BAY AREA AIR QUALITY MANAGEMENT DISTRICT

BOARD OF DIRECTORS
STATIONARY SOURCE COMMITTEE MEETING

COMMITTEE MEMBERS

MARK DeSAULNIER –CHAIRPERSON
JULIA MILLER
JOHN SILVA
GAYLE UILKEMA

JERRY HILL - VICE CHAIRPERSON
MARK ROSS
MARLAND TOWNSEND
SHELIA YOUNG

MONDAY
NOVEMBER 24, 2003
9:30 A.M.

7th FLOOR BOARD ROOM

REVISED AGENDA

1. **CALL TO ORDER - ROLL CALL**

2. **PUBLIC COMMENT PERIOD** *(Public Comment on Non-Agenda Items Pursuant to Government Code § 54954.3) Members of the public are afforded the opportunity to speak on any agenda item. All agendas for regular meetings are posted at District headquarters, 939 Ellis Street, San Francisco, CA, at least 72 hours in advance of a regular meeting. At the beginning of the regular meeting agenda, an opportunity is also provided for the public to speak on any subject within the Board's authority. Speakers will be limited to five (5) minutes each.*

3. **APPROVAL OF MINUTES OF MAY 21, 2003 & JUNE 18, 2003** **W. Norton/ 5052**

4. **REPORT ON CONTROL MEASURE SS-17: PROPOSED AMENDMENTS TO REGULATION 8, RULE 10: PROCESS VESSEL DEPRESSURIZATION** **K. Wee/4760**
kwee@baaqmd.gov

   Staff will give a status report on the development of Control Measure SS-17 from the 2001 Ozone Attainment Plan, Regulation 8, Rule 10: Process Vessel Depressurization. A hearing before the full Board is scheduled for January 21, 2004 to consider adoption. This is an informational item only.

5. **REPORT ON CONTROL MEASURE SS-16: PROPOSED AMENDMENTS TO REGULATION 8, RULE 18: EQUIPMENT LEAKS** **K. Wee/4760**
kwee@baaqmd.gov

   Staff will give a status report on the development of Control Measure SS-16 from the 2001 Ozone Attainment Plan, Regulation 8, Rule 18: Equipment Leaks. A Board hearing is scheduled for January 21, 2004 to consider adoption. This is an information item only.

6. **COMMITTEE MEMBER COMMENTS/OTHER BUSINESS**

   Any member of the Board, or its staff, on his or her own initiative or in response to questions posed by the public, may: ask a question for clarification, make a brief announcement or report on his or her own activities, provide a reference to staff regarding factual information, request staff to report back at a subsequent meeting concerning any matter or take action to direct staff to place a matter of business on a future agenda. (Gov't Code § 54954.2)

7. **TIME AND PLACE OF NEXT MEETING –-AT THE CALL OF THE CHAIR**

8. **ADJOURNMENT**

WCN:mag

AGENDA NO. 3

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
939 ELLIS STREET
SAN FRANCISCO, CALIFORNIA 94109
(415) 771-6000

DRAFT MINUTES

Summary of Board of Directors
Stationary Source Committee Meeting
Wednesday, May 21, 2003
Following adjournment of 9:45 a.m. Board Meeting

1. **Call to Order – Roll Call:** 11:55 a.m.

   Roll Call: Mark DeSaulnier, Chairperson; Jerry Hill, Julia Miller, Mark Ross, John Silva, Marland Townsend.

   Absent: Shelia Young, Gayle Uilkema.

2. **Public Comment Period:** There were none.

3. **Approval of Minutes of April 16, 2003:** Director Miller moved approval of the minutes; seconded by Director Hill; carried unanimously by acclamation.

5. **Consideration and Recommendation to Approve Memorandum of Cooperation between the U.S. Environmental Protection Agency (EPA) and the Air District to Identify and Make Available Emergency Response Support for Homeland Security:** *The Committee considered recommending to the Board of Directors a Memorandum of Cooperation with EPA to identify and offer to make available Emergency Response support, which can contribute toward the maintenance of homeland security.*

   Peter Hess, Deputy APCO, presented the report and, in response to a question from Director Miller, stated that if there is a homeland security event and there needs to be air monitoring, the District staff would share samples and collect the air monitoring, or provide the necessary air samples to the first responders who would go into the areas, therefore, this does not require any additional District staff.

   Committee Action: Director Townsend moved approval of the staff recommendation; seconded by Director Miller; carried unanimously by acclamation.

4. **Staff Report on Further Study Measure 11: Marine Loading Operations:** Due to a lack of time, this item was postponed to the next meeting.

6. **Overview of Title V Operating Permit Program:** Due to a lack of time, this item was postponed to the next meeting.

7. **Committee Member Comments/Other Business:** Chairperson DeSaulnier recommended that if staff can reasonably anticipate that the Regular Board meeting will be lengthy, a second date should be scheduled for this Committee to meet, such as the following Friday. Staff was requested to poll the Committee members for meeting on an alternate day of the week.

   William C. Norton, Executive Officer/APCO, noted that on July 16, 2003 the Executive Recruitment Ad Hoc Committee would meet, which is the same day this Committee would meet. Chairperson DeSaulnier stated he would discuss with Mr. Norton the rescheduling of the July Committee meeting.

8. **Time and Place of Next Meeting:** At the Call of the Chair.

9. **Adjournment:** 11:59 a.m.

Mary Romaidis
Clerk of the Boards

AGENDA NO. 3

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
939 ELLIS STREET
SAN FRANCISCO, CALIFORNIA 94109
(415) 771-6000

DRAFT MINUTES

Summary of Board of Directors
Stationary Source Committee Meeting
Wednesday, June 18, 2003
Following adjournment of 9:45 a.m. Board Meeting

1. **Call to Order – Roll Call:** 11:06 a.m.

   Roll Call: Jerry Hill, Vice-Chairperson; Mark Ross, John Silva, Marland Townsend.

   Absent: Mark DeSaulnier, Julia Miller, Shelia Young, Gayle Uilkema.

2. **Public Comment Period:** There were none.

3. **Approval of Minutes of May 21, 2003:** There being no quorum present, approval of the minutes was deferred to the next meeting.

4. **Environmental Review of Plans and Rules-Contractor Selection:** *The Committee was to consider recommending Board of Directors approval of Environmental Audit, Inc. as the contractor to conduct California Environmental Quality Act (CEQA) analyses and prepare CEQA documents for the 2003 Clean Air Plan, the 2004 Ozone Attainment Strategy, and amendments to District regulations, and authorization for the Executive Officer to execute a contract for up to $200,000 with Environmental Audit, Inc. to perform these services.*

   There being no quorum present, Vice-Chairperson Hill stated this item will be referred to the full Board without a recommendation from the Committee.

5. **Staff Report on Further Study Measure 11: Marine Loading Operations:** *Staff gave a status report on the development of Further Study Measure 11: Marine Loading Operations.*

   Fred Tanaka, Air Quality Engineer, presented the report and reviewed the following:

   - Marine loading operations status report.
   - Background on the regulation.
   - Types of Cargos.
   - The inventory from September 2000 to August 2001.
   - Showed a loading event of an unregulated cargo.
   - The District's process for developing a regulation on marine loading operations.
   - Concepts, which include:
     1. Expand applicability,
     2. Strengthen emission standard,

3. Phase-in requirements,
4. Addressing housekeeping and ballasting activities, and
5. Streamlining reporting requirements.

- The next steps:
  1. Finish draft rule and staff report.
  2. Continue to meet with workgroups.
  3. Schedule workshop.
  4. Update emissions inventory.

In response to questions from Director Townsend, Mr. Tanaka stated that some terminals have control equipment already, depending on the activity. Mr. Tanaka also noted that most of the air districts on the coast have a marine loading rule in place. There was a brief discussion on tank cleaning and where it is done.

There was one speaker on this item:

Dennis Bolt
Western States Petroleum Association

Committee Action: None. This report provided for information only.

6. Overview of Title V Operating Permit Program: *Staff gave an overview of the Air District's Title V Operating Permit Program.*

Steve Hill, Air Quality Engineer Manager, Permit Services Division, presented the report and stated that this program requires major facilities to have federal operating permits and that the Air District administers the program. Mr. Hill noted there are 105 facilities within the District that are subject to Title V and there are 35 facilities with Synthetic Minor permits. Mr. Hill reviewed the following:

- The percent of industrial facilities with Title V permits.
- The percent of NOx emissions from industrial facilities, with the majority of these emissions coming from Title V facilities.
- The potential to emit.
- Title V program elements
  1. Existing applicable requirements,
  2. New monitoring,
  3. New record keeping, and
  4. New reporting.
- Title V permit review time.
- Public Participation.
- EPA review.
- Title V permit administrative record, maintenance, compliance, modification, reopening and renewal.

Committee Action: None. This report provided for information only.

7. Committee Member Comments/Other Business: There were none.

8. Time and Place of Next Meeting: At the Call of the Chair.

9. Adjournment: 11:42 a.m.

Mary Romaidis
Clerk of the Boards

AGENDA: 4

BAY AREA AIR QUALITY MANGEMENT DISTRICT
Memorandum

To: Chairperson DeSaulnier and Members of the Stationary Source Committee

From: William C. Norton
Executive Officer/APCO

Date: November 20, 2003

Re: Report on Control Measure 17 – Proposed Amendments to Regulation 8, Rule 10: Process Vessel Depressurization

RECOMMENDED ACTION:

This item is a report on proposed amendments for information and comment. No action is necessary.

BACKGROUND

Bay Area 2001 Ozone Plan Control Measure SS-17, proposes amendments to Regulation 8, Rule 10: Process Vessel Depressurization. It proposes more stringent controls on emissions from the depressurization of process vessels at refineries and chemical plants. Staff has worked cooperatively with industry, environmental groups and the Air Resources Board to develop the proposed amendments.

DISCUSSION

The proposed amendments will supplement the existing control options with a concentration standard or a mass emission limit.

The proposed major amendments to Regulation 8, Rule 10 will:

- Prohibit process vessels from venting to the atmosphere unless the emissions of total organic compounds are reduced to a concentration below 10,000 parts per million;
- Limit the mass emissions of a limited number of vessels that exceed 10,000 ppm to below 15 pounds per day;
- Expand the number of process vessels covered by this rule; and
- Add monitoring and recording requirements to measure emissions vented to atmosphere once each 24-hour period.

These amendments will reduce emissions of organic and other pollutants, including toxic compounds. Staff has identified a potential State Implementation Plan (SIP) emission reduction credit of 1 ton per day with a total implementation cost of approximately $24,500 per year. The cost effectiveness is approximately $70 per ton of precursor organic compound emissions reduced.

The attached regulation and staff report are still draft documents to allow for California Environmental Quality Act (CEQA) review and public comment. The public hearing to consider the proposed amendments is scheduled for January 21, 2004.

Respectfully submitted,

William C. Norton
Executive Officer/APCO

Attachments:
Draft Regulation 8, Rule 10
Draft Staff Report for Regulation 8, Rule 10 (Appendices omitted)

REGULATION 8
ORGANIC COMPOUNDS
RULE 10
PROCESS VESSEL DEPRESSURIZATION

INDEX

REGULATION 8
ORGANIC COMPOUND
RULE 10
PROCESS VESSEL DEPRESSURIZATION

8-10-100 GENERAL

8-10-101 Description: The purpose of this Rule is to limit emissions of total ~~precusor~~ organic compounds from depressuring and opening of process vessels ~~depressurization~~ at petroleum refineries and chemical plants. (Amended 3/17/82, 7/20/83)

8-10-110 Exemption, Equipment Subject to Other Rules ~~Storage Vessels:~~ ~~The requirements of Section 8-10-301 shall not apply to stationary containers used solely for the storage of an organic liquid~~ The provisions of this rule shall not apply to vessels that are subject to the following Regulation 8 rules:

110.1 Regulation 8, Rule 5: Storage of Organic Liquids
110.2 Regulation 8, Rule 24: Pharmaceutical and Cosmetic Manufacturing Operations
110.3 Regulation 8, Rule 35: Coating, Ink and Adhesive Manufacturing
110.4 Regulation 8, Rule 36: Resin Manufacturing
110.5 Regulation 8, Rule 41: Vegetable Oil Manufacturing Operations
110.6 Regulation 8, Rule 50: Polyester Resin Operations
110.7 Regulation 8, Rule 52: Polystyrene, Polypropylene, and Polyethylene Foam Product Manufacturing Operations

~~**8-10-111 Exemption, Chemical Plants:** The provisions of Section 8-10-301 shall not apply to chemical plants until January 1, 1985.~~ (Adopted 7/20/83)

8-10-112 Limited Exemption, Measurement Periods: The provisions of Section 8-10-301 shall not apply while a process vessel is opened for a period of time reasonably necessary for measurements to determine compliance with the concentration and mass limits of this rule.

8-10-113 Exemption, Small Vessels: The requirements of this Rule shall not apply to any process vessel with a volume of less than 100 cubic feet (ft^3).

8-10-200 DEFINITIONS

8-10-201 Chemical Plant: Any facility engaged in producing organic or inorganic chemicals and/or manufacturing products by chemical processes. Any facility or operation that has ~~28~~ 325 as the first ~~two~~ three digits in the~~ir Standard Industrial Classification Code as determined from the Standard Industrial Classification Manual published in 1972 by the Executive Office of the President, Office of Management and Budget~~ North American Industrial Classification Standard (NAICS) code. Chemical plants may include, but are not limited to the manufacture of: industrial inorganic and organic chemicals; plastic and synthetic resins, synthetic rubber, synthetic and other man made fibers; drugs; soap, detergents and cleaning preparations, perfumes, cosmetics and other toilet preparations; paints, varnishes, lacquers, enamels and allied products; agricultural chemicals; safflower and sunflower oil extracts; re-refining.(Adopted 7/20/83)

8-10-202 Petroleum Refinery: ~~Any facility engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants or other products through distillation of petroleum or through redistillation, cracking, rearrangement or reforming of unfinished petroleum derivatives~~. A facility that processes petroleum, as defined in the North American Industrial Classification Standard No. 32411 (1997). (Adopted 7/20/83)

8-10-203 Process Unit: A manufacturing process which is independent of other processes and is continuous when supplied with a constant feed of raw materials and sufficient storage facilities for the final product. (Adopted 7/20/83)

8-10-204 Process Vessel: Any vessel in which organic compounds are fractionated ~~on more than one tray or on packing~~, ~~or~~ chemically reacted, ~~or~~ washed or purified. These vessels shall include but are not limited to reactors, columns, accumulator vessels, knockout pots, surge/settling drums and other similar devices.

(Renumbered 7/20/83)

8-10-205 **Organic Compound:** Any compound of carbon, excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates and ammonium carbonate.

8-10-206 **Total Organic Compound:** All organic compounds of carbon including methane, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates and ammonium carbonate, that would be emitted to the atmosphere.

8-10-300 STANDARDS

8-10-301 **Process Vessel Depressurizing:** ~~The control~~ Emissions of ~~precursor~~ total organic compounds ~~emissions~~ from depressurizing any process vessel at a petroleum refinery or a chemical plant ~~during a process unit turnaround~~ shall be ~~accomplished so that the organic compounds, after passing through a knockout pot to remove the condensable fraction, must either be:~~ controlled by venting them to a

~~301.1 Recovered (add to the~~ fuel gas system~~) and combusted~~,

~~301.2 Controlled and piped to an appropriate~~ firebox, ~~or~~ incinerator ~~for combustion,~~

~~301.3 F~~flared~~,~~ or otherwise

~~301.4 C~~contained and treated so as to prevent their emissions to the atmosphere. ~~Such procedures shall continue until the pressure within the process vessel is as close to atmospheric pressure as practicably possible, in no case shall a process vessel be vented to the atmosphere until the partial pressure of organic compounds in that vessel is less than 1000 mm Hg (4.6 psig).~~

(Amended 3/17/83, 3/20/83)

8-10-302 **Opening of Process Vessels:** No process vessel may be opened to the atmosphere unless the following requirements are met:

302.1 The partial pressure of organic compounds in the vessel must be less than 1000 mm Hg (4.6 psig);

302.2 Effective July 1, 2004, except as provided in Section 8-10-302.3, the internal concentration of total organic compounds must be reduced prior to release to atmosphere to less than 10,000 parts per million (ppm) expressed as methane (C_1).

302.3 Effective July 1, 2004, the number of vessels at a refinery or chemical plant that are opened when the internal concentration of organic compounds and methane is 10,000 ppm or greater may not exceed 10% of the total process vessel population for that refinery or chemical plant, and the organic compound emissions from the opening of each such vessel shall not exceed 15 pounds per day. No such vessel may be opened on any day on which the APCO predicts an exceedance of a National Ambient Air Quality Standard for ozone or declares a Spare the Air Day.

