SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT *ENGNEERING AND COMPLIANCE* APPLICATION PROCESSING AND CALCULATIONS	PAGES	PAGE
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RULE 1173 COMPLIANCE PLAN

COMPANY NAME AND ADDRESS

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EQUIPMENT LOCATION

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Facility ID: 131003

Claim of Confidentiality: Yes

BACKGROUND

The BP West Coast Products Limted Lliability Company (BP) currently operates a refinery located in the City of Carson. The South Coast Air Quality District (District) classifies the facility as being subject to Title V, and the requirements of the District's Regional Clean Air Incentive Market (RECLAIM) for Nitrous Oxides and Sulfur Oxides.

In January of 2008, BP submitted a Compliance Plan application for Rule 1173 to comply with the latest amendment under the rule that was approved by the Governing Board on 1 June 2007. Under the District's latest revision for Rule 1173, BP does not only need to monitor all of its atmospheric process pressure relief valves (PRDs), but is also required to install automatic monitoring devices, tamper proof, that record the release, and its duration as well. Furthermore, BP needs to use the collected data to quantify the emissions that each PRD releases to the atmosphere. Some of the major changes in Rule 1173 requirements are as follows:

Table No.1 Regulatory Citation

RULE 1173 SUBDIVISION (h)(1)	
Regulatory Citation	**Rule Requirement**
(A)	If a refinery has less than 50 atmospheric PRDs, it must install electronic valve monitoring devices on 50% of all PRDs in its inventory at a minimum by 1 January 2009. As for the remaining PRDs, all must be outfitted by 1 July 2009.
(B)	(i): If a refinery has more than 50 atmospheric PRDs, the facility must install electronic valve monitoring devices on at least 20% of PRDs in its inventory by 1 January 2009. (ii): Install electronic valve monitoring devices on atmospheric PRDs to reach 40% of its inventory by 1 July 2009. (iii): Install electronic valve monitoring devices on the remaining atmospheric PRDs in its inventory by 1 July 2010.
(C)	All atmospheric PRDs that are not outfitted with the electronic valve monitoring devices are required to be monitored for atmospheric releases by using the existing process instrumentation installed as part of the process control until such time as the requirements of (h)(1)(A) and (B) are met.
(D)	As an alternative to (h)(1)(A) and (B), a refinery may delay the installation of electronic valve monitoring devices on all atmospheric PRDs until the next refinery turnaround after 1 June 2007 provided the refinery operator demonstrates to the satisfaction of the District that outfitting the PRDs is not feasible or is a safety hazard. This alternative schedule, however, needs a written approval from the District.
(E)	A refinery may choose to use multiple devices in addition to electronic PRD monitoring devices to monitor releases and quantify the amount of release. However, if the operator chooses to use a combination of devices, it must still comply with the schedule in (h)(1)(A) and (B) whichever is applicable and needs the District's approval for employing the devices on its PRDs.
(F)	PRDs that are connected to an air pollution control or vapor recovery are exempted from the requirements under (h)(1)(A) and (B). The operator can also propose, as an alternative to install electronic valve monitoring devices, to connect its process PRDs to a vapor recovery system or air pollution control on the condition that the PRDs will be connected at the next refinery turnaround after 31 December 2008 and identify in the Compliance Plan before 31 December 2008.
(G)	PRDs in service of heavy liquids that releases to drains and are subject to Rule 1176 are exempt from the electronic valve monitoring requirements of Rule 1173.

PROPOSED RULE 1173 COMPLIANCE PLAN AND EVALUATION

As required by the District's Rule 1173, BP has completed its inventory of all PRDs that must comply with the requirement of Rule 1173, which requires electronic monitoring devices. The company's inventory shows that its refinery has four hundred and fourty two PRDs. Based on the total, BP needs to follow the schedule as outlined by Rule 1173 (h)(1)(B). Table No. 1 in Attachment A gives the current PRD inventory at BP's Carson refinery.

Under the District's Rule 1173 (h)(4), an inventory of Rule 1173 components subject to the rule must be clearly identified. The BP's revised atmospheric PRD inventory, Table No.1, complies with the identification requirements: It clearly tags each PRD with an unique identification number, the location of the PRD, size of valve, pressure setting, and the option for each device.

APPLICABLE RULE ANALYSIS

Rule 1173 (h)(1)(A) and (B) : Compliance Schedule Requirement

The District's Rule 1173 (h)(1) gives two schedules for complying with the new electronic monitoring and recording device requirements for atmospheric PRDs. These devices must also be able to quantify the emissions of each release. The compliance schedules are divided into two groups, one for facilities with fifty or less PRDs, and one for facilities with more than fifty PRDs. BP falls under the fifty PRDs or more schedule.

