment B of Rule 1118	Use emission factor of 0.047 lb/mmBTU for Butane in Attachment B

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

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

Flare	Pilot/Purge Gas (N.G.) Flow	Pilot Flame	Visible Emissions
North	Common orifice type flow meter	Thermocouple ¹	Color video
UK			
South			
LPG			

¹This information is not contained in Section F of the proposed plan but was provided on 2-2-12 in an email response to additional information (AI) request under A/N 484549.

FLARE GAS RECOVERY AND FLARING OPERATIONS

The North, UK and South flares are interconnected and configured into a single integrated flare system by sealing each flare with a water seal drum in a staged design. Under normal operation, the water seal in the drums allows vent gases to be recovered by three flare gas recovery compressors whenever process unit(s) vent into the flare system during emergencies, shutdowns, startups, turnarounds or essential operational needs. When venting exceeds the capacity of the gas recovery compressors, vent gases are combusted at the flare stack after it breaches the static head pressure of the water inside the seal drums. Routing of the vent gases is controlled by the relative heights of the liquid seals in each drum. Vent gases flow from any operating unit(s) are directed first to the UK flare, which has the greatest smokeless control at low flare volumes. Heavy vent gas flow is directed to the North flare, which has the greatest smokeless capacity. When heavy flow events exceed the first flare's smokeless capacity, excess flow spill over successively to the second and third flare as needed. The UK flare is typically set the lowest so it will be the first flare to vent, followed successively by the North and South flares if the header pressure continues to rise after the compressors are fully loaded.

The design capacity of the flare gas recovery compressors are shown in Section H of the proposed plan submitted under A/N 458034. All three compressors are reciprocating type. The cylinder loading for two of the three compressors are controlled based on suction pressure while the third compressor has no cylinder loading control and is always fully loaded when operating. When the vent gas flow exceeds the capacity of the fully loaded compressor, rising header (suction) pressure causes the cylinder to be loaded in steps until the other compressor is fully loaded. The suction pressure at each compressor varies depending upon seal liquid height, flare system gas flow and resealing time following a flare event. When the flare system flow is low, the compressor is able to keep the flare header pressure from breaking the flare seal at partial cylinder loading. At higher flare system flow rates, the pressure increases, causing the compressor controller to load more cylinders. Flow in excess of the compressor capacity at full load can cause the flare liquid seal to break if the pressure in the header becomes high enough. The controllers are set to load the compressors to 100% before the flare liquid seal is broken. The certified Rule 1118 continuous flow meters, shown in Table 2, are located downstream of the flare seal drums to accurately measure the vent gas flow that are not recovered by the compressors and combusted at the flare stack.

The clean service LPG flare is completely isolated from the other flares and operates independently to combust vent gases from the butane storage tanks. When this flare is taken out of service for maintenance, the duplicate LPG rental flare is connected in parallel to maintain flaring capability. There is no vapor recovery system on the LPG flare and its portable spare unit.

Pursuant to Rule 1118(b)(6), CP Wilmington 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 for the purpose of identifying the end of a flare event. Water seal level settings, flare header pressure and vent gas flow monitoring data were submitted to the District for evaluation of this proposed method. However, the data presented failed to demonstrate consistent correlation with flaring when the water seal is breached and vice versa. The data contained too many inconsistencies for the District to deem the proposed method effective and reliable for determining the end of a flare event at the North, UK and South flares in lieu 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.

ENGINEERING EVALUATION REPORT

PLAN EVALUATION

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 revised plan submitted by the CP Wilmington refinery has the required information specified by Rule 1118(f)(3).

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 458034.
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 458034.
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 484549.
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 submitted under A/N 458034.
Flow diagrams showing the interconnections of the flares to vapor recovery system and process unit	(E)	√	See Section E of the proposed plan submitted under A/N 458034.
Descriptions of the assist system process control, flame detection system and pilot ignition system.	(F)	√	See Section F of the proposed plan submitted under 458034 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 Section G of the proposed plan submitted under A/N 458034.

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
ENGINEERING AND COMPLIANCE DIVISION
REFINERY & WASTE MANAGEMENT

Page 6 of 10
 Appl. number 484549
 Processed by Thomas Lee
 Reviewed by
 Date 12-15-11

ENGINEERING EVALUATION REPORT

Requirements	Rule 1118 (f)(3)	Yes	Comment
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 Section H of the proposed plan submitted under A/N 458034.
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 Section I of the proposed plan submitted under 484549 and supplemental drawings submitted in an AI response dated 11-9-11. No on/off flow indicators used.
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 and revised Section J of the proposed plan submitted under A/N 484549.
Description and data used to determine actuating and de-actuating settings for on/off flow indicator, and method to verify these settings.	(K)	--	No on/off flow indicator used.
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 458034 for grab sample analysis prior to installation of inline HHV and TSC analyzer(s).
Description of data recording, collection and management system.	(M)	√	See revised Section M of the proposed plan submitted under A/N 484549.
Description of proposed method to determine, monitor and record total gas volume, HHV and total sulfur concentrations of vent gases.	(N)	√	See Section M above and Table 2 for gas flow and CEMS used for HHV and TSC.

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
ENGINEERING AND COMPLIANCE DIVISION
REFINERY & WASTE MANAGEMENT

Page 7 of 10
 Appl. number 484549
 Processed by Thomas Lee
 Reviewed by
 Date 12-15-11

ENGINEERING EVALUATION REPORT

Requirements	Rule 1118 (f)(3)	Yes	Comment
Schedule for installation and operation of flare monitoring system.	(O)	√	FGMS installed and operational. Final compliance cert. pursuant to variance case 4900-79 was submitted to District HB on 12-2-10.
Description of any proposed alternative criteria to determine a sampling event for each specific flare.	(P)	√	'Sampling flare event' 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 Flare Monitoring and Recording Plan submitted by the CP Wilmington refinery contains all of the requirements pursuant to Rule 1118 (f)(3). Therefore, the plan is recommended for approval with the following conditions:

- 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	North	UK	South	LPG	LPG (Spare*)
Type	General Service	General Service	General Service	Clean Service	Clean Service

*Applicable only when flare is in service.

ENGINEERING EVALUATION REPORT

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 flare water seal, header pressure, closure of control valve and/or 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. For the general service flares, 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 clean service flare, the owner/operator shall calculate emissions of criteria pollutants from each flare event using the equation and emissions factors for 'Propane and Butane' in Attachment B of Rule 1118.
10. The owner/operator shall install and maintain flow meters to monitor and record the pilot and all purge gas flows to the general service flares.
11. The owner/operator shall monitor the flares at all times for presence of a pilot flame using thermocouple that will alarm the owner/operator in the event of a flame out. The pilot shall be re-ignited immediately after a pilot flame out occurs.

12. 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.
13. 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.
14. 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 substituted to satisfy this condition.
15. For the purpose of Rule 1118(d)(1) compliance determination, flare emissions from this facility and ConocoPhillips Carson Refinery (facility ID #800362) shall be considered as flare emissions from a single petroleum refinery.
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. 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. 13.
 - g. Relative Cause Analysis completed pursuant to Condition No. 14.

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
ENGINEERING AND COMPLIANCE DIVISION
REFINERY & WASTE MANAGEMENT

ENGINEERING EVALUATION REPORT

Page	10 of 10
Appl. number	484549
Processed by	Thomas Lee
Reviewed by	
Date	12-15-11

- 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 Wilmington (ID 800363) and ConocoPhillips Carson (ID 800362) normalized over the combined crude oil processing capacity in calendar year 2004 pursuant to Condition 15.
- 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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- 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 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.