8-10-400 ADMINISTRATIVE REQUIREMENTS

8-10-401 ~~**Turnaround Records**~~ **Reporting:** ~~Refinery personnel shall keep records of each process unit turnaround, listing as a minimum:~~

~~401.1 The date of unit shutdown and/or depressurizing,~~

~~401.2 The approximate process vessel hydrocarbon concentration when the organic emissions were first discharged into the atmosphere, and~~

~~401.3 The approximate quantity of total precursor organic compounds emitted into the atmosphere. These records shall be kept for at least two (2) years and be made available to the APCO during any compliance inspection.~~

Any facility subject to the provisions of this rule shall submit an annual report to the Air Pollution Control Officer (APCO) containing the elements of Section 8-10-502. The annual report shall be submitted by February 1 of each year. By April 1, 2004, any facility subject to the provisions of this rule shall submit an initial report that lists each vessel, it's volume in cubic feet, and it's service type. The list shall be updated yearly, as necessary, and submitted with the annual report.

~~(Amended 3/17/82, 7/10/83)~~

~~**8-10-402 Increments of Progress:** A person who must modify existing sources or install new control equipment at chemical plants to comply with the requirements of this Rule shall comply with the following compliance schedule:~~

~~402.1 January 1, 1984: Submit to the APCO final control plan which describes, as a minimum, the steps, including a construction schedule, that will be taken to achieve compliance with such requirements.~~

~~402.2 July 1, 1984: Submit a completed application for any Authority to Construct necessary to achieve compliance with such requirements.~~

~~402.3 January 1, 1985: Be in compliance with all the requirements of this Rule.~~

~~(Amended July 20, 1983)~~

8-10-500 MONITORING AND RECORDS

8-10-501 Monitoring: Any vessel subject to this rule shall be monitored for the concentration of total organic compounds prior to opening and once per day during the time the vessel is open to the atmosphere. The sample shall be a representative sample of the internal atmosphere of the vessel. This section shall not apply if it can be demonstrated that the concentration of total organic compounds has been reduced to a concentration equal to or less than 100 ppm for three consecutive days.

8-10-502 Emission Monitoring: The meter used to measure the concentration of total organic compound emissions shall meet the accuracy requirements specified in EPA Method 21.

8-10-503 Records: Any facility subject to the provisions of this rule shall keep records of each vessel depressurization. The records shall include the following information:

503.1 The date, time, type of activity, and duration of depressurization and vessel opening,

503.2 The type of service, size and name or vessel identification number,

502.3 The measured total organic compound concentration and calculated mass emissions from each depressured vessel, including the sample location and any assumptions made in calculating the mass emissions,

503.4 The number and size of any air movers used to assure compliance with confined space entry requirements.

503.5 Records shall be maintained for at least 5 years and shall be made available to the APCO for inspection at any time.

8-10-600 MANUAL OF PROCEDURES

8-10-601 Monitoring Procedures: The procedures used to monitor emissions are set forth in EPA Method 21.

Bay Area Air Quality Management District

939 Ellis Street
San Francisco, CA 94109

Proposed Amendments

Regulation 8 Rule 10: Process Vessel Depressurization

Control Measure SS-17

Draft Staff Report

November 2003

Prepared by:

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I. EXECUTIVE SUMMARY

Bay Area 2001 Ozone Plan Control Measure SS-17, Process Vessel Depressurization proposes amendments to Bay Area Air Quality Management District (BAAQMD) Regulation 8, Rule 10; Process Vessel Depressurization (Reg 8-10) that would require more stringent controls on emissions from the depressurization of process vessels at refineries and chemical plants. These vessels typically process hydrocarbons and other materials, often under pressure. These vessels require periodic maintenance and repairs that may involve entry into the confined space by plant personnel. To make a vessel safe for entry, it must be purged of the hydrocarbons and other materials it contains. This purging requires great care in order to minimize any risk of explosion or risk to personnel. Typically, hydrocarbons are swept from a vessel by non-combustible purge gas until the hydrocarbon content is well below the level at which an explosion may occur. Once this level is reached, air can be used to purge remaining vapors from the vessel. Personnel may then enter the vessel to perform repairs or maintenance.

The proposed amendments implement Control Measure SS-17 by supplementing the existing control options with a concentration standard or a mass emission limit. The proposed major amendments to Regulation 8, Rule 10 will:

- Prohibit process vessels from venting to the atmosphere unless the emissions of total organic compounds are reduced to a concentration of below 10,000 parts per million (ppm);
- Limit the mass emissions of a limited number of vessels that exceed 10,000 ppm to below 15 pounds per day;
- Expand the number of process vessels covered by this rule; and
- Add monitoring and recording requirements to measure emissions vented to atmosphere once each 24-hour period.

These amendments will reduce emissions of organic and other pollutants, including toxic compounds. Staff has identified a potential reduction of 1 ton per day of precursor organic compounds with a total implementation cost of approximately $24,500 per year. The cost effectiveness is approximately $70 per ton of precursor organic compound emissions reduced.

II. BACKGROUND

A. Emission Source

Periodic maintenance and repair of process equipment are essential to refinery and chemical plant operations. The procedure for shutting down a process unit for maintenance or repair varies from refinery to refinery and from one process vessel to another. In general, shutdowns are accomplished by first shutting off the heat supply to the unit and circulating feedstock through the unit as it cools. Gas oil may be blended into the feedstock to prevent solidification of the product as the temperature drops. The cooled liquid is then pumped out to storage facilities, leaving hydrocarbon vapors in the unit. The pressure of the hydrocarbon vapors in the unit is reduced by venting the various components in the unit to a disposal facility such as a fuel gas system, a vapor recovery system, or a flare system. The residual hydrocarbons remaining in the unit after reducing the pressure are purged out with steam, nitrogen, chemical agents, and/or water. Any purged gases should be discharged to the disposal facilities. Condensed steam and water effluent that may contain hydrocarbon or malodorous compounds should be handled by closed water treatment systems.[1] Once the unit has been purged, air is then used to sweep out any remaining process gases so that personnel may safely enter the process unit.

A survey was conducted to determine the scope of applicability of the current rule and to review the methods presently used for depressurization of vessels. Plants listed in the District database were screened to determine the applicability of the existing rule. A portion of chemical plants screened was determined to be subject to other source specific regulations and exempt from Reg 8-10. Therefore, an exemption has been added for plants subject to other rules and to clarify the applicability of the rule to chemical plants not subject to other District rules and to petroleum refineries. The five Bay Area refineries participated in workgroup meetings, and submitted site-specific depressurization methods. Site visits were conducted to review records and procedures.

The procedures for depressurization were relatively consistent and demonstrated compliance with a combination of the compliance options provided for in the current regulation. The procedures emphasized recovery of gases that could be used as fuel, and disposing of those gases that have low heating value and would negatively impact the quality of fuel gas. Typically, inert gases include nitrogen, and steam. The methods for emission calculations varied. One facility obtains a grab sample from the depressurized vessel, analyzes the sample in their lab using gas chromatography, and then calculates the

[1] Air Pollution Engineering Manual

partial pressure of hydrocarbon and the mass emissions. Most facilities record the lower explosive limit (LEL) and estimate the mass emissions using the assumption that there are no emissions after one vessel volume turnover. No records are kept by the refineries beyond two years so there was insufficient data to verify this assumption. The proposed amendments would include a provision for daily monitoring and record retention for five years.

B. Rule Development History

Regulation 8, Rule 10 was adopted by the BAAQMD Board of Directors on March 17, 1982 and amended July 20, 1983. It is intended to limit emissions of precursor organic compounds from process vessel depressurization during refining unit turnarounds. It requires that organic compounds, after passing through a knockout pot to remove the condensable compounds, be: (1) recovered and combusted in the fuel gas system, (2) controlled and piped to an appropriate firebox or incinerator, (3) flared, or (4) contained and treated. Venting to the atmosphere is prohibited until the partial pressure of organic compounds in the vessel is less than 4.6 psig. Emission reductions from the implementation of the initial rule in 1982 were estimated by the Air Resource Board at over 17 tons of organics per year.[2]

In attainment plans for the state ozone standard (Clean Air Plans) from 1991 to 2000, the District included Control Measure C4: Improved Process Vessel Depressurization Rule. The measure originally focused on the control efficiency as the preferred means used to reduce emissions during depressurization. The measure proposed that carbon adsorption with a control efficiency of 95% be used. It also proposed that compressor capacity for the flare gas recovery systems be sufficient to recover flows from vessels during depressurization, thereby reducing flaring.[3] The measure was revised for the Bay Area 2000 Clean Air Plan to require abatement of emissions to continue below the pressure limit in the current rule to an unspecified lower pressure or concentration.[4]

Control Measure SS-17, Process Vessel Depressurization was included in the 2001 Ozone Attainment Plan for the national ozone standard. This measure is identical to Control Measure C4 from the 2000 Clean Air Plan. The measure identified 0.14 tons per day of precursor organic emissions as available for control. The proposal estimated a reduction of 0.07 tons per day to be achieved by a concentration standard or a reduction in the allowable pressure prior to opening the vessel to atmosphere. The proposed amendments include a prohibition on venting to atmosphere unless the total organic compounds prior to release are reduced to a concentration below 10,000 ppm, expressed

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[2] Air Resource Board, Response to Request for Information, December 23, 1980
[3] Bay Area '91 Clean Air Plan, Vol. III, Appendix G, Control Measure # C4.
[4] Bay Area 2000 Clean Air Plan, Control Measure # C4.

as methane or the total emissions from vessels having a concentration greater than 10,000 ppm be less than 15 pounds per day for a limited population of vessels.

C. Purpose of Proposed Regulation

The proposed amendments to Regulation 8, Rule 10, Process Vessel Depressurization are intended to implement Control Measure SS-17 from the Bay Area 2001 Ozone Attainment Plan. The purpose of the rule is to limit the amount of total organic compounds emitted to the atmosphere after a process vessel is depressurized and cleaned.

D. Means for Controlling Emissions

Prior to adoption of Regulation 8 Rule 10 in 1983, emissions from depressurized vessels were vented to the atmosphere. The regulation imposed control requirements consisting of thermal destruction or treatment until the partial pressure of hydrocarbon in a vessel was less than 4.6 psig. Although this was interpreted to mean the indicated vessel gauge pressure had to be less than 4.6 psig, depressurization typically achieved control by thermal destruction to a gauge pressure of 2-4 pounds. At this point the depressurized vessel was prepared for maintenance by venting to atmosphere any remaining emissions, off-gassing etc, with air movers. The movement of air through the vessel is essential to maintain a safe workspace. Standards for these conditions are set forth in permits required for confined space entry and county use permits.

The proposed amendments target the emissions vented to atmosphere. The options used to control emissions are left to the facility, while the level of control is mandated by the specified concentration or mass standard. These options would still include the existing methods of thermal destruction, however other options are available. These are likely to involve more extensive cleaning procedure either in the form of more time or alternate materials used for cleaning. Another option might involve portable abatement devices, for example a thermal oxidizer or carbon beds. Each of these options has unique factors to consider when choosing a compliance strategy. The facilities will have the flexibility to choose the option most suitable to their operational requirements.

The factors that need to be considered when choosing a control option include safety, cost, and degree of cleanliness. Safety issues were voiced during workgroup meetings when discussing portable abatement devices. Adding abatement collection components would add to mobility concerns in already confined spaces that occur during major maintenance turnarounds. Facility use permits might prohibit the introduction of a source of ignition within process units, such as a portable thermal oxidizer. Some suggest that an increase flammability risk might occur with contamination of carbon beds. These issues may be resolved with increased costs and proper monitoring and maintenance. The most probable choice for achieving the proposed emission standard is likely to be extended purging either with steam or chemical agents. None of the options require facilities to use any unsafe practices.

E. Means for Monitoring Emissions

The method for monitoring emissions is driven by Section 8-10-301.4 partial pressure of hydrocarbon less than 4.6 psig or conditions specified on the permit for confined space entry, typically 10% of the lower explosive limit (LEL). To determine the partial pressure of hydrocarbons in a vessel, a sample is collected then analyzed by gas chromatography. Confined space entry standards, OSHA regulation 29CFR1910.146 require the internal atmosphere be tested with a calibrated, direct-reading instrument for oxygen content, flammable gases, and if necessary toxic air contaminants. These checks are typically done using LEL meters which provide the percent LEL and oxygen level in the atmosphere. Other sensors may be used including carbon monoxide, hydrogen sulfide, etc.. Most manufacturers suggest the meters be calibrated using a known methane or pentane standard. However, a previous National Institute for Occupational Safety and Health (NIOSH) study found that manufacturer-recommended calibration techniques do not match instrument performance when monitoring jet fuel vapors. JP-8 and Jet-A fuels are generally C9 to C16 compounds. Because most LEL meters are calibrated against n-alkanes less than C9, some meters may underestimate the explosive potential of jet fuel vapor in tanks after removal of the most volatile components.[5]

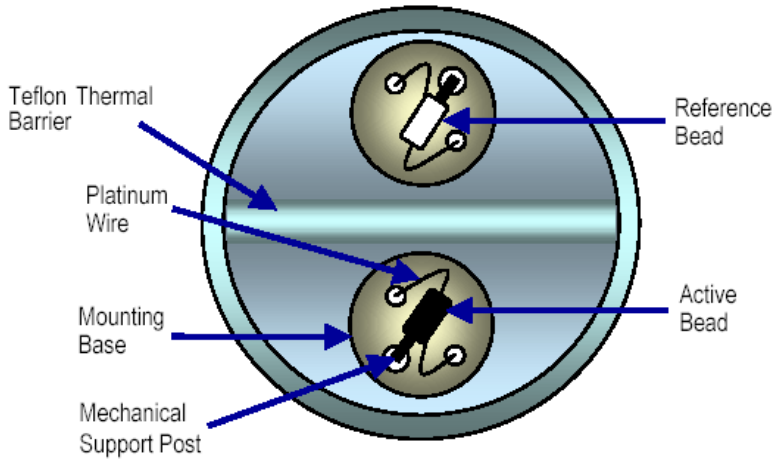

Fig. 1 Catalytic Bead Sensor

[5] FIELD-PRODUCED JP-8 STANDARD FOR CALIBRATION OF LOWER EXPLOSIVE LIMIT METERS USED BY JET FUEL TANK MAINTENANCE PERSONNEL. S. Martin, P. Jensen, NIOSH, Morgantown, WV; J. Pleil, US EPA, Research Triangle Park, NC

The principle of operation of an instrument measuring % LEL is called catalytic oxidation. When exposed to a mixture containing gases and oxygen, the measuring bead coating allows the oxygen and combustibles to combine at its surface, Figure 1. The energy produced by this reaction heats the measuring bead. The rise in temperature changes the bead's resistance and is related to the concentration of the combustible gas. This rise in temperature is generated by a constant-current supplied to the sensor. The sensor signal readout is indicated as percent LEL. The catalyst employed in these sensors is critical to the accuracy and life of the sensor, and impacts the variety of combustible gases the sensor can detect.

Although catalytic bead sensors have been in use for decades, the technology has some drawbacks. A main drawback is the inability to operate in an environment deficient in oxygen since the bead requires oxidation of hydrocarbon gas. Oxygen levels impact oxidation efficiency and the sensor's accuracy. Another drawback is sensor poisoning by chemical compounds such as silicones and sulfur compounds leading to a decline in catalytic activity. Contamination can show up during normal maintenance of the system as an increase in the response time to calibrate, recovery time after exposure and loss of exposure response. Since these conditions can occur without warning to the operator, electrocatalytic hydrocarbon sensors are not fail-to-safe. Fail-to-safe in this instance implies the sensor's ability to communicate its dysfunctional status to the operator. Catalytic sensors are still the sensors of choice when it comes to operating the sensor head above 75°C.

Hydrocarbon sensors based on infrared (IR) absorption principles do not suffer from the drawbacks of catalytic bead sensors. This leads to increased reliability and a hydrocarbon monitoring system that can operate maintenance free for years. IR absorption based instruments offer fail-to-safe operation because the optical technology is an active one, able to communicate the sensor's status and faults to the operator.

The IR method of measuring gas concentration is based on the absorption of IR radiation at certain wavelengths as the radiation passes through a volume of the gas. IR hydrocarbon gas detectors can be classified into two types known as point detectors and open path detectors. For point detectors, the absorption path length is fixed, and is determined by the instrument design to be a few inches. For the open path IR detectors, the absorption path length can be as long as 100 meters.