Rule 1173 (h)(1) Analysis

Expect to Comply. Under the group with fifty or more atmospheric PRDs, BP must install monitoring devices on at least twenty percent of its PRDs by 1 January 2009 and fourty percent by 1 July 2009, and the remaining PRDs by 1 July 2010 as required by (h)(1)(B). The following calculations show how many devices must be outfitted with monitoring devices by the required deadlines:

Total Number of Atmospheric PRDs: 442

Minimum Number of PRDs by 1 January 2009 = 442 x .2 = 88.4 = ***89 atmospheric PRDs***

Number of PRDs required by 1 July 2009 = 442 x .4 = ***177 atmospheric PRDs***

Number of PRDs required by 1 July 2010 = ***442 atmospheric PRDs***

The number of valves to be outfitted by the three given dates will be incorporated as plan conditions for the District's approval of the BP's Rule 1173 Compliance Plan. BP is therefore expected to comply.

Rule 1173 (h)(1)(C): Monitoring with Process Instrumentation and Control Requirements

In paragraph (h)(1)(C), refineries are required to monitor their atmospheric PRDs that are not outfitted with electronic monitoring devices by using process control instrumentation or other indicators until all PRDs comply with the requirements of (h)(1).

Rule 1173 (h)(1)(C) Analysis

Comply. BP has proposed process controls and indicators to monitor releases from its PRDs. The specific methods are listed in Table No.1 in Attachment A. In some major process units that have pressure sensors, the company will use the combination of pressure readings and pipe covers, light weight hoods, that slip over the PRDs. If there is a release from a PRD, the cover will be blown off giving the evidence of a release.

Rule 1173 (h)(1)(D): Alternative Schedule for Installing Electronic Monitoring Devices

Not Applicable. (h)(1)(D) gives refineries the option of delaying the compliance schedule for installing PRD monitoring devices until the next turnaround after 1 June 2007 if the companies provide sufficient justification that it can not be done without jeopardizing safety. BP in its application did not request to be placed under the alternative schedule.

Rule 1173 (h)(1)(E): Combination of Monitoring

Comply. (h)(1)(E) gives refineries the option to use a combination of devices or methods to demonstrate compliance with monitoring. Under Rule 1173 (h)(1)(A) and (B), refineries are required to install electronic monitoring devices, tamper-proof, that are capable of recording a release, the duration, and the amount of release.

BP has decided to use a the combination of existing pressure sensors installed on its processes, pressure relief valve design or equations to determine the release, new electronic monitoring devices and existing data acquisition systems at the refinery that will measure and record the duration.

Specifically, BP will use an approved ultrasonic/acoustic or pressure monitoring devices, or other District approved devices and receivers. The new electronic monitoring devices will

send signals to the receivers, which will convert the signals, if a PRD release has occurred, to be recorded on the BP's existing distribution control system (DCS) plant data historian. All data recorded will be time stamped (Please see BP's submittal in the file).

BP's new monitoring devices, however, only monitor and record the opening of the PRDs and their release durations. The new monitoring and recording devices do not, however, automatically calculate the amount released to the atmosphere. To quantify the PRD releases, BP proposes to use the time measured and recorded by the District approved electronic monitoring devices, existing pressure sensor, and the PRD pressure setting as data inputs for the American Petroleum Institute's (API) pressure relief valve equation for design or sizing in API RP 521. Because all the PRDs in BP's inventory are in gas or liquid service, the appropriate equations are the ones for the sizing of relief valves in gas and liquid service. Those equations are as follows (API RP 521, Section 3.6.2.1.1).

PRD Equation for Vapor or Gas Service

$$W_s = \frac{(ACK_d K_b K_c)(P+14.7)}{3600\sqrt{\frac{(T+460)Z}{M}}}$$

$W_{voc} = W_s * VOC * t$

$W_{TVOC} = \sum W_{voc}$

Where:

A = Relief Valve Orifice Size

$$C = Sizing\ Coefficient = 520\sqrt{k\left(\frac{2}{k+1}\right)^{\frac{k+1}{k-1}}}$$

k = Cp/Cv = Specific Heat Ratio for the released gas
Kd = Effective Coefficient of Discharge (use Kd = 0.975 in absence of manufacturer's PRD specific data)
Kb = Capacity Correction Factor
Kc =Combination Correction Factor. (Kc =1 if no rupture disk; Kc = 0.9 if rupture disk)
M = Molecular Weight of the released gas
P = Pressure (psig), as measured with Continuous Process Monitoring System
T = Temperature (°F)
t = Recorded Duration of Release in Seconds by Electronic Monitoring Device

VOC = weight percent VOC in the released gas
Ws = Flow through the PRD, lb/sec
Wvoc = Flow of VOCs through the PRD
W_{TVOC} = Total VOC Released during the Event, lbs
Z = Compressibility Factor