Instruments based on IR technology use two wavelengths, one at the gas-absorbing wavelength and the other at a wavelength not absorbed by the gas. IR detectors are immune to poisoning, resistant to corrosion, operate in a deficit or surplus oxygen atmosphere, and have no reduction in sensor life from repeated exposure to gas. With the sophisticated optical and electronic designs currently used, the detectors are factory

calibrated and virtually maintenance free. This is particularly desirable when sensors must be located in inaccessible areas and cannot be easily calibrated on a periodic basis. [6]

With flame ionization technology, the sample gas is mixed with a fuel (normally hydrogen) and burned in an atmosphere of "blanket air". The hydrogen delivery system provides a precise flow to the detector. Sample gathering is done by using a small diaphragm air pump. The sample delivery system provides air to the detector chamber to maintain the flame combustion and introduce the organic air contaminants for analysis. The ions formed in the burning process cause an electrical conduction between two electrodes in the combustion chamber (or detector cell) that is amplified by a highly sensitive electrometer-amplifier circuit. The electrical output of the electrometer-amplifier is directly proportional to the quantity of flame ionizable hydrocarbons present, and is linear over a wide range. Figure 2 illustrates both the hydrogen flow and air flow patterns in the OVA 128.

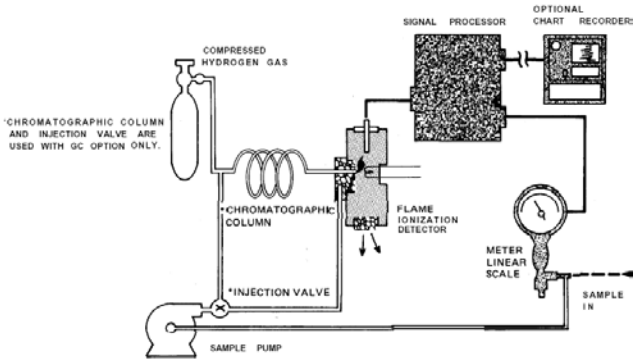

Figure 2 OVA 128[7]

Staff considered three technologies to monitor the emissions from depressured vessels. Table 1 suggests some advantages and disadvantages of each technology. The proposed amendments specify the use of a meter that meets the accuracy requirements of EPA Method 21.

[6] INFRARED TECHNOLOGY FOR FAIL-TO-SAFE HYDROCARBON GAS DETECTION, Dr. Shankar Baliga, Senior Development Scientist, General Monitors

[7] Century OVA 128 Portable Hydrocarbon Analyzer Product Specification Brochure

Table 1: Monitoring Technology Comparision

TECHNOLOGY	ADVANTAGE	DISADVANTAGE
Catalytic detectors	Robust	Catalysts can become poisoned or inactive due to contamination
	Simple to operate	The only means of identifying detector sensitivity loss due to catalytic poisons is by checking with the appropriate gas on a routine basis and recalibrating as required.
	Easy to install, calibrate and use	Requires oxygen for detection.
	Long life with a low life-cycle cost	Prolonged exposure to high concentrations of combustible gas may degrade sensor performance.
	Proven technology currently in use by refiners.	
Flame ionization	Universal organic compound response with approximately the same high sensitivity for all	The initial cost is higher than catalytic detectors.
	Flame ionization will not respond to changes in relative humidity or changes in CO and CO2 concentration.	More difficult to calibrate and maintain than catalytic detectors.
	A mass sensing detector which exhibits minimal effects from changes in temperature, pressure, or flow.	High maintenance cost compared to catalytic detectors.
	Provides excellent dynamic range and concentration linearity.	Requires a fuel source.
Infrared	High resistance to contamination and poisoning	Initial higher cost per point. IR detectors in the past have been more expensive than catalytic detectors at initial purchase, but they are rapidly coming down in price to cost parity with catalytic detectors.
	Fail-to-safe operation	Higher spare parts cost.
	Ability to operate in the absence of oxygen or in enriched oxygen	The gas to be measured must be infrared active, such as a hydrocarbon.
		Gases that do not absorb IR energy (such as hydrogen) are not detectable.
		High humidity, dusty and/or corrosive field environments can increase IR detector maintenance costs.
		Routine calibration to a different gas is not practical.
		A relatively large volume of gas is required for response testing.
		Does not perform well for multiple gas applications.
		Cannot replace the IR source in the field – must be returned to factory for repair.

III. PROPOSED RULE

The proposed amendments to Regulation 8, Rule 10, Process Vessel Depressurization would replace the existing control options with a concentration standard or a mass emission limit. A new provision will add a requirement to measure total organic compounds initially upon the opening of the vessel to the atmosphere and once per 24-hour period during the time the vessel is open. Monitoring and recording requirements are added to reflect these changes. Table 2 is a summary of the proposed amendments.

Table 2: Summary of Proposed Amendments

REGULATION SECTION #	DESCRIPTION
8-10-101	Adds language to describe control of emissions from depressurizing and opening process vessels.
8-10-110	Adds an exemption for sources subject to other rules including: Regulation 8, Rule 24, Pharmaceutical And Cosmetic Manufacturing Operations; Regulation 8, Rule 35, Coating, Ink And Adhesive Manufacturing; Regulation 8, Rule 36, Resin Manufacturing; Regulation 8, Rule 41, Vegetable Oil Manufacturing; Regulation 8, Rule 50, Polyester Resin Operations; Regulation 8, Rule 52, Polystyrene, Polypropylene And Polyethylene Foam Product Manufacturing.
8-10-111	Obsolete requirement, no longer necessary. Replaced with an exemption during monitoring.
8-10-112	Adds an exemption for measurement periods.
8-10-113	Adds an exemption for vessels volume smaller than 100 cubic feet.
8-10-201	Updates the definition of a chemical plant to reflect the proper standard industrial classification number.
8-10-202	Updates the definition of a petroleum refinery to reflect the proper standard industrial classification number.
8-10-204	Expands the definition of process vessels to include other containers.
8-10-205	Adds a definition for organic compounds.
8-10-206	Adds a definition for total organic compounds.
8-10-301	Clarifies control options during depressurization.
8-10-302	Adds an emission limitation on vessel openings.
8-10-401	Adds an annual reporting requirement.
8-10-402	Deletes obsolete requirements for chemical plants.
8-10-501	Adds monitoring protocols.
8-10-502	Adds specifications for emission monitoring.
8-10-503	Adds specifications for record keeping.
8-10-601	Adds a method to measure emissions.

Discussion of Proposed Language

Section I - Draft Amendments

Exemptions

8-10-101 Description: The purpose of this Rule is to limit emissions of total ~~precusor~~ organic compounds from depressuring and opening of process vessels ~~depressurization~~ at petroleum refineries and chemical plants.

The proposed changes describe the intent to limit the amount of total organic emissions vented to the atmosphere. This reflects the change from specifying options to handle materials from vessel depressurization.

8-10-110 Exemption, Equipment Subject to Other Rules ~~Storage Vessels:~~ ~~The requirements of Section 8-10-301 shall not apply to stationary containers used solely for the storage of an organic liquid.~~ The provisions of this rule shall not apply to vessels that are subject to the following Regulation 8 rules;

110.1 Regulation 8, Rule 5, Storage of Organic Liquids.
110.2 Regulation 8, Rule 24, Pharmaceutical And Cosmetic Manufacturing Operations.
110.3 Regulation 8, Rule 35, Coating, Ink And Adhesive Manufacturing.
110.4 Regulation 8, Rule 36, Resin Manufacturing.
110.5 Regulation 8, Rule 41, Vegetable Oil Manufacturing Operations.
110.6 Regulation 8, Rule 50, Polyester Resin Operations.
110.7 Regulation 8, Rule 52, Polystyrene, Polypropylene And Polyethylene Foam Product Manufacturing Operations.

Section 8-10-110 exemptions are proposed for adoption to eliminate duplication of standards for vessels under the jurisdiction of existing District regulations. The California Health & Safety Code requires that any amendments or proposals to a rule must be nonduplicative. The exemptions reference the appropriate existing District regulation for the specific source operation.

~~**8-10-111 Exemption, Chemical Plants:** The provisions of Section 8-10-301 shall not apply to chemical plants until January 1, 1985.~~

The exemption in Section 8-10-111 for chemical plants is proposed for deletion due to obsolete requirements.

8-10-111 Limited Exemption, Emissions During Measurement: The provisions of Section 8-10-301 shall not apply during periods of measurements, which are necessary to demonstrate compliance with the concentration and mass limits of this rule.

This language is necessary to distinguish emissions released due to compliance monitoring from those released from normal depressurization activities. Sample locations vary and may include sample taps, bleeder valves, and/or open manways located at various positions on the vessel. The most significant release would occur if measurements are taken from open manways. Staff is of the opinion that the amounts of emissions are statistically insignificant and are in need of exemption to allow compliance monitoring.

8-10-113 Exemption, Small Vessels: The requirements of this Rule shall not apply to any process vessel with a volume of less than 100 cubic feet (ft^3).

This language was added to exclude small vessels that are not defined as a permit required confined space and subject to entry standards. They are not large enough to enter for maintenance work. The emissions during depressurization are handled the same as larger vessels, recovered into a fuel gas system, flared, or combusted in an appropriate firebox or incinerator. The emissions form opening these containers are likely insignificant.

Definitions

8-10-201 Chemical Plant: Any facility engaged in producing organic or inorganic chemicals and/or manufacturing products by chemical processes. Any facility or operation that has ~~28~~ 325 as the first ~~two~~ three digits in their ~~Standard Industrial Classification Code~~ as determined from the ~~Standard Industrial Classification Manual published in 1972 by the Executive Office of the President, Office of Management and Budget~~ North American Industrial Classification Standard (NAICS). Chemical plants may include, but are not limited to the manufacture of: industrial inorganic and organic chemicals; plastic and synthetic resins, synthetic rubber, synthetic and other man made fibers; drugs; soap, detergents and cleaning preparations, perfumes, cosmetics and other toilet preparations; paints, varnishes, lacquers, enamels and allied products; agricultural chemicals; safflower and sunflower oil extracts; re-refining.

8-10-202 Petroleum Refinery: ~~Any facility engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants or other products through distillation of petroleum or through redistillation, cracking, rearrangement or reforming of unfinished petroleum derivatives.~~ A facility that processes petroleum, as defined in the North American Industrial Classification Standard No. 32411 (1997).

Section 8-10-201 & 202: The Standard Industrial Classification (SIC) code, established by the Bureau of Census to track the flow of goods and services within the economy, is a statistical classification standard used for all establishment-based Federal economic statistics. The SIC codes facilitate comparisons between facility and industry data. The facilities we call "chemical plants" all appeared in the 1987 SIC (the last update to the SIC codes) under standards with numbers that began with the digits "28." The SIC code system was replaced by the North American Industrial Classification Standard (NAICS) code. Under the NAICS, almost all of these industrial categories now have 5 or 6-digit numbers beginning with "325," but there are some minor exceptions that are probably not

an issue in the Bay Area (e.g., sulfur recovery from natural gas production, alumina refining, table salt manufacturing). The petroleum refining industry was classified as SIC 2911, which includes the production of petroleum products through distillation and fractionation of crude oil, redistillation of unfinished petroleum derivatives, cracking, or other processes.[8] NAICS was developed jointly by the U.S., Canada, and Mexico to provide new comparability in statistics about business activity across North America. The proposed amendment for Section 202 is to change the code number to the NAICS classification #32411 for petroleum refineries.

8-10-204 **Process Vessel:** Any vessel in which organic compounds are fractionated ~~on more than one tray or on packing~~, ~~or~~ chemically reacted, ~~or~~ washed or purified. These vessels include reactors, columns, accumulator vessels, knockout pots, surge/settling drums and other similar devices that are greater than 10 cubic feet (ft^3).

The definition of process vessel is proposed to be expanded to include other containers that have the potential to emit total organic compounds. These vessels were not subject to the existing depressurization standard, are typically smaller in size than regulated vessels, however there are a larger number of these vessels.

8-10-205 **Organic Compound:** Any compound of carbon, excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates and ammonium carbonate.

8-10-206 **Total Organic Compounds:** All organic compounds of carbon including methane, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates and ammonium carbonate, that would be emitted to the atmosphere.

These definitions were added to clarify the intent to include methane as a regulated compound. Some researchers have demonstrated the need to consider methane in global ozone formation.[9]

Standards

8-10-301 **Process Vessel Depressurizing:** ~~The control~~ Emissions of ~~precursor~~ total organic compounds ~~emissions~~ from depressurizing any process vessel at a petroleum refinery or a chemical plant ~~during a process unit turnaround~~ shall be ~~accomplished so that the organic compounds, after passing through a knockout pot to remove the condensable fraction, must either be:~~ controlled by venting them to a ~~301.1 Recovered (add to the~~ fuel gas system~~) and combusted~~,

[8] EPA Sector Notebook, 1995

[9] Linking Ozone Pollution And Climate Change:The Case For Controlling Methane, GEOPHYSICAL RESEARCH LETTERS, VOL. 29, NO. 19, 1919, Doi:10.1029/2002GL015601, 2002

~~301.2 Controlled and piped to an appropriate~~ firebox, ~~or~~ incinerator ~~for combustion,~~
~~301.3 F~~flared~~,~~ or otherwise
~~301.4 C~~contained and treated so as to prevent their emissions to the atmosphere. ~~Such procedures shall continue until the pressure within the process vessel is as close to atmospheric pressure as practicably possible, in no case shall a process vessel be vented to the atmosphere until the partial pressure of organic compounds in that vessel is less than 1000 mm Hg (4.6 psig).~~

(Amended 3/17/83, 3/20/83)

8-10-302 Opening of Process Vessels: No process vessel may be opened to the atmosphere unless the following requirements are met:

302.1 The partial pressure of organic compounds in the vessel must be less than 1000 mm Hg (4.6 psig);

302.2 Except as provided in Section 8-10-302.3, the internal concentration of total organic compounds must be reduced prior to release to atmosphere to less than 10,000 parts per million (ppm) expressed as methane (C_1).

302.3 The number of vessels at a refinery or chemical plant that are opened when the internal concentration of organic compounds and methane is 10,000 ppm or greater may not exceed 10% of the total process vessel population for that refinery or chemical plant, and the organic compound emissions from the opening of each such vessel shall not exceed 15 pounds per day. No such vessel may be opened on any day on which the APCO predicts an exceedance of a National Ambient Air Quality Standard for ozone or declares a Spare the Air Day.

These sections establish a limit on the amount of total organic compounds that may be emitted from a process vessel. Staff considered existing refinery practices, other District's Standards (Appendix), and similar District standards to establish the concentration standard. The existing control options are retained to control emissions during depressurization. A standard was added to prohibit venting to atmosphere until the total organic compounds are reduced to a concentration of less than 10,000 ppm, expressed as methane. A mass emission limit was developed to limit the total daily organic emissions. This provision was developed in response to the discussion on the issue of the cost of and the time it takes to bring into compliance those vessels, which have indicated concentrations greater than 10,000 ppm. It would not apply on days that the District predicts an excess of any Federal Ambient Air Quality Standard for ozone. The information available was not sufficient to determine the actual time it takes to achieve an internal atmospheric concentration of less than 10,000 ppm, however the mass calculations indicate that 15 pounds per day is feasible.

Refinery practices for entering vessels are guided by Occupational Safety And Health Standards, Part 1910, Sec.1910.146 Permit-Required Confined Spaces. The code contains elements required to protect worker health and safety for permit-required confined spaces. It requires an employer to develop an overall program for controlling, and protecting employees from permit space hazards and for regulating employee entry into spaces safely into the vessel. One element is evaluation testing, where the atmosphere of a confined space is analyzed using equipment of sufficient sensitivity and

specificity to identify and evaluate any hazardous atmospheres that may exist or arise, so that appropriate permit entry procedures can be developed and acceptable entry conditions stipulated. Combustible gasses are tested after oxygen levels and before toxic gases because the threat of fire or explosion is both more immediate and more life threatening, in most cases, than exposure to toxic gasses and vapors. The level generally established in the industry is to achieve 10% of the LEL, although some procedures specify 2% and actual levels tend towards zero. Staff reviewed these values to develop the concentration standard. A list of the LEL of various compounds can be found in the Appendix.

Administrative Requirements

8-10-401 ~~**Turnaround Records**~~ **Reporting:** ~~Refinery personnel shall keep records of each process unit turnaround, listing as a minimum:~~

~~401.1 The date of unit shutdown and/or depressurizing,~~

~~401.2 The approximate process vessel hydrocarbon concentration when the organic emissions were first discharged into the atmosphere, and~~

~~401.3 The approximate quantity of total precursor organic compounds emitted into the atmosphere. These records shall be kept for at least two (2) years and be made available to the APCO during any compliance inspection.~~

Any facility subject to the provisions of this rule shall submit an annual report to the Air Pollution Control Officer (APCO) containing the elements of Section 8-10-502. The annual report shall be submitted by February 1 of each year. By April 1, 2004, any facility subject to the provisions of this rule shall submit an initial report that lists each vessel, it's volume in cubic feet, and it's service type. The list shall be updated yearly, as necessary, and submitted with the annual report.

Section 8-10-401: The elements required for records are proposed to be incorporated into the 500 Section of the rule for Monitoring and Records. A requirement to submit an annual report was added to allow periodic review of inventory changes for future emission reduction planning. This frequency was selected based on the need to gather timely information for future air quality planning. Language was added to identify the due date of the annual report, and to require submittal of the facilities vessel inventory including the volume of the vessel and the type of material typically handled in the vessel.

~~**8-10-402 Increments of Progress:** A person who must modify existing sources or install new control equipment at chemical plants to comply with the requirements of this Rule shall comply with the following compliance schedule:~~

~~402.1 January 1, 1984: Submit to the APCO final control plan which describes, as a minimum, the steps, including a construction schedule, that will be taken to achieve compliance with such requirements.~~

~~402.2 July 1, 1984: Submit a completed application for any Authority to Construct necessary to achieve compliance with such requirements.~~

~~402.3 January 1, 1985: Be in compliance with all the requirements of this Rule.~~

Section 8-10-402: This section is proposed to be deleted due to the obsolete increments of progress for chemical plants.

Monitoring and Records

8-10-501 **Monitoring:** Any vessel subject to this rule shall be monitored for the concentration of total organic compounds prior to opening and once per day during the time the vessel is open to the atmosphere. The sample shall be a representative sample of the internal atmosphere of the vessel. This section shall not apply if it can be demonstrated that the concentration of total organic compounds has been reduced to a concentration equal to or less than 100 ppm for three consecutive days.

Section 8-10-501: This section is proposed to specify procedure for measuring emissions from depressurized process vessels. The intent is to ensure that a representative sample of the internal atmosphere of the vessel is acquired while providing some flexibility in sampling locations. The purpose of the increased frequency for measuring emissions is to verify the cleanliness of the vessel and to determine the emissions after a number of air changes in the vessel. This data will be used for future air quality planning.

A provision was added that considers minimizing costs associated with monitoring. If it can be demonstrated that the emissions are minimized and static, then a facility would be considered in compliance with the daily monitoring requirements. This provision has the potential to reduce the cost of monitoring given that some vessels may remain open for 30 days.

8-10-502 **Emission Monitoring:** The meter used to measure the concentration of total organic compound emissions shall meet the accuracy requirements specified in EPA Method 21.

Section 8-10-502: The specification for meter accuracy proposed in this section references EPA standards (Appendix). These elements include the following: (1) response time, (2) detection technology, (3) scale of the instrument, (4) sample flow rate, (5) response factor, and (6) calibration precision and frequency.

8-10-503 **Records:** Any facility subject to the provisions of this rule shall keep records of each vessel depressurization. The records shall include the following information:

503.1 The date, time, type of activity, and duration of depressurization and vessel opening,

503.2 The type of service, size and name or vessel identification number,

502.3 The measured total organic compound concentration and calculated mass emissions from each depressured vessel, including the sample location and any assumptions made in calculating the mass emissions,

503.4 The number and size of any air movers used to assure compliance with confined space entry requirements.

503.5 Records shall be maintained for at least 5 years and shall be made available to the APCO for inspection at any time.

Section 8-10-503: This section adds elements to the previously required information for records, Section 401. It specifies the information to be tracked including the date, time, and duration of the turnaround, vessel identification including the volume and material processed, and the concentration and calculated mass of emissions for the vessel turnaround. The additional elements that were added include tracking the time of the vessel opening, the type of activity, the sample location, and any assumptions used in the calculation of mass emissions. These clarifying points; (1) distinguish the time between the process of vessel depressurization from the actual time the vessel is open to the atmosphere, (2) collect information about any activity associated with the vessel, and (3) provide site and vessel specific information for emission calculations. In addition, the record retention period is expanded to five years to correspond to Title V requirements.

Manual of Procedures

8-10-601 Monitoring Procedures: The procedures used to monitor emissions are set forth in EPA Method 21.

This section was added to specify a method (EPA Method 21) to use when monitoring the concentration of organic emissions from open vessels.

IV. EMISSIONS AND EMISSION REDUCTIONS

The frequency of turnarounds varies depending on the process unit. The typical time between turnarounds is generally three to four years. Some process units go for as long as ten years between turnarounds. The current rule requires retention of records for two years. This factor limits the data available for analysis. Staff requested records for the prior two years and received information from three of the five refineries. This information was used to determine the quantity of precursor organic compounds available for reduction, the potential emissions allowed by the current rule, and the estimated reduction if the proposed limit is adopted. Table 3 shows the summary of emissions.

The emissions allowed by the current rule are shown as approximately one ton per day. This is a conservative estimate and assumes that a vessel is hydrocarbon free after one volume turnover. The potential to emit is likely higher due to factors that affect the cleanliness of the vessel, such as material off-gassing from catalysts or remaining liquids, clingage to the vessel walls and internal components, and turnaround timelines. The proposed amendments gather information necessary to calculate the mass of emissions.

Table 3: Estimated Precursor Organics[1]

REFINERY	REFINERY ESTIMATE[2] (pounds per day)		ALLOWED BY CURRENT RULE[3] (pounds per day)	
YEAR	2002	2003	2002	2003
Refinery A	0.56	0.42	382	148
Refinery B	0.19	0.57	340	730
Refinery C	4.22	N/A		
Refinery D[4]	N/C	N/C		
Refinery E	N/A	N/A		
Bay Area[5]	1.88	2.5	1,805	2,195

[1] Methane content at 1% (District Sample Analysis, Lab # 02-144)
[2] Calculated mass emissions from refinery records
[3] Assumes no clingage, no outgassing, no liquid in vessel, a molecular weight of 100, a molar volume of 379 cubic feet per pound mole.
[4] Values given are as either greater or less than 10% LEL. N/C-not calculated
[5] Assumes 2 of 5 (A&B) refineries 2 yr data set is representative of all refineries

V. Economic Impacts

A. Socioeconomic Impacts

Section 40728.5 of the Health and Safety Code requires an air district to assess the socioeconomic impacts of the adoption, amendment, or repeal of a rule if the rule is one that "will significantly affect air quality or emissions limitations." Applied Economic Development, Berkeley, California, is preparing a cost analysis.

B. Costs

The proposed amendments impose requirements that differ only slightly from existing practice. There are some minor costs associated with a change in monitoring equipment for those facilities that switch to flame or photoionization detectors for surveying emissions from vessel depressurization. Generally, facilities use catalytic detectors to monitor confined space atmospheres. Although flame ionization detectors are used for fugitive surveys, for example to determine compliance with District Regulation 8, Rule 18, Equipment Leaks, some refineries reported that extra staff, specialized training, and higher quality calibration gases would be required to monitor process vessel depressurization. This would be necessary to insure compliance with OSHA standards (…a user shall be properly trained on the meter used to measure…), and the accuracy requirements of Method 21. The workgroup discussed capability of meeting Method 21 by the existing LEL technology. Manufacturers have suggested that new meters meet Method 21, and EPA has listed the technology as an approved technology in Method 21.

Industry stated that based on current depressurization procedures a few vessels would be in violation of the proposed standard. Currently, there is insufficient information available to determine the additional time and methods necessary to meet the standard. An estimate was developed based on the presumed cost of an additional day of cleaning. Table 5 is staff's estimate of the various cost items that may be imposed by the proposed rule.

Table 5: Cost Estimate Per Facility

COST ITEM	COST ITEM
Records[1]	$360
Maintenance & Calibration[2]	$1,540
Monitoring[3]	$22,500
Total	$24,500

[1] $30/hr for 12 hours (one hour per month for 12 months)

[2] 10% of equipment purchase price (EPA Cost Manual), Includes Parts and Calibration once per quarter

[3] 300 vessels, annual cost at one half-hour per vessel monitored once per day for 15 days every 3 years at $30/hr

Table 5 is an estimate of costs associated with the implementation of the proposed amendments. These amendments will reduce emissions of organic and other pollutants, including toxic compounds. Staff has identified a potential State Implementation Plan (SIP) emission reduction credit of 1 ton per day with a total implementation cost of approximately $24,500 per year. The cost effectiveness is approximately $70 per ton of precursor organic compound emissions reduced.

C. Incremental Costs

Under Health and Safety Code Section 40920.6, the District is required to perform an incremental cost analysis when adopting a Best Available Retrofit Control Technology (BARCT) rule or feasible measure required by the California Clean Air Act. To perform this analysis, the District must (1) identify one or more control options achieving the emission reduction objectives for the proposed rule, (2) determine the cost effectiveness for each option, and (3) calculate the incremental cost effectiveness for each option. To determine incremental costs, the District must "calculate the difference in the dollar costs divided by the difference in the emission reduction potentials between each progressively more stringent potential control option as compared to the next less expensive control option." The proposed amendments to Regulation 8, Rule 10 are intended to implement Control Measure SS-17 from the Bay Area 2001 Ozone Attainment Plan and Control Measure C4 from the Bay Area 2000 Clean Air Plan. Because Control Measure C4 is intended to meet feasible measure requirements under the California Clean Air Act, an incremental cost analysis is required.

During the rule development process, two control options were discussed: (1) measure all vessels and determine emissions, and (2) limit emissions to 10,000 ppm. Option 1 would require monitoring and reporting of data. Option 2 would be a standard that would limit emissions to 10,000 ppm. The cost of monitoring for each option was assumed to be the same. A summary of these costs is listed in Table 5 and is discussed in the next section.

Option 1 assumes that the only additional costs would be the daily monitoring and recordkeeping requirements. This is based on existing requirements. Option 2 assumes rental costs for regenerative systems at $5,000 per day. This assumption was based on discussions at workgroup meetings.

Table 4: Total Incremental Cost Effectiveness for All Facilities

	Cost ($/year)	Emission Reduction (tons/year)	Cost Per Ton of Emissions ($/ton)	Incremental Cost ($/ton)
Option 1	122,000	266	450	---
Option 2	228,000	298	750	300

VI. ENVIRONMENTAL IMPACTS

Pursuant to the California Environmental Quality Act, the District will prepare an initial study for the proposed amendments to determine whether they would result in any significant environmental impacts. It is expected that adoption of the proposed amendments will create environmental benefits from a reduction in emissions of both total and toxic organic compounds.

VII. REGULATORY IMPACTS

California Health and Safety Code Section 40727.2 require the District to identify existing federal air pollution control requirements for the equipment or source type affected by the proposed rule or regulation. The District must then note any differences between these existing requirements and the requirements imposed by the proposed rule. Regulation 8, Rule 10: Process Vessel Depressurization, applies to specific vessels in refineries and chemical plants when depressuring a vessel. The proposed amendments expand the applicability to a greater number of process vessels and limit the emissions after depressurization. No federal air pollution control requirement was identified for the equipment or source type affected by the proposed rule or regulation.

VIII. RULE DEVELOPMENT HISTORY

A workgoup was formed that included representatives from California Air Resources Board, Industry, Communities for a Better Environment, and District Staff. The workgroup has met three times to discuss technical issues. The issues discussed included the definition of process vessel, current methods used to determine emissions to the atmosphere, methods used to clean and purge vessels, interpreting existing data, emission limitations and controls. A public workshop was held on October 28, 2003 to present proposed language and discuss technical issues. As of this report, no written comments have been submitted. The issue of most concern was the proposed requirement to use EPA Method 21 for monitoring emissions. Industry was of the opinion that the specifications in the method added costs with little gains. They based this opinion on the need to adhere to the calibration and performance specifications of the instrument used to measure emissions in addition to the added time for training and monitoring. This is relevant for those facilities that contract out for monitoring, and/or use a basic LEL meter. The method has flexibility in the type of meter that may be used to monitor emissions. The requirements for calibration are similar to existing procedures (OSHA requires “the use of a calibrated meter”), however some meters in use may not meet the performance specification. In these cases an increased cost would be incurred, however

staff is of the opinion these costs are insignificant.

IX. DISTRICT STAFF IMPACTS

Implementation of the proposed regulation will have a limited impact on the District's resources. However, these changes are essential and necessary in order to satisfy the commitments in the Bay Area 2001 Ozone Attainment Plan. Staff will need to verify the vessel concentration during turnarounds, review reports and records, and collect and analyze gas samples for selected vessels.

X. CONCLUSION

The proposed amendments to Regulation 8, Rule 10, Process Vessel Depressurization will meet the commitments made during the adoption of the 2001 Ozone Attainment Plan for Control Measure SS-17. It is intended to limit the amount of precursor organic compounds released after a vessel has been cleaned, depressurized and opened for entry.

Pursuant to the Health and Safety Code Section 40727, new regulations must meet necessity, authority, clarity, consistency, non-duplicity and reference. The proposed regulation is:

- Necessary to meet control measure SS-17 in the Bay Area 2001 Ozone Attainment Plan.
- Authorized by California Health and Safety Code Section 40702.
- Clear, in that the new regulation specifically delineates the affected industry, compliance options and administrative requirements for industry subject to this rule,
- Consistent with other District rules, and not in conflict with state or federal law,
- Non-duplicative of other statutes, rules or regulations, and
- The proposed regulation properly references the applicable District rules and test methods and does not reference other existing law.

The proposed regulation has met all legal noticing requirements and has been discussed with all interested parties. District staff recommends adoption of Regulation 8, Rule 10: Process Vessel Depressurization.

XI. REFERENCES

Air Pollution Engineering Manual

FIELD-PRODUCED JP-8 STANDARD FOR CALIBRATION OF LOWER EXPLOSIVE LIMIT METERS USED BY JET FUEL TANK MAINTENANCE PERSONNEL. S. Martin, P. Jensen, NIOSH, Morgantown, WV; J. Pleil, US EPA, Research Triangle Park, NC.

INFRARED TECHNOLOGY FOR FAIL-TO-SAFE HYDROCARBON GAS DETECTION, Dr. Shankar Baliga, Senior Development Scientist, General Monitors

Century OVA 128 Portable Hydrocarbon Analyzer Product Specification Brochure

Control Measure C4, Technical Assessment Document, October 9, 1991

EPA Sector Notebook, 1995

EPA Cost Manual, January 2002

Bay Area 2001 Ozone Attainment Plan, adopted October 24, 2001

XII. Appendix

Flammable Properties

COMPOUND	MOLECULAR WEIGHT	LEL (volume %)	LEL (PPM)	10% LEL (expressed as ppm C_1)
Methane	16.04	5.00	50,000	5,000
Ethane	30.07	3.00	30,000	6,000
Propane	44.09	2.12	21,200	6,360
Butane	58.12	1.86	18,600	7,440
Pentane	72.15	1.40	14,000	7,000
Hexane	86.17	1.18	11,800	7,080
Octane	114.23	0.95	9,500	7,600
Nonane	128.25	0.83	8,300	7,470
Decane	142.28	0.77	7,700	7,700
Ethylene	28.05	2.75	2,750	550
Propylene	42.08	2.00	2,000	600
Acetylene	26.04	2.50	2,500	500
Cyclohexane	84.16	1.26	1,260	756
Benzene	78.11	1.40	1,400	840
Toluene	92.13	1.27	1,270	889

INVENTORIES

Bay Area District, Emissions-Program Code 280, Category 20

Base year 1999: 12 pounds per day precursor organic
Summer 1999: 200 pounds per day precursor organic
Base Year 2002: 2 pounds per day precursor organic

Vessel Volume (ft3)	Reported Emissions (lbs/year)
Refinery A: 375,000[1]	48
Refinery B: 243,405[1]	60
Refinery C: 724,477[2]	7[3]
Refinery D:	
Refinery E:	

[1] Average of 2002 & 2003
[2] Refinery Total
[3] Average of 2001 & 2002

AGENCY	PROVISIONS
San Joaquin Valley Rule 4454: Refinery Process Unit Turnaround	A person shall depressurize any vessel containing VOCs unless: 4.1 The organic vapors shall either be: 4.1.1 Recovered, added to the refinery fuel gas system and combusted; or 4.1.2 Controlled and piped to an appropriate firebox or incinerated for combustion; or 4.1.3 Flared, until the pressure within the process vessel is as close to atmospheric pressure as is possible. 4.2 All process vessels shall be depressurized into the control facilities to less than 1020 mm Hg (5 psig) before venting/opening to atmosphere.
San Luis Obispo Rule 442: Refinery Process Turnarounds	A. A person shall not vent organic compounds to the atmosphere during the depressurization or the vessel purging steps of a refinery process turnaround. B. venting all uncondensed organic gases to a fuel gas system or to a flare
Santa Barbara Rule 322: Process Turnarounds	1. A person shall not vent organic compounds to the atmosphere during process depressurization or the vessel purging steps of a refinery process turnaround. 2. venting all uncondensed organic gases to a fuel gas system or to a flare
South Coast Rule 1123: Refinery Process Unit Turnaround	collected and contained for use as fuel or sent to a gas disposal system until the pressure in the vessel is below five pounds per square inch, gauge, or is within ten percent above the minimum gauge pressure at which the vapors can be collected, whichever is lower. For every refinery that uses inert gas displacement or vacuum eduction for process turnaround, a person operating the refinery shall submit to the Executive Officer a plan which describes at least the following: (A) the procedure used for gas displacement or eduction; (B) the disposition of the displaced or educed organic gases; (C) the stage in the displacement or eduction procedure at which the disposition is changed from a control facility to atmospheric venting (D) the criteria by which said stage is identifiable. Any vessel, or group of vessels, that has been depressurized to less than five pounds per square inch, gauge, shall be exempted
Ventura Rule 74.8: Refinery Process Turnarounds	1. A person shall not vent reactive organic compounds to the atmosphere 1. venting all uncondensed reactive organic compound gases to a fuel gas system or to a flare

BAY AREA AIR QUALITY MANGEMENT DISTRICT
Memorandum

To: Chairperson DeSaulnier and Members of the Stationary Source Committee

From: William C. Norton
Executive Officer/APCO

Date: November 20, 2003

Re: Report on Control Measure 16 – Proposed Amendments to Regulation 8, Rule 18: Equipment Leaks

RECOMMENDED ACTION:

This item is a report on proposed amendments for information and comment. No action is necessary.