PRD Equation for Liquid Service

$$Q = 0.63AK_dK_wK_v\sqrt{\frac{P}{G}}$$

M = Q*8.34*G*t

Q = flow rate, (U.S. gallon per second)
Kd = Rated Coefficient of Discharge (use Kd = 0.65 in absence of manufacturer's PRD specific data)
Kw = Capacity Correction Factor (Kw = 1 for atmospheric back pressure)
Kv = Correction Factor due to Viscosity (assume = 1)
P = Pressure (psig), as measured with Continuous Process Monitoring System
G = Specific Gravity of the liquid at flowing temperature
M = Release per Event in lbs
t = Recorded Duration of Release in Seconds by Electronic Monitoring Device

Rule 1173 (h)(1)(F): PRD Connection to Air Pollution Control or Vapor Recovery

Not Applicable. (h)(1)(F) allows refinery operators to connect any of its PRDs to either an air pollution control device or vapor recovery provided that the connections are made during the first refinery turnaround after 31 December 2008. BP did not choose this option for any of its atmospheric PRDs in its inventory.

Rule 1173 (h)(1)(G): Exemption for Liquid PRDs

Expect to Comply. (h)(1)(G) exempts atmospheric PRDs in liquid service from (h)(1)(A) and (B) if they are connected to drains or are part of a system subject to Rule 1176. A condition will be imposed in the BP's Rule 1173 plan. Compliance is therefore expected.

RECOMMENDATIONS AND CONDITIONS

Because BP chooses to use a combination devices to monitor, record, and quantify its PRD releases, the company has submitted a Rule 1173 Compliance Plan for the District's approval as required by the amended Rule 1173 (h)(1)(E). After a review of the BP's plan, the District recommends approval with the following conditions:

CONDITIONS

1. The operator shall install and operate its atmospheric PRD monitoring systems in accordance with all data and specifications submitted with this application under which this plan is approved unless otherwise specified below.

2. The operator shall install electronic monitoring devices as proposed in the PRD inventory and compliance plan on all 413 atmospheric PRDs in its inventory that are subject to Rule 1173 (h)(1)(B) by July 1, 2010.

3. Upon completion of installation of the electronic monitoring device for a PRD, the operator shall use the continuous valve monitoring system (CVMS), which shall include the process pressure monitoring and recording system and electronic monitoring device for the PRD, to document and determine the release durations and quantities.

4. CVMS shall be defined to include the electronic monitoring devices, pressure sensors or transmitters, receivers, and the data acquisitions or recording systems. Continuous recording shall be defined as the recorded pressure readings and electronic valve monitoring readings at a minimum of one minute intervals. The data recording systems shall be accurately synchronized with the time and date of the measurement.

5. The operator shall ensure that the CVMS for each of the subject atmospheric PRDs is properly maintained and kept in good operating condition at all times when the process equipment that it serves is in operation, except when it is taken out of service due to the following reasons:

    a. Failure, breakdown, or unplanned maintenance of the data acquisition or recording system, which shall not exceed 48 hours cumulatively in any given calendar quarter. The operator shall also report the time period that the data recording system is out of service in the quarterly report.

b. Planned maintenance of the CVMS shall not exceed 7 days in a calendar year unless the operator has notified the District by e-mail detailing the specific reason for the maintenance within 24 hours of taking the CPMS from service. All notifications shall be forwarded to refinery.compliance@aqmd.gov.

6. The operator shall use following equation(s) or other alternative District-approved methodology to determine the volatile organic compound (VOC) emissions from a PRD release. The operator shall submit a plan application in order for the District to evaluate an alternative VOC emission estimation methodology.

PRD Equation for Vapor or Gas Service

$$W_s = \frac{(ACK_d K_b K_c)(P+14.7)}{3600\sqrt{\frac{(T+460)Z}{M}}}$$

Wvoc = Ws * VOC * t

$W_{TVOC} = \sum$ Wvoc

Where:

A = Relief Valve Orifice Size

$$C = Sizing\ Coefficient = 520\sqrt{k\left(\frac{2}{k+1}\right)^{\frac{k+1}{k-1}}}$$

k = Cp/Cv = Specific Heat Ratio for the released gas
Kd = Effective Coefficient of Discharge (use Kd = 0.975 in absence of manufacturer's PRD specific data)
Kb = Capacity Correction Factor
Kc = Combination Correction Factor. (Kc =1 if no rupture disk; Kc = 0.9 if rupture disk)
M = Molecular Weight of the released gas
P = Pressure (psig), as measured with Continuous Process Pressure Monitoring System
T = Temperature (°F)
t = Recorded Duration of Release in Seconds by Electronic Monitoring Device
VOC = weight percent VOC in the released gas
Ws = Flow through the PRD, lb/sec