BACKGROUND

Bay Area 2001 Ozone Plan Control Measure SS-16, proposes amendments to Regulation 8, Rule 18: Equipment Leaks. It proposes replacing leaking valves with leakless technology. Staff has worked cooperatively with industry, environmental groups and the Air Resources Board to develop the proposed amendments.

DISCUSSION

The proposed amendments will implement SS-16 by ensuring the Best Available Control Technologies are used to reduce emissions.

The proposed major amendments to Regulation 8, Rule 18 will:

- Reduce the number of components allowed on a non-repairable list;
- Set a maximum leak standard at 10,000 parts per million; and
- Allow connections to be placed on a non-repairable list at a ratio of one connection per two valves.

These amendments will reduce emissions of organic and other pollutants, including toxic compounds. Staff has identified a potential State Implementation Plan (SIP) emission reduction credit of 0.2 ton per day with a total implementation cost of $23,500 to $118,000 per year. The cost effectiveness is approximately $320 to $1600 per ton of precursor organic compound emissions reduced.

The attached regulation and staff report are draft documents to allow for California Environmental Quality Act (CEQA) review and public comment. The public hearing to consider the proposed amendments is scheduled for January 21, 2004.

Respectfully submitted,

William C. Norton
Executive Officer/APCO

Attachments:
Draft Regulation 8, Rule 18
Draft Staff Report for Regulation 8, Rule 18 (Appendices omitted)

REGULATION 8
ORGANIC COMPOUNDS
RULE 18
EQUIPMENT LEAKS

INDEX

REGULATION 8
ORGANIC COMPOUNDS
RULE 18
EQUIPMENT LEAKS

(Adopted October 1, 1980)

8-18-100 GENERAL

8-18-101 Description: The purpose of this Rule is to limit emissions of organic compounds~~,~~ ~~including~~ and methane~~,~~ from leaking equipment at petroleum refineries, chemical plants, bulk plants and bulk terminals including, but not limited to: valves, connectors, pumps, compressors, pressure relief devices, diaphragms, hatches, sight-glasses, fittings, sampling ports, meters, pipes, vessels, and refinery wastewater collection system components.

(Amended 3/17/82; 3/4/92; 1/7/98)

8-18-110 Exemption, Controlled Seal Systems and Pressure Relief Devices: ~~Except for Section 8-18-603, t~~The provisions of this Rule shall not apply to seal systems and pressure relief devices vented to a vapor recovery or disposal system which reduces the emissions of organic compounds from the equipment by 95% or greater as determined according to Section 8-18-603.

(Amended, Renumbered January 7, 1998)

8-18-111 Exemption, Small Facilities: The provisions of this rule shall not apply to facilities which have less than 100 valves or less than 10 pumps and compressors. Such facilities are subject to the requirements of Regulation 8, Rule 22.

(Adopted 3/4/92; Amended, Renumbered 1/7/98)

8-18-112 Exemption, Bulk Plant and Terminal Loading Racks: The provisions of this rule shall not apply to those connections at the interface between the loading rack and the vehicle being loaded.

(Adopted 3/4/92; Amended, Renumbered 1/7/98)

8-18-113 Limited Exemption, Initial Boiling Point: The provisions of Sections 8-18-400 shall not apply to equipment which handle organic liquids having an initial boiling point greater than 302° F.

(Adopted 3/4/92; Amended, Renumbered 1/7/98)

8-18-114 Limited Exemption, Research and Development: The provisions of Section 8-18-401, 402 and 502 shall not apply to research and development plants which produce only non-commercial products solely for research and development purposes.

(Adopted 3/4/92; Amended, Renumbered 1/7/98)

8-18-115 Limited Exemption, Storage Tanks: The provisions of this rule shall not apply to appurtenances on storage tanks including pressure relief devices, which are subject to requirements contained in Regulation 8, Rule 5: Storage of Organic Liquids.

(Adopted January 7, 1998)

8-18-116 Limited Exemption, Vacuum Service: The provisions of Section 8-18-400 and 502 shall not apply to equipment in vacuum service.

(Amended January 7, 1998)

8-18-117 Limited Exemption, Visual Inspection: The provisions of Section 8-18-403 shall not apply to days when a facility is not staffed.

(Amended, Renumbered January 7, 1998)

8-18-117 Deleted January 7, 1998

8-18-200 DEFINITIONS

8-18-201 Background: The ambient concentration of total organic compounds determined at least 3 meters (10 feet) upwind from the equipment to be inspected and not influenced by any specific emission point as indicated by a hydrocarbon analyzer specified by Section 8-18-501.

(Amended March 4, 1992)

8-18-202 Bulk Plants and Terminals: A distribution facility which is subject to Regulation 8, Rule 6, 33 or 39.

(Amended, Renumbered January 7, 1998)

8-18-203 **Chemical Plant:** Any facility engaged in producing organic or inorganic chemicals and/or manufacturing chemical products by chemical processes. Any facility or operation that has ~~28~~ 325 as the first ~~two~~ three digits in their ~~Standard Industrial Classification Code as determined from the Standard Industrial Classification Manual~~ North American Industrial Classification System number. Chemical plants include facilities that manufacture chemical products by chemical processes such as: industrial inorganic and organic chemicals; plastic and synthetic resins, synthetic rubber, synthetic and other man made fibers; drugs; soap, detergents and cleaning preparations, perfumes, cosmetic and other toilet preparations; paints, varnishes, lacquers, enamels and allied products; agricultural chemicals; safflower and sunflower oil extracts; re-refining.

(Renumbered and Amended January 7, 1998)

8-18-204 **Connection:** Flanged, screwed, or other joined fittings used to connect any piping or equipment.

(Amended, Renumbered January 7, 1998)

8-18-205 **Equipment:** All components including, but not limited to: valves, pumps, compressors, pressure relief devices, diaphragms, hatches, fittings, sampling ports, pipes, plugs, open-ended lines, gages or sight-glasses.

(Amended, Renumbered January 7, 1998)

8-18-206 **Inaccessible Equipment**: Any equipment located over 13 feet above the ground when access is required from the ground; or any equipment located over 6.5 feet away from a platform when access is required from a platform.

(Amended, Renumbered January 7, 1998)

8-18-207 **Inspection:** The determination of the concentration of total organic compounds leaking from equipment using EPA Reference Method 21 as required by Section 8-18-501.

(Amended, Renumbered January 7, 1998)

8-18-208 **Leak:** The concentration of total organic compounds measured above background, measured 1 centimeter or less from the leak, expressed as methane and measured using EPA Reference Method 21.

(Amended, Renumbered January 7, 1998)

8-18-209 **Leak Minimization:** Reducing the leak to the lowest achievable level using best modern practices and without shutting down the process the equipment serves.

(Renumbered 3/17/82; Amended 3/4/92; 1/7/98)

8-18-210 **Leak Repair:** The tightening, adjustment, or addition of material, or the replacement of the equipment, which reduces the leakage to the atmosphere below the applicable standard in Section 8-18-300.

(Renumbered 3/17/82; Amended 3/4/92; 1/7/98)

8-18-211 **Liquid Leak:** Dripping of liquid at a rate of greater than 3 drops per minute and a concentration of total organic compounds greater than the applicable leak standard in Section 8-18-300.

(Amended, Renumbered January 7, 1998)

8-18-212 **Organic Compound:** Any compound of carbon, excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates and ammonium carbonate.

(Amended, Renumbered January 7, 1998)

8-18-213 **Petroleum Refinery:** Any facility that processes petroleum products as defined in North American Industrial Classification Standard Number 32411, Petroleum Refining.

(Amended, Renumbered January 7, 1998)

8-18-214 **Pressure Relief Device:** The automatic pressure-relieving device actuated by the static pressure upstream of the device including, but not limited to pressure relief valves and rupture disks.

(Amended, Renumbered January 7, 1998)

8-18-215 **Process Unit:** A manufacturing process which is independent of other processes and is continuous when supplied with a constant feed or raw materials and has sufficient storage facilities for product.

(Amended, Renumbered January 7, 1998)

8-18-216 **Quarter:** One of the four consecutive 3-month divisions of the calendar year beginning on January 1.

(Amended, Renumbered January 7, 1998)

8-18-217 **Reinspection:** Any inspection following the minimization or repair of leaking equipment.

(Amended, Renumbered January 7, 1998)

8-18-218 **Rupture Disc:** The thin metal diaphragm held between flanges.

(Amended, Renumbered January 7, 1998)

8-18-219 **Total Organic Compounds:** The concentration of organic compounds and methane as indicated by a hydrocarbon analyzer as specified by Section 8-18-501~~, including methane~~.

(Amended, Renumbered January 7, 1998)

8-18-220 **Turnaround:** The scheduled shutdown of a process unit for maintenance and repair work.

(Amended, Renumbered January 7, 1998)

8-18-221 **Valve:** Any device that regulates the flow of process material by means of an external actuator acting to permit or block passage of liquids or gases.

(Amended, Renumbered January 7, 1998)

8-18-222 **Weephole:** A drain hole in the discharge horn of a pressure relief device.

(Adopted January 7, 1998)

8-18-223 **Deleted January 7, 1998**

8-18-224 **Deleted January 7, 1998**

8-18-225 **Major Leak:** Any leak that cannot be minimized below a concentration of 10,000 parts per million (ppm) total organic compounds, expressed as methane.

8-18-300 STANDARDS

8-18-301 **General:** Except for valves, pumps and compressors, connections and pressure relief devices subject to the requirements of Sections 8-18-302, 303, 304, 305 and 306, a person shall not use any equipment that leaks total organic compounds in excess of 100 ppm unless the leak has been discovered by the operator, minimized within 24 hours and repaired within 7 days.

(Amended 7/15/81; 3/17/82; 9/6/89; 3/4/92; 1/7/98)

8-18-302 **Valves:** A person shall not use any valve that leaks total organic compounds in excess of 100 ppm unless ~~the leak has been discovered by the operator, minimized within 24 hours and repaired within 7 days; or if the leak has been discovered by the APCO, repaired within 24 hours.~~ one of the following conditions is met:

302.1 If the leak has been discovered by the operator, minimized within 24 hours and repaired within 7 days; or

302.2 If the leak has been discovered by the APCO, repaired within 24 hours; or

302.3 The valve meets the applicable provisions of Section 8-18-306.

(Adopted 3/4/92; Amended 1/7/98)

8-18-303 **Pumps and Compressors:** A person shall not use any pump or compressor that leaks total organic compounds in excess of 500 ppm unless one of the following conditions is met:~~the leak has been discovered by the operator, minimized within 24 hours and repaired within 7 days; or if the leak has been discovered by the APCO, repaired within 24 hours.~~

303.1 If the leak has been discovered by the operator, minimized within 24 hours and repaired within 7 days; or

303.2 If the leak has been discovered by the APCO, repaired within 24 hours; or

303.3 The pump or compressor meets the applicable provisions of Section 306.

(Adopted 3/4/92; Amended 1/7/98)

8-18-304 **Connections:** A person shall not use any connection that leaks total organic compounds in excess of 100 ppm unless one of the following conditions ~~are~~ is met:

304.1 If ~~T~~the leak has been discovered by the operator, minimized within 24 hours and repaired within 7 days; or

304.2 If ~~T~~the connection is inspected as required by Section 8-18-401.6 and the leak has been discovered by the APCO, repaired within 24 hours; or

~~2.1 If the leak is discovered by the operator, minimized within 24 hours and repaired within 7 days; or~~

~~2.2 If the leak has been discovered by the APCO, repaired within 24 hours.~~

304.3 Effective July 1, 2004, a connection that leaks in excess of 100 ppm and no greater than 10,000 ppm can be considered non-repairable equipment pursuant to Section 8-18-306 provided each non-repairable connection is considered as two valves toward the total number of non-repairable equipment allowed.

(Adopted 3/4/92; Amended 1/7/98)

8-18-305 Pressure Relief Devices: A person shall not use any pressure relief device that leaks total organic compounds in excess of 500 ppm unless the leak has been discovered by the operator, minimized within 24 hours and repaired within 15 days; or if the leak has been discovered by the APCO, repaired within 7 days.

(Amended January 7, 1998)

8-18-306 Non-repairable Equipment: Any valve, pressure relief device, pump or compressor which cannot be repaired as required by Section 8-18-302, 303 or 305, ~~must~~ shall comply with the following conditions:

306.1 The valve, pressure relief device, pump or compressor ~~must be~~ is repaired or replaced within 5 years or at the next scheduled turnaround, whichever date comes first.

306.2 Effective July 1, 2004, ~~T~~the number of components awaiting repair ~~shall~~ does not exceed the percentages of the total population for each equipment type expressed in the table below or 1 piece of equipment.

Equipment	Total Number of Non-repairable Equipment Allowed (%)
Valves and Connections, including Valves with Major Leaks, as allowed by Section 8-18-304.3	0.~~5~~30% of total number of valves
Valves with Major Leaks as allowed by Section 8-18-302.3	0.025% of total number of valves
Pressure Relief Devices	1.0% of total number of pressure relief devices
Pumps and Compressors	1.0% of total number of pumps and compressors

306.3 Effective July 1, 2004, a person shall not operate a valve with a major leak 45 days following discovery of the leak unless the mass emission rate is measured in accordance with Section 8-18-604, and determined to be less than 15 pounds per day.

~~306.3 In lieu of compliance solely with Sections 8-18-306.24 and not with any other requirements of this rule, the valve, pressure relief device, pump or compressor must meet the following conditions:~~

~~3.1 The valve, pressure relief device, pump or compressor must be measured for mass emissions within 7 days after the leak is discovered;~~

~~3.2 The mass emission measurement of the component must be less than the applicable standard in the table below and the corresponding total number of non-repairable equipment, including non-repairable equipment from Section 8-18-306.2, are less than the standards in the table below.~~

~~Equipment~~	~~Mass Emission Standard~~	~~Total Number of Non-repairable Equipment Allowed (%)~~
~~Valves~~	~~0.1 lb/day~~	~~1.0%~~
~~Pressure Relief Devices~~	~~0.2 lb/day~~	~~5%~~
~~Pumps and Compressors~~	~~0.2 lb/day~~	~~5%~~

~~3.3 If the valve, pressure relief device, pump or compressor's mass emission measurement is greater than 15 lb/day total organic compounds, the valve, pressure relief device, pump or compressor must be repaired within 7 days after the mass emission measurement is determined.~~

(Adopted3/4/92, Amended 1/7/98)

8-18-307 Liquid Leak: A person shall not use any equipment that leaks liquid as defined in Section 8-18-211, unless the leak has been discovered by the operator, minimized within 24 hours and repaired within 7 days.

(Adopted3/4/92; Amended 1/7/98)

8-18-308 Alternate Compliance: The requirements of Sections 8-18-301, 302, 303, 304, 305, 306 and 307 shall not apply to any facility which complies with an alternative emission reduction plan that satisfies all the requirements in Sections 8-18-405 and 406.

(Adopted January 7, 1998)

8-18-400 ADMINISTRATIVE REQUIREMENTS

8-18-401 Inspection: Any person subject to this Rule shall comply with the following inspection requirements:

401.1 All connections that have been opened during a turnaround shall be inspected for leaks within 90 days after start-up is completed following a turnaround.

401.2 Except as provided under Subsection 8-18-401.3, 404, 405, and 406 all valves, pressure relief devices, pumps or compressors subject to this Rule shall be inspected quarterly.

401.3 Inaccessible valves and pressure relief devices subject to this Rule shall be inspected at least once a year.

401.4 Any equipment subject to this Rule may be inspected at any time by the APCO.

401.5 Any equipment found to have a leak in excess of the standard in Section 8-18-300 shall be reinspected within 24 hours after leak repair or minimization.

401.6 Any connection that is inspected annually or that is part of an APCO and EPA approved connection inspection program is subject to the provisions of Subsection 8-18-304.2.

401.7 Any pressure relief device equipped with a weephole shall be inspected quarterly at the outlet of the weephole if the horn outlet is inaccessible.

401.8 Any pressure relief device that releases to the atmosphere shall be inspected within 5 working days after the release event.

401.9 Effective July 1, 2004, any valve placed on the non-repairable list shall be inspected at least once per quarter.

401.10 Effective July 1, 2004, the mass emission rate of any valve with a major leak placed on the non-repairable list in accordance to Subsections 8-18-306.3 and 8-18-309 shall be determined at least once per calendar year. The District shall be notified 96 hours prior to conducting measurements.

(Amended 3/17/82; 9/3/86; 9/6/89; 3/4/92; 1/7/98)

8-18-402 Identification: Any person subject to this Rule shall comply with the following identification requirements:

402.1 All valves, pressure relief devices, pumps and compressors shall be identified with a unique permanent identification code approved by the APCO. This identification code shall be used to refer to the valve, pressure relief device, pump or compressor location. Records for each valve, pressure relief device, pump or compressor shall refer to this identification code.

402.2 All equipment with a leak in excess of the applicable leak limitation in Section 8-18-300 shall be tagged with a brightly colored weatherproof tag indicating the date the leak was detected.

(Amended 3/4/92; 1/7/98)

8-18-403 Visual Inspection Schedule: All pumps and compressors subject to this rule shall be visually inspected daily for leaks. If a leak is observed, the concentration of organic compounds shall be determined.

(Renumbered January 7, 1998)

8-18-404 Alternative Inspection Schedule: The inspection frequency for valves may change from quarterly to annually provided all of the conditions in Subsection 404.1 and 404.2 are satisfied.

404.1 The valve has been operated leak free for five consecutive quarters; and

404.2 Records are submitted and approval from the APCO is obtained.

404.3 The valve remains leak free. If a leak is discovered, the inspection frequency will revert back to quarterly.

(Adopted January 7, 1998)

8-18-405 Alternate Emission Reduction Plan: Any person may comply with Section 8-18-308 by developing and submitting an alternate emission reduction plan to the APCO that satisfies all of the following conditions:

405.1 The plan shall contain all information necessary to establish, document, measure progress and verify compliance with an emission reduction level set forth in this rule.

405.2 All emission reductions must be achieved solely from equipment and connections subject to this rule.

405.3 Public notice and a 60-day public comment period shall be provided.

405.4 Following the public comment period, the plan shall be submitted to and approved in writing by the EPA, Region IX prior to the APCO approval of the plan.

405.5 An alternate emission reduction plan must provide for emission reductions equal to or greater than required by the specific limits in this rule.

(Adopted 1/7/98; Amended 11/27/02)

8-18-406 Interim Compliance: A facility is subject to the limits contained in Sections 8-18-301, 302, 303, 304, 305, 306 and 307 until receipt of the written approvals of both the APCO and the EPA of an Alternate Emission Reduction Plan that complies with Section 8-18-405.

(Adopted1/7/98; Amended 11/27/02)

8-18-500 MONITORING AND RECORDS

8-18-501 Portable Hydrocarbon Detector: Any instrument used for the measurement of organic compounds shall be a combustible gas indicator that has been approved by the APCO and meets the specifications and performance criteria of and has been calibrated in accordance with EPA Reference Method 21 (40 CFR 60, Appendix A).

(Amended 3/17/82; 9/6/89; 3/4/92)

8-18-502 Records: Any person subject to the requirements of this rule shall maintain records that provided the following information:

502.1 For equipment subject to Section 8-18-402.1, the equipment identification code, equipment type and the location of the equipment.

502.2 The date of all inspections and reinspections and the corresponding leak concentrations measured as specified by Section 8-18-401.

502.3 Records shall be maintained for at least 5 years and shall be made available to the APCO for inspection at any time.

502.4 Records of all non-repairable equipment subject to the provisions of Section 8-18-306 shall be maintained, ~~submitted to the District quarterly~~ and contain the equipment identification code, equipment type, equipment location, leak concentration measurement and date, the duration the equipment has been on the non-repair list, any mass emission rate determination and date of the determination was made, last process unit turnaround date, and total number of non-repairable equipment awaiting repair.

(Adopted 3/4/92; Amended 1/7/98)

8-18-503 Reports: Any person subject to the requirements of this rule shall submit the information to the District:

503.1 Records of all non-repairable equipment subject to the provisions of Section 8-18-306 shall be submitted to the District quarterly and contain the equipment identification code, equipment type, equipment location, leak concentration measurement and date, the duration the equipment has been on the non-repair list, any mass emission rate determination and date of the determination was made, last process unit turnaround date, and total number of non-repairable equipment awaiting repair.

503.2 An inventory of the total numbers of valves, pressure relief devices, pumps and compressors and connections to which this rule applies shall be submitted to the District at least once a year.

8-18-600 MANUAL OF PROCEDURES

8-18-601 Analysis of Samples: Samples of organic compounds as defined in Section 8-18-113 shall be analyzed for Initial Boiling Point as prescribed in ASTM D-1078- 98 or ASTM D-86.

(Adopted March 17, 1982; Amended March 4, 1992; January 7, 1998)

8-18-602 Inspection Procedure: Inspections of equipment shall be conducted as prescribed by EPA Reference Method 21 (40 CFR 60, Appendix A).

(Adopted 9/6/89; Amended 3/4/92; 1/7/98)

8-18-603 Determination of Control Efficiency: The control efficiency as specified by Section 8-18-110 shall be determined by any of the following methods: 1) BAAQMD Manual of Procedures, Volume IV, ST-7, 2) EPA Method 25 or 25A. A source shall be considered in violation if the ~~VOC~~ emissions of organic compounds measured by any of the referenced test methods exceed the standards of this rule.

(Renumbered and Amended January 7, 1998)

8-18-604 Determination of Mass Emissions: The mass emission determination as specified by Section 8-18-306 shall be determined using ~~by~~ any of the following methods: 1) EPA Protocol for Equipment Leak Emission Estimates, Chapter 4, Mass Emission Sampling, (EPA-453/R-95-017) November, 1995 or 2) a method determined to be equivalent by the EPA and approved by the APCO.

(Adopted January 7, 1998)

Bay Area Air Quality Management District

939 Ellis Street
San Francisco, CA 94109

Proposed Amendments

Regulation 8 Rule 18: Equipment Leaks

Control Measure SS-16

Draft Staff Report

November 2003

Prepared by:

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TABLE OF CONTENTS

I. EXECUTIVE SUMMARY

Bay Area 2001 Ozone Plan Control Measure SS-16, proposes amendments to Bay Area Air Quality Management District Regulation 8, Rule 18: Equipment Leaks. It proposes more stringent controls on emissions from leaking valves at petroleum refineries and chemical plants. Regulation 8, Rule 18 requires refineries to develop and implement a Leak Detection and Repair (LDAR) program to control fugitive emissions. Fugitive emissions occur from valves, pumps, compressors, pressure relief valves, flanges, connectors, piping and other equipment components.

Staff reviewed specific valve technologies to determine short-term and long-term emission performance. From this evaluation, staff concluded that petroleum refineries are required to utilize the best technology available for replacements to consistently achieve the stringent leak standard of 100 ppm. The strict leak standard combined with the limit on the number of valves that can be placed on the non-repairable list constitute Best Available Control Technology (BACT). Therefore, compliance with this rule as proposed represents what is presently BACT.

Staff also evaluated areas in which additional emission reductions could be achieved. This evaluation indicated that:

- The number of valves allowed on the non-repairable list could be reduced from the current level of 0.5 percent to 0.3 percent. The level of 0.3 percent represents the level currently achieved by refineries.
- A maximum leak standard be established for valves leaking above 10,000 ppm because they are responsible for the largest fraction of the emission inventory.

Additionally, refineries requested flexibility for connections that are very difficult to repair. Currently, connections must be repaired at any cost irrespective of emissions. To address this concern without increasing emissions, staff proposes that connections leaking below 10,000 ppm be allowed on the non-repairable list at a ratio of one connection per two valves. In addition, the total number of valves and connections allowed on the list will be determined strictly by the total number of valves in use at the refinery as documented annually.

The proposed amendments ensure best available control technologies are used to reduce emissions. The proposed major amendments to Regulation 8, Rule 18 will:

- Reduce the fraction of components allowed on a non-repairable list;
- Set a maximum leak standard at 10,000 parts per million (ppm); and
- Allow connections to be placed on a non-repairable list at a ratio of one connection per two valves.

These amendments will reduce emissions of organic and other pollutants, including toxic compounds. Staff has identified a potential reduction of 0.2 ton per day of precursor organic compounds with a total implementation cost of $23,500 to $118,000 per year. The cost effectiveness is approximately $320 to $1600 per ton of precursor organic compound emissions reduced.

II. BACKGROUND

There are five petroleum refineries within the jurisdiction of the District with approximately 233,000 total valves. The population of connections is estimated to be five times greater.

Regulatory History

Rule 8-18 was first adopted in 1980 and was amended in 1992, with minor changes in 1998 and 2002. Rule amendments adopted in 1992 significantly lowered the allowable leak concentration limits to the lowest in the country and required more effective inspection and repair programs in order to reduce emissions and promote self-compliance. The 1992 amendments were estimated to reduce emissions by 1.2 tons per day.

Rule 8-18 was last amended in November 2002 to address a minor deficiencies identified by US EPA in their limited approval/disapproval of the rule.

Rule Development Process

During the process to develop this proposed amendment to Rule 8-18, staff has worked extensively with the affected industry, interested public, and other air pollution control agencies, such as the California Air Resources Board (CARB), the U.S. Environmental Protection Agency (USEPA) and other air pollution control districts.

Site Visits

Staff conducted numerous site visits to the Bay Area refineries to accompany both facility and district inspectors during Rule 8-18 inspections and learn how refinery staff carryout their leak detection and repair programs. These tours and the time spent in communication with both the inspectors and the representatives of the refineries were invaluable to the development of a balanced understanding of operations and technologies associated with the implementation of Rule 8-18.

Literature Review and Information Requests

Staff reviewed various sources of information regarding fugitive emissions, including bellow sealed valves, hermetically-sealed valves, fugitive emission rules of other California air districts, and reports provided by the refineries regarding their non-repairable lists and leak detection and repair programs.

Workgroup Meetings

During this rulemaking process, six workgroup meetings were held in various locations. These workgroup meetings provided a forum in which technical and regulatory issues concerning this rule could be discussed in a effort to ensure that all participants had ample opportunity to voice their concerns and present comments and related information. In attendance at these meetings were industry representatives, environmentalists, CARB staff members, and district staff.

Workshops

Staff hosted one workshop on October 28, 2003, to discuss draft amendments to the rule in a public forum. In attendance at the meeting were industry representatives, members of the public, environmentalist, and CARB staff members.

Current Rule Requirements

Each of the five refineries within the District has a leak detection and repair (LDAR) program. These programs function to ensure that all components are inspected regularly and, if a leak is found, the equipment is repaired, replaced, or placed on a list to be repaired. Under the current rule, there are four options under which a facility may comply with the rule:

Option 1 – Leak Concentration Standard: This option allows the facility to inspect affected equipment for leaks; 100 ppm for valves and connections, and 500 ppm for pumps, compressors and pressure relief devices. All equipment with leaks discovered by the facility must be minimized within 24 hours and repaired within seven days. All leaks discovered by the District must be repaired within 24 hours. All equipment not subject to an LDAR program discovered to be leaking by District staff is a violation of this rule.

A fraction of the equipment that cannot be repaired may be placed on a non-repairable list for up to five years or the next scheduled turnaround for that plant, whichever date comes first. The maximum fraction of components on the facility-wide turnaround list cannot exceed 0.5 percent for valves and 1.0 percent for pumps, compressors and pressure relief devices. Currently, connections are not allowed to be placed on a turnaround list.

Option 2 – Mass Emissions Standard: This option allows the facility to use the concentration standards as trigger levels and measure any non-repairable component for mass emissions. Using the above Option 1 leak concentration standards as trigger levels, any non-repairable component can be measured for mass emissions. If the mass emission rate is greater than 15 pounds per day, the component must be repaired. If the mass emission rate is less than 0.1 or 0.2 pounds per day, no further action is required. The number of components leaking between 0.1 or 0.2 and 15 pounds per day cannot exceed a small percentage of the total number of components at the facility.

Option 3 – Reduced Inspection Frequency: Using the above Option 1 leak concentration standards as trigger levels, facilities can increase the interval between inspections for components that do not leak. This option will reduce the cost of inspection and maintenance plans. The inspection frequency for equipment, except pumps and compressors, may be changed from quarterly to annually provided the equipment has been operated leak free for five consecutive quarters and records are submitted and approved by the District. If a leak is discovered, the frequency reverts back to quarterly inspections for that component.

Option 4 – District Approved Inspection and Maintenance Plan: The final option allows facilities to implement an alternate program to reduce emissions from leaks. This option requires a written plan approved by the District and EPA. To date, no Bay Area refinery has elected to use this option.

Other Air District Rules

Several other air pollution control districts in California have rules that address fugitive emissions from refineries and chemical plants. These districts include the South Coast Air Quality Management District (Rule 1173), the San Joaquin Valley Unified Air Pollution Control District (4451 & 4452), and Ventura County Air Pollution Control District (Rule 74.7). In addition to these districts' rules, the federal New Source Performance Standards affect emissions from equipment leaks. The table in Appendix A provides a simplified comparison of the major provisions of these rules with the provisions of the District's current rule.

Overview of Current Leak Detection and Repair (LDAR) Programs

Each LDAR program functions to ensure that all components are:

- Identified,
- Labeled (except connections),
- Inventoried,
- Inspected for leaks, and
- If found leaking, tagged, repaired, replaced, or placed on a non-repairable list.

Identification: Each piece of equipment is uniquely identified in association with the plant at which it is located, the type of equipment, and a unique identification number.

Labels: In addition, this identity is also placed on a label that is attached to each component or group of components. Labels contain varying degrees of information, but most will at least include the identification number.

Inventory: Each piece of equipment is inventoried in a database that contains information on the equipment such as type, location, installation date, dates of inspection, leak concentration, and repair history.

Inspections: Each refinery employs an inspection team that consists of either in-house employees or contractors[1]. The inspection team calibrates their VOC detector, which is typically either a flame or photo ionization detector, and proceeds with the inspection. A member of the inspection team carries a monitoring device that reads and records information from a barcode or identifier attached to the component being inspected. If a leak is detected, a team member or another facility employee will attempt to minimize the leak as required by

[1] Three of the five Bay Area refineries employ independent contractors to conduct leak detection and repair, and the remaining refineries utilize in-house employees. All refineries have a separate group dedicated to the task of leak detection and repair.

the rule. If the leak cannot be minimized, a team member will identify the component with a waterproof, indelible tag, upon which information regarding the leak is recorded and the component is identified for repair or replacement. Once the inspection is completed, the recorded information is uploaded into an LDAR data base.

Technology Review

The District reviewed equipment that could represent Best Available Control Technology for valves, pumps, compressors, pressure relief devices and for previously unspecified equipment, such as heat exchangers.

Valves

There are several valve types on the market and in use that have been demonstrated in practice to operate in a "leak free" manner. These valves include bellows seal valves and solenoid-actuated valves, which are both hermetically sealed to reduce the potential for fugitive emissions. Hermetically seal means that the valve is air tight.

Bellows Seal Valves

Bellows seal valves normally operate in a leak free manner because the moving components of the valve are hermetically sealed from the ambient air. Bellows seal valves function by replacing the packing and sliding or rotating seals with bellows (accordion-like tubing). This replacement eliminates the opportunity for emissions from the sliding of rotating seals and packing. However, without monitoring, failure of the bellows can result in emissions.

The bellows are sealed in two different ways. In one manner the bellows are welded to the valve stem at the top and the valve body at the bottom. The process fluid is contained inside the bellows. In the other method, the bellows are welded to the valve stem at the bottom and the body on the top. The process fluid is contained in the annular region between the valve bonnet and bellows.