Wvoc = Flow of VOCs through the PRD
W_{TVOC} = Total VOC Released during the Event, lbs
Z = Compressibility Factor

PRD Equation for Liquid Service

$$Q = 0.63AK_dK_wK_v\sqrt{\frac{P}{G}}$$

M = Q*8.34*G*t

Q = flow rate, (U.S. gallon per second)
Kd = Rated Coefficient of Discharge (use Kd = 0.65 in absence of manufacturer's PRD specific data)
Kw = Capacity Correction Factor (Kw = 1 for atmospheric back pressure)
Kv = Correction Factor due to Viscosity (assume = 1)
P = Pressure (psig), as measured with Process Pressure Monitoring System
G = Specific Gravity of the liquid at flowing temperature
M = Release per Event in lbs
t = Recorded Duration of Release in Seconds by Electronic Monitoring Device

Mair = M – Md - Mr

Where
Md = lb of liquid recovered from drain. The operator may use the volume and the density of the liquid to determine the mass of the liquid recovered, or direct weight scale measurement. The amount of liquid recovered shall not include cleanup material, absorbent, and cleaning solution, or any material other than the liquid released by the liquid PRD.

Mr = lb of liquid recovered by cleanup crew. The operator may use the volume and the density of the liquid to determine the mass of the liquid recovered, or direct weight scale measurement. The amount of liquid recovered shall not include cleanup material, absorbent, and cleaning solution, or any material other than the liquid released by the liquid PRD.

For each PRD release event, it shall be assumed that the PRD is fully open for the duration of the release recorded by the monitoring device. Any alternative in

determining the release duration or quantity shall be evaluated and approved in writing by the District.

If the operator wants to determine the amount of emissions for a release from a PRD event by excluding the amount of liquid recovered, the operator shall maintain records of the weight of the excluded materials as defined by M_d and M_r.

7. The operator shall calibrate and maintain each pressure sensor and electronic monitoring device in accordance with manufacturer's specifications.

8. All components of the CVMS shall be made available to District personnel for inspection upon request.

9. The operator shall keep the "Pipe End Cover" such as a piper cover and drain cap on each PRD identified under this current approved plan as the monitoring devices for releases until the PRD is equipped with the electronic monitoring device and the CVMS or other approved monitoring devices. Until such time, the operator shall comply with the following conditions for each PRD:

A. The operator shall visually inspect each "Pipe End Cover" at least once during each eight-hour operating period to confirm that the pipe end cover is properly secured in place at the outlet of the PRD vent gas piping.

B. The operator shall ensure that each "Pipe End Cover" is properly maintained and free of holes, tears, and openings at all times. For "accessible" PRDs, the operator shall inspect each "Pipe End Cover" at least once every calendar quarter to confirm that the pipe end cover is in good working order. For "inaccessible" PRDs, the operator shall inspect each "Pipe End Cover" at least once every calendar year to confirm that the pipe end cover is in good working order. The operator shall generate a written record of the inspection.

C. The operator shall notify the District within one hour of the time that it is identified by the operator that the "Pipe End Cover" has been blown off of the PRD vent gas piping outlet. The notification shall be made by calling 1-800-CUT-SMOG.

D. The equation in Condition no. 6 shall be utilized to calculate the volatile organic compound (VOC) emissions from a PRD release. For each PRD release event, it shall be assumed that the PRD is fully open from the time that the "Pipe End Cover" was last identified to be in position at the PRD vent gas piping outlet until the time that it

is identified that the "Pipe End Cover" has been blown off of the PRD vent gas piping outlet unless the operator can provide physical evidence or process data that supports, to the satisfaction of the District, a different time period for the release. This different time period may be established based on the process pressure records, PRD pressure setpoint and physical observation of the Pipe End Cover.

10. The operator shall keep adequate records to show compliance with all plan conditions. Such records shall be made available to District personnel upon request. The operator shall maintain records for at least five years.

11. As specified under Rule 1173 (h)(F), until the time the PRDs identified in Table II in the Attachment are connected to the vapor recovery or control system, the operator shall monitor these PRDs by using electronic process control instruments that allow for real time continuous parameter monitoring or telltale indicator.

12. The provisions of this plan will not apply to any PRDs that are determined to be no longer subject to Rule 1173(h), including PRDs that have been removed, tied into a closed system, been modified so that they fall under the provisions of Rule 1173(h)(1)(G), or are located on equipment that is out of service and hydrocarbon free. If the operator makes any changes allowed under this condition, the operator shall submit an updated inventory to the District within 12 months identifying changes to the inventory.