Solenoid-Actuated Valves

Solenoid-actuated valves are a departure from the standard air- or motor-operated valve design typically used for process fluid storage and handling of hydrocarbons. These valves are solenoid-actuated. They do not use stem, packing, or bellows. Further, solenoid-actuated valves isolate all moving parts within the process pressure areas. Because the actuator of these valves is completely sealed from the atmosphere and is actuated via magnetism, the potential for emissions due to the failure of seals surrounding dynamically moving parts is eliminated.

Pumps/Compressors

Recent development in pump technologies may offer some potential for emission reductions. Hermetically sealed pumps have been available on the market and in use for decades. There are two basic categories of pumps, canned induction motor driven pumps and the synchronous and asynchronous magnetic driven pumps. Because these pumps are hermetically sealed, the potential for fugitive emissions is greatly reduced from pumps using seals. Currently, the number of sealed pumps in operation at the five Bay Area refineries is unknown. If further evaluation and analyses indicate that sealed pumps can function as well as hermetically sealed

pumps, then a BACT determination could reflect this performance and the Districts regulatory approach could take advantage of their use in refineries.

III. PROPOSED RULE AMENDMENTS

A number of regulatory issues regarding the Rule 8-18 have been raised. Examining these issues through this rulemaking process has led to the development of regulatory amendments to this rule that will contribute towards emissions reductions. Provisions for examining this rule were made under Control Measure SS-16 low emission refinery valves in the October 2001 Bay Area Ozone Attainment Plan.

This rulemaking process has resulted in five main regulatory proposals. These proposals:

- Allow the refineries to determine the best technology that achieves the standards of the regulation and best meets their service needs;
- Reduce the number of valves that are allowed on the non-repairable list;
- Limit the number of valves leaking in excess of 10,000 ppm;
- Require mass emission rate determinations for valves leaking in excess of 10,000 ppm and control those with excess emissions; and
- Allows connections with leaks that do not exceed 10,000 ppm to be placed on the non-repairable list at a ratio of one connection per two valves.

Through these concepts the regulation will take advantage of the improvements in the ability of the refineries to locate and repair leaking components and improvements in valve technology, such as hermetically sealed valves and advancements in valve stem packing materials. These improvements have led to emission reductions that have not been credited to this rule. Also, the rule will ensure that the components that are believed to be responsible for the greatest emissions are examined and if found to have excessive emissions, controlled.

Meeting the "BACT" Standard of the Rule

District Staff reviewed specific valve technologies to evaluate short-term and long-term emission performance to determine if Regulation 8, Rule 18, Equipment Leaks (Rule 8-18), should limit equipment replacements to these technologies. From this evaluation, staff concluded that the petroleum refineries are essentially forced to utilize the best technology available for replacements to consistently achieve the stringent emission standards of the rule – the 100 ppm leak limit for valves and 0.5 percent of the total number of valve allowed on a non-repairable list. Consequently, the strict emission standard combined with the limit placed on the non-repairable list constitute a "best available control technology" standard. As long as the refineries consistently meet this standard, the regulation should not dictate which technologies should be used. Refineries should be allowed to use their expertise to determine the technology best suited for the conditions of use that will ensure compliance with the requirements (i.e. standards) of the rule.

This approach will allow the introduction of improved technology that may "cross over" from other industrial application without requiring an exhaustive review process to maintain a BACT list. Basically, the facilities are held responsible to use technologies that meet the standard.

Reducing the Number of Components on the Non-Repairable List

The non-repairable list was established to provide a mechanism to address essential components. Essential components are those pieces of equipment that cannot be repaired or replaced unless the process unit is shutdown and the component is isolated. This activity would likely create more emissions than the actual fugitive leaks. The rule allows a certain percentage of each type of equipment to be placed on the list. Table 1 indicates the current allowable fractions of each component on the non-repairable list.

Table 1
Current Allowable Limits for Components Awaiting Repair or Replacement

Equipment	Fraction of Non-repairable Equipment Allowable	Maximum Duration
Valves	0.5%	5 years or next turnaround
Pressure Relief Devices	1 %	5 years or next turnaround
Pumps/Compressors	1 %	5 years or next turnaround

Data collected from the refineries indicate that the curent LDAR programs implemented at some refineries result in a much lower fraction of leaking equipment being placed on a non-repairable list than the fraction allowable by Rule 8-18. This suggests that it is possible to reduce the percentage of equipment allowed on the non-repairable list or address non-repairable equipment in a different manner.

Staff proposes to modify the allowable fractions according to the table below.

Table 2
Proposed Revisions to the Allowable Limits for Components Awaiting Repair or Replacement

Equipment	**Fraction of Non-repairable Equipment Allowable up to 10,000 ppm**	**Maximum Duration**
Valves and connectors (including valves with major leaks)	0.3% of total number of valves	5 years or next turnaround
Valves with major leaks	0.025% of the total number of valves	5 years or next turnaround
Pressure Relief Devices	1.0% total number of PRVs	5 years or next turnaround
Pumps/Compressors	1.0% total number of pumps and compressors	5 years or next turnaround

In this proposal, the fraction of valves allowed on the non-repairable list would be reduced from 0.5 percent to 0.3 percent. Additionally, valves leaking in excess of 10,000 ppm would be limited to 0.025 percent of the total number of valves and this number would be included in the number that make up the 0.3 percent value.

Concentration Limit for Non-repairable Components

The proposal will also limit the number of valves with major leaks to 0.025 percent of the total number of valves in operation at the facility. Before a valve with a major leak (one that leaks in excess of 10,000 ppm) can be placed on the non-repairable list, its mass emission rate must be determined and found to be below 15 pounds per day. In addition, the mass emission rate must be determined at least once per year to ensure that the leak does not exceed the 15-pound limit. Staff believes it is unreasonable to allow a component to leak an indefinite amount of mass emissions for up to five years.

The amendments will require refineries to take action on valves that are found leaking in excess of 10,000 ppm (50 to 100 times the allowable limits). If a component is found to leak in excess of 10,000 ppm, the operator must do one of the following; 1) minimize the leak below 10,000 ppm within 24 hours and repair the component within seven days, or 2) measure the mass emission rate of the leak and place the component on the non-repairable list only if the mass emission rate is less than 15 pounds per day. If the valve leaks in excess of the allowable mass emission rate, then the operator must either repair or replace that component or capture and vent those emissions to a control device.

Additionally, the refiner must notify the District of each mass emission rate determination at least 96 hour prior to the determination. This will allow the District to review the process of the emission rate determination and also allow concurrent testing of the leaking component for methodology evaluation.

Connections on the Non-repairable List

The refineries have long asserted that regulatory flexibility is needed for connections that pose difficulty in repair. To address this concern, staff proposes allowing connections with leaks less than 10,000 ppm to be placed on the non-repairable list in a very limited fashion that would not result in a relaxation of the rule. To ensure that any emissions associated with a connection being placed on the non-repairable list is offset, the rule will contain a disincentive for placing connections on the list. The amendments would require that connections placed on the non-repairable list are at a ratio of one connection per two valves. The fraction of components allowed on the list is strictly limited to the number of valves and valves only located at the refinery. For example, if a refinery has 50,000 valves and the fraction of valves allowed on the non-repairable list is 0.3 percent, then the number of valves allowed on the list could not exceed 150. Additionally, for each connection allowed on the list, two spaces of the 150 allotted for valves would no longer be available.

IV. OTHER AREAS FOR POTENTIAL EMISSION REDUCTIONS

During this rule development process, other strategies were identified that have the potential for achieving emission reductions. Staff examined definitions for complex equipment, such as heat exchangers, that are currently regulated pursuant to Section 8-18-301. Staff also reviewed the development of procedures to address leaks from these complex components, such that the facility would not have to utilize the variance process when these leaks occur, as is currently the case. However, due to time constraints, staff was unable to fully explore and develop these strategies. These issues and strategies are being documented for future rule making efforts.

Leak Limit of 10,000 ppm for ALL components

A maximum leak value of 10,000 ppm for any component would help to significant reduce emissions from valves, pumps and compressors. South Coast Rule 1173, Control of VOC Leaks and Releases from Components at Petroleum Facilities and Chemical Plans has an absolute maximum limit 50,000 ppm for any leaking component. This provision has been in effect at the South Coast for over a decade.

A provision such as this would require refineries to take action on components that are found leaking in excess of 10,000 ppm. This type of provision would require an operator to minimize leaks below 10,000 ppm within 24 hours and repair the component within seven days, capture and vent the emissions to a control device, or determine the mass emission rate. If the mass emission rate is below a de minimus level, the component could be placed on the non-repairable list.

This approach would provide an incentive for refineries to address components with the highest leak, before placing those components on the non-repairable list. The inability to repair a valve leaking above the 15-pound limit would not necessarily result in the shutdown of a plant. This provision allows the emissions to be routed to an air pollution control device in the interim between shutdowns or turnarounds. Several other air districts in California that have refineries within their jurisdictions employ similar approaches in their fugitive emissions rules.[2] South Coast fugitive rule considers any leak in excess of 50,000 ppm a violation of the rule (50,000 ppm for light liquid/gas/vapors service and 500 ppm for heavy liquid). The San Joaquin Valley Unified Air Pollution Control District requires that any component leaking in excess of 10,000 be repaired within 15 days, vented to a control device within 30 days, or be demonstrated that repair is infeasible and allowed to wait until the next turnaround or one year, which ever is shorter (§§4451 5.3.2.2 & 5.3.2.3). Ventura County APCD also has a similar provision that allow a critical component with a leak in excess of 10,000 ppm a maximum leak duration of a year (Rule 74-7, §E.5).

Discussions with South Coast AQMD staff indicate that the refiners initially believed that it would be extremely difficult to comply with a maximum leak limit. However, after

[2] South Coast AQMD, Rule 1173, §§(d)(1)(B) and (g)(2); Ventura County APCD. Rule 74-7, §E.5; and San Joaquin Valley Unified APCD, Rule 4451 §§5.3.1 and 5.3.2 and Rule 4452 §5.2.1.2.

implementation of the provisions the refiners discovered that components with major leaks can be minimized and to date only one refiner has had to apply for a variance.

An initial assessment of data reported by the refineries indicate that less than one in 5000 components leak in excess of 10,000 ppm, which is less than ten at any one refinery. Only a very small fraction of these components are expected to have mass emissions rates in excess of the preset limits. Those that exceed the limits would have to be addressed.

Violations for Leaks Detected During District Inspections

The current rule allows refineries 24 hours to repair leaks found by District inspectors. Leaks discovered by refinery personnel must be repaired within seven days. A possible improvement to the current rule would be to consider leaks detected by District staff and found to be in excess of a minimum percentage of the components inspected would be a violation. This would place all the responsibility on the refinery. The District inspections would not substitute for operator inspections. The expectation is that if operator inspections were performed sufficiently, there would be little opportunity for District staff to discover any unidentified leaks. The facility concern was that even if they had a good LDAR program, leaks could still occur and issuing a violation would be a disincentive to perform.

Accelerated Replacement of Equipment with Frequent Leaks/Repairs

Some specific equipment components appear to be more prone to leaks and require more repair. Equipment such as this should be replaced at an accelerated replacement rate with equipment that consistently meets the requirements of the rule. The accelerated rate should reflect the leak/repair history of the equipment. If equipment components were given a maximum number of allowable leaks/repairs within a specific timeframe, the components demonstrated to leak frequently would be addressed more quickly. Other equipment with a history of no leaks could be inspected less frequently, as is currently allowed by the Rule. Other California air districts have similar provisions in their fugitive emissions rules.[3]

Replacement of Inaccessible Equipment with Superior Technologies

Replacement of inaccessible equipment with superior technologies should reduce the potential for emissions. Inaccessible equipment is defined as any equipment located 13 feet above the ground when access is required from the ground or equipment located over 6.5 feet from a platform when access is required from a platform. Under the current regulation these components are inspected for leaks once a year rather than quarterly, as required for accessible components. This reduced inspection frequency results in a longer average time period before a leak is detected and repaired.

Control Emissions from Heat Exchangers

Heat exchangers are potential sources of VOC emissions. Heat exchangers can leak VOCs into the liquid cooling medium and be emitted from the cooling towers at the refineries. A first step would be to measure VOC emissions at cooling towers over an entire cycle to determine whether emissions are significant. To determine if a leak exists in a heat

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[3] South Coast AQMD Rule 1173, §(g)(2) and Ventura County APCD Rule 74-7, §§E.5 and E.7.

exchanger, the VOC concentrations of cooling water at the inlet and outlet to the heat exchanger could be compared. A higher VOC concentration at the outlet would indicate a leak. Measurements could be made with probes placed in the inlet and outlet streams or by the placement of tap valves to collect samples from each stream. A leak standard could then be established either at the cooling tower or at each heat exchanger.

Emissions from cooling towers has been proposed as a further study measure in the 2003/2004 ozone planning process.

Quantification of Mass Emissions and Emission Caps

If the mass of emissions could be reliably determined from concentrations and flow rates, the emissions from equipment placed on the non-repairable equipment list could be offset on a pound per pound basis by other equipment to which Rule 8-18 is applicable. This approach could result in a maximum limit, or cap, on the mass of fugitive emissions. Any leaking equipment found to have a mass emissions rate that results in the total fugitive emission cap being exceeded, could be required to control or reduce the emissions from equipment already on the non-repairable list.

This approach provides several benefits. It quantifies the mass of the fugitive emissions for a facility for every piece of equipment on a facility's non-repairable list and provides an incentive to replace the high-emitting equipment as soon as possible. This is more advantageous than allowing equipment to remain on the non-repairable list up to five years irrespective of the emission rate. This approach would provide a facility flexibility to make the most cost effective choices that results in the least emission consequence.

Increase Inspection Frequencies

Increasing the frequency of inspections would reduce the time that a leaking component goes undetected, and decrease emissions. Because the rule requires minimization and repair within set timeframes, emissions could be decreased. To implement increased inspections frequencies, additional staffing would be required. Staff would have to further assess potential emission reduction benefits from increased inspection frequencies.

Smart LDAR

The U.S. EPA and API jointly worked on a project called "Smart LDAR" through the U.S. EPA's Common Sense Initiative for the Petroleum Refining Sector. The project attempted to determine whether there are means to focus efforts on those components that contribute most significantly to total fugitive emissions. Research indicates that a small subset of all leaking components is responsible for most of the emissions. Rather than focus effort on controlling minor leaks, the Smart LDAR project is examining the use of remote sensing methods that would allow quick identification and repair of leaks causing large emissions.

V. ISSUES FOR FUTURE RULE DEVELOPMENT

There are several clarifying issues that were not addressed in this rulemaking process. These issues should be addressed in the future.

Combine PRDs/PRVs Requirements in a Single Rule

Staff will address emission reductions for pressure relief devices (PRDs) and pressure relief valves (PRVs) in a separate rulemaking process for Regulation 8, Rule 28, Episodic Releases From Pressure Relief Devices at Petroleum Refineries and Chemical Plants (Rule 8-28). The provisions relating to PRDs/PRVs in Rule 8-18 should be deleted and addressed in Rule 8-28.

Clarify Inspection Frequency for Connections

Rule 8-18 does not require a specific inspection frequency for connections. The rule should be clarified to explicitly state that inspections are optional. If the facility has no connector inspection program, then a leak found by the District is an immediate violation.

VI. EMISSION INVENTORY AND EMISSION REDUCTIONS

Emission Inventory

Emission inventory data collected over the past several years indicate that fugitive emissions have been constantly decreasing. Table 3 details these emissions and reductions. There was a significant emissions reduction between the 2001 inventory and the current modified 2002 inventory. This emission reduction is due mostly to the adoption of new correlations factors from the EPA that are published in the ARB's "California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon Leaks at Petroleum Facilities." However, not withstanding the change in correlation factors, there has been a general downward trend to fugitive emissions over the last several years. This trend is largely due to improvement in the leak detection and repair programs, required by the rule since 1998, and the fact that the refiners' programs became more effective over time.

TABLE 3
Estimated Emissions Inventories for All Fugitives Components[1]

	SIP (Modified 1999 Inventory)[1]	2000 Inventory[2]	2001 Inventory[2]	Current (Modified 2002 Inventory) [2,3,4]
Refinery	**(organic emissions - pounds/day)**			
Chevron	7 ,821	7,821	7,773	2,294
Shell	352	352	351	381
ConocoPhillips	1,543	1,543	1,473	1,474
Valero Asphalt	35	35	35	22
Valero	1,969	530	257	332
Tesoro	1,690	1,690	1,688	128

Total (tons/day)	**6.71**	**5.99**	**5.79**	**2.32**

1. These are the estimated fugitive emissions from all components affected by Rule 8-18, including valves, pumps, compressors, pressure relief devices, and connections.
2. The annual emission inventories are based on emission estimates provided to the District by each refinery.
3. The values in this column reflect the use of modified correlation factors for each component category, as published in the ARB's "California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon Leaks at Petroleum Facilities."
4. These values are currently under review and may not reflect the final emission inventory for 2002.

Emission Reductions

The emission reductions for the proposed amendments are presented in Table 4. These emission reductions are based on the assumption that all leaking components other than connections will be discovered at the five Bay Area refineries.

TABLE 4
Emission Reduction Estimates[1].

	Rule 8-18 Emissions[2] (lbs/day (TPD))	**Amended Rule 8-18 Emissions[3] (lbs/day (TPD))**	**Emission Reductions (lbs/day (TPD))**
Valves	706 (0.35)	303 (0.15)	403 (0.20)

1. Assumes a total of 233,000 valves at all five Bay Area refineries (see Table 5).
2. Assumes that the total number of valves leaking is 0.50 percent of all valves.
3. Assumes that the total number of valves leaking is 0.30 percent of all valves and that fraction leaking above 10,000 ppm is 0.0025 percent.

Staff estimates that there are approximately 233,000 total valves at the five Bay Area refineries. Table 5 presents the inventory for valves, pump and compressors, pressure relief devices, and connections.

TABLE 5
Estimated Inventories[1] of Various Components Subject to Rule 8-18 at the Bay Area Refineries

Refinery	**Components**		
	Valves	**Pumps and Compressors**	**Connections**
Chevron	71,000	800	355,000
ConocoPhillips	27,000	250	134,000
Shell	52,000	360	217,000

Tesoro	33,000	1500	156,000
Valero	50,000	300	250,000
TOTALS	**233,000**	**2110**	**1,112,000**

1. These values are based on quarterly reports and direct quotes from industry representatives.

VII. ECONOMIC IMPACTS

Socioeconomic Impacts
Section 40728.5 of the Health and Safety Code requires an air district to assess the socioeconomic impacts of the adoption, amendment, or repeal of a rule if the rule is one that "will significantly affect air quality or emissions limitations." Applied Economic Development of Berkeley, California, is preparing the required cost analysis.

Costs
The costs associated with the proposed amendment are primarily the costs of determining the mass emission rates of valves leaking in excess of 10,000 ppm and the cost of controlling component with emissions above the 15-pound limit. There are two methods that were identified as reliable methods of determining mass emissions: high volume collection system (HCVS) and the US EPA vacuum method. These methods are described and compared in Appendix B.

Table 6 compares the cost of each of these methods. The cost values in table 5 have been inflated from 1995 values using inflation factor of 1.2 obtained from the US Department of Labor, Bureau of Statistics (www.bls.gov).

TABLE 6
Cost Estimates for Mass Emission Rate Determinations

	HCVS	**Vacuum Method**
Total time required for ONE sample[1]	4 hours	Two days
Labor Cost per sample ($450/day)	$225	$900
Lab Cost per sample	$0	$400
TOTAL COST per sample	**$225**	**$1300**

1. This represents the time needed to sample one valve and not a population of valves. These value is based on the assumption that valves leaking in access of 10,000 ppm would be found individually and, therefore addressed individually. Further, it is expected to take at least a half day to prepare the instrumentation (calibration and flow rate determination) for the high volume sampler and two days to enclose the leaking component and prepare for sampling (calibration and flow rate determination).

It was estimated that a total of 60 valves may need mass measurements. The cost of sampling 60 valves annually was estimated between $13,500 and $78,000. The cost to capture, vent and control emissions from a valve with excess emissions can range from $5,000 to $20,000[4] each depending on the valve size, location (accessible or inaccessible, proximity to a vent for flare or fire box, spatial proximity to other components, etc.). It was estimated that 2.5 percent of valves leaking in excess of 10,000 ppm will have emissions of 15 pounds per day or greater,[5] or 2.5 percent. That is approximately two valves Districtwide that could potentially be required to be controlled. This would result in a potential cost of $10,000 to $20,000 to reduce 5.5 tons of emissions or a cost effectiveness that range between $1,800 and $3,600 per ton reduced.The annual costs associated with these proposed amendments are presented in Table 7.

TABLE 7
Costs of the Proposal

Requirement	Annual Costs
Mass Emission Rate Determinations	$13,500 -$78,600
Control of Valves with Excessive Leaks	$10,000 to $40,000
TOTAL COSTS	**$23,500 to $118,000**

The emission reduction that will result from this proposal is estimated to be approximately 74 tons per year. This results in a potential cost effectiveness range of **$320 to $1,600 per ton** of precursor organic compounds Districtwide.

Incremental Costs
Under Heath and Safety Code, Section 40920.6, the District is required to perform an incremental analysis when adopting a Best Available Retrofit Control Technology (BARCT) rule or feasible measure required by the California Clean Air Act. To perform this analysis, the District must (1) identify one or more control options achieving the emission reduction objectives for the proposed rule, (2) determine the cost effectiveness for each option, and (3) calculate the incremental cost effectiveness of each option. To determine incremental costs, the District must "calculate the difference in dollar cost divided by the difference in the emission reduction potentials between each progressively more stringent potential control option as compared to the next less expensive control option."

This regulatory development process was initiated to examine the feasibility of drafting amendments to Regulation 8, Rule 18 that would implement Control Measure SS-16 from the

[4] This cost range is based on personal conversations between District staff and staff members of the California Air Resources Board and refinery personnel.

[5] Emissions estimates provide by WSPA.

Bay Area 2001 Ozone Attainment Plan. To implement Control Measure SS-16, staff evaluated requiring replacement valves meet BACT requirements or that they be "leakless" valves. Staff has concluded the strict emission standard combined with the limit placed on the non-repairable list constitute a "best available control technology" standard and that no additional provisions are necessary to ensure that refineries meet that standard of the rule.

In addition, during this rule development process, staff examined various alternatives to achieve the emissions reduction required under the 2001 Ozone plan. The first option considered was to require all valves placed on the non-repair list to be repaired or replaced with hermetically-sealed valves. The second option considered is outlined in this proposal. An analysis was performed to compare the alternative and this proposal and is summarized in Table 8.

TABLE 8

Incremental Cost Analysis

	Annual Emissions Reductions	**Annual Costs**	**Cost Effectiveness**
Replace Valves with Hermetically-Sealed Valves	Negligible[1]	$32 million	Indeterminate
The Proposal	74 tons	$23,500 to $118,000	$320 to $1,600 per ton

1. Specific emission reductions cannot be credited to the replacement of valves with bellow seal valves because all valves must meet the 100 ppm standard and limits on the non-repairable list.

Cost for Replacing Valves with Hermetically-Sealed Valves

Bellow seal valves cost approximately $12,000, which is about $7000 more than a typical valve. Two tenths of a percent of the total number of valves (233,000), could be placed on the non-repairable list for up to five years (46,600 valves). It is expected that about half of these valves would need to be replaced with bellow seal valves or 23,300 valves. Because the valves can remain on the list up to five year, 20 percent of the valves would be cycled out

each year (4660 valves). This type of an approach would result in an annual cost of $32 million.

VIII. ENVIRONMENTAL IMPACTS

Pursuant to the California Environmental Quality Act, the District will prepare an initial study for the proposed amendments to determine whether or not they would result in any significant environmental impacts. It is expected that the adoption of the proposed amendments will create environmental benefits from reducing emissions of both total and toxic organic compounds.

IX. REGULATORY IMPACTS

California Health and Safety Code, Section 40727.2 requires the District to identify existing federal air pollution control requirements for the equipment or source type affected by the proposed rule or regulation. The District must then note any differences between these existing requirements and the requirements imposed by the proposal. Regulation 8, Rule 18: Equipment Leaks applies to fugitive emissions from valves, pumps, compressors, pressure relief devices, connection and any other component that may have fugitive leaks. The proposal does not expand the applicability or the current rule. No federal air pollution control requirement was identified for the equipment or source type affected by the proposal.

X. DISTRICT STAFF IMPACTS

Implementation of the proposal will have a negligible impact on the resources of the District. Staff will need to review reports regarding mass emission rate determinations and, occasionally, conduct site visit to witness of those determinations.

XI. CONCLUSIONS

The proposed amendments to Regulation 8, Rule 18, Equipment Leaks will meet the commitment made during the adoption of the 2001 Ozone Attainment Plan for Control Measure SS-16. The proposal is intended set stringent standard and performance requirements that when implemented , will represent the best current industry practices and abilities and allow the District to account for any associated emission reduction.

Pursuant to the Health and Safety Code Section 40727, new regulations must meet necessity, authority, clarity, consistency, non-duplicity and reference. The proposed regulation is:

- Necessary to meet control measure SS-16 in the Bay Area 2001 Ozone Attainment Plan.
- Authorized by California Health and Safety Code Section 40702.
- Clear, in that the new regulation specifically delineates the affected industry, compliance options and administrative requirements for industry subject to this rule,
- Consistent with other District rules, and not in conflict with state or federal law,
- Non-duplicative of other statutes, rules or regulations, and
- The proposed regulation properly references the applicable District rules and test methods and does not reference other existing law.

The proposal has met all legal noticing requirements and has been discussed with all interested parties. District staff recommends adoption of Regulation 8, Rule 18, Equipment Leaks.

Appendix A

Comparison of the Basic Provisions of the Fugitive Emissions Rules of Four California Air Districts

Comparison of the Basic Provisions of the Fugitive Emissions Rules of Four California Air Districts

	BAAQMD Rule 8-18	South Coast AQMD Rule 1173	SJVUAPCD Rules 4451 & 4452	Ventura Co. APCD Rule 74.7
Minimum Leak Limits	§§8-18-211, 301→305	§1173 (d)(1)	§4451.3.9.1.1; §4451.3.9.2; §4452.3.6.1	§§74-7 L.18→L.20, L.22 & L.23,
Liquid	3 drops/min	3 drops/min	3 drops/min	minor ≥3 drops/min major = stream or mist
Valves	100 ppm	HL > 500; LL > 50k/10k*	10,000 ppm	minor ≥1,000 1,000 > major ≥ 10k
Connections	100 ppm	HL > 500; LL > 50k/10k*	10,000 ppm	
Pumps/ Compressors	500 ppm	HL > 500/100*; LL > 50k/10k*	10,000 ppm	
PRDs/PRVs	500 ppm	LL > 50k/200*	10,000 ppm	major > 200 ppm
		L = leak (in ppm or drops/min) HL = heavy liquid leak LL = light liquid/gas/vapor leak *Limits for leaks found above leak thresholds (see Turnaround Lists)		
INSPECTION FREQUENCIES	§§8-18-401.1→401.3	§§1173 (f)(1)(B) & (C)	§4451.5.2 & §4452.5.1	§74-7 D.1 & D.2
Valves	Quarterly	Quarterly	Quarterly	Monthly →Quarterly
Connections	Annually	Quarterly	Annually	Monthly →Annually
Pumps/ Compressors	Quarterly	Quarterly	Quarterly	Monthly →Quarterly
PRDs/PRVs	Annually	Quarterly	Quarterly	Quarterly (≤110 days)
Inaccessibles	Annually	Annually	Annual or shutdowns	
NON-REPAIRABLE LIST	§§8-18-306.2 & 306.3	Leak Thresholds: §1173(d)(1)Table 1	§4451.5.2 & §4452.5.1.4	
Duration	≤ 5 yrs.	No time limit (∞)	Next shutdown	none
Valves	0.5% | 1%	0.5%	2%	none

	BAAQMD Rule 8-18		South Coast AQMD Rule 1173	SJVUAPCD Rules 4451 & 4452	Ventura Co. APCD Rule 74.7
Connections	0%	0%	0.5%	2%	none
Pumps/ Compressors	1%	5%	1%	2% Shutdown or one year	none
PRDs/PRVs	1%	5%	1%	2%	
REPAIR SCHEDULES	§§8-18-301→305		§1173 (g)(1) Table 2	§4451.5.3.2 & §4452.5.1.4	§74-7 E Table 1
Valves	24 hr (District)/ 7 days (operator)		500 < LL ≤ 10k: 7 days 100 < HL< 500: 7 days 3 drops/min & 100 < HL ≤ 500: 7 days 10k < L ≤ 25k: 2 days/ext 3 days L > 25k: 1 day HL > 500: 1 day/ext 3 days LL > 3 drops/min: I day	m: 1 yr M: 15 days reduce < 10 d/min / 10k or vent to flare or control or show control is infeasible	m: 14 days, M: 5 days, S: 1 days
Connections	24 hr (District)/ 7 days (operator)			m: 1 yr M: 15 days reduce < 10 d/min / 10k or vent to flare or control or show control is infeasible	m: 14 days, M: 5 days, S: 1 days
Pumps/ Compressors	24 hr (District)/ 7 days (operator)			15 day > 15 day: replace, vent to control or repair at shutdown	m: 14 days, M: 5 days, S: 1 days
PRDs/PRVs	7 days (District)/ 17 days (operator)		200 < L ≤ 25k: 2 days	m: 1 yr M: 15 days reduce < 10 d/min / 10k or vent to flare or control or show control is infeasible	m: 14 days, M: 5 days, S: 1 days
			L = leak (in ppm or drops) HL = heavy liquid leak LL = light liquid/gas/vapor leak ext = extended repair period	Leak: m≤ 10 drops/min or 10,000 ppm M > 9 drops/min or 10,000 ppm.	Leaks: m≤ 10,000, 10,000 <M ≤ 25,000 S >25,000

Appendix B

Estimating Fugitive Emissions

Appendix C

Emission Estimates

EMISSION ESTIMATES FOR VALVES

Valves
200,000 @ Leak Rate 0.5 percent

Screening Value (ppm)	Numbers of Valves	Leak Rate (lb/day)
0	198,575	82
0<S<100	425	1
100<S<10,000	850	16
>10,000	150	507
Total		**606**

Valves
200,000 @ Leak Rate 0.3% and only 0.025% above the 10,000-ppm limit

Screening Value (ppm)	Numbers of Valves	Leak Rate (lb/day)
0	199,145	82
0<S<100	255	0
100<S<10,000	550	10
>10,000	50	168
Total		**260**

Valves
200,000 @ Leak Rate 0.2% and only 0.025% above the 10,000-ppm limit

Screening Value (ppm)	Numbers of Valves	Leak Rate (lb/day)
0	199,430	82
0<S<100	170	0
100<S<10,000	350	6
>10,000	50	168
Total		**256**

1. This is the leak rate for all valves with a leak concentration greater than 10,000 ppm, the other value is for all leaks greater than 10,000 ppm, which would be limited to a maximum mass emission rate of 1 lb/day.

Emission Reduction:

Emission Reductions @ 0.3 percent Leaking	Emission Reductions @ 0.2 percent Leaking
346 lbs/day	458 lbs/day
0.21 TPD	0.23 TPD

Approach and Assumptions

Source of Emission Factors:

Emission estimates were calculated using the ARB's "California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon Leaks at Petroleum Facilities."

TABLE IV-3a: CAPCOA-REVISED 1995 EPA CORRELATION EQUATIONS AND FACTORS FOR REFINERIES AND MARKETING TERMINALS [a]

Component Type/ Service Type	Default Zero Factor (kg/hr)[b]	Correlation Equation (kg/hr)[c]	Pegged Factor (kg/hr)[d]	
			10,000 ppmv	100,000 ppmv
Valves/All	7.8E-06	2.27E-06(SV)^0.747	0.064	0.138
Pump seals/All	1.9E-05	5.07E-05(SV)^0.622	0.089	0.610[e]
Others [f]/All	4.0E-06	8.69E-06(SV)^0.642	0.082	0.138
Connectors/All	7.5E-06	1.53E-06(SV)^0.736	0.030	0.034
Flanges/All	3.1E-07	4.53E-06(SV)^0.706	0.095	0.095
Open-ended lines/All	2.0E-06	1.90E-06(SV)^0.724	0.033	0.082

Number of Values at Refineries:

The number of valves in currently in operation at all the five Bay Area refineries is estimated to 200,000 and is based on WSPA Evaluation of Regulation 8, Rules 8 and 25 conducted by Radian (December 1996), which estimated 180,000 valves.

Number of Value Leaking in Excess of 10,000 ppm:

Based on data collected during inspection audits of refinery fugitive components (July 1999 BAAQMD Inspection Audit of Fugitive Components at Refineries and May 1997 BAAQMD Inspection Audit of Fugitive Components at Refineries), staff estimated that 15 percent of the leaking valves leak above 10,000.

Additional Assumptions for Emission Estimates:

For valves with leak concentrations between 0 and 100 ppm, the average leak concentration is 30 ppm; and the percent of leaking valves between 0 and 100 ppm is 0.5 times the number of valves leaking below 10,000 ppm.