Bay Area Air Quality Management District
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San Francisco, CA 94109
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Permit Evaluation
and
Statement of Basis
for
MAJOR FACILITY REVIEW PERMIT
Significant and Minor Revisions

for

ConocoPhillips – San Francisco Refinery
Facility #A0016

Facility Address:
1380 San Pablo Avenue
Rodeo, CA 94572

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1380 San Pablo Avenue
Rodeo, CA 94572

October 2006

Application 13690

Application Engineer: Brenda Cabral
Site Engineer: Brenda Cabral

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Title V Statement of Basis

A. Background

This facility is subject to the Operating Permit requirements of Title V of the federal Clean Air Act, Part 70 of Volume 40 of the Code of Federal Regulations (CFR), and BAAQMD Regulation 2, Rule 6, Major Facility Review because it is a major facility as defined by BAAQMD Regulation 2-6-212. It is a major facility because it has the "potential to emit," as defined by BAAQMD Regulation 2-6-218, more than 100 tons per year of a regulated air pollutant.

Major Facility Operating permits (Title V permits) must meet specifications contained in 40 CFR Part 70 as contained in BAAQMD Regulation 2, Rule 6. The permits must contain all applicable requirements (as defined in BAAQMD Regulation 2-6-202), monitoring requirements, recordkeeping requirements, and reporting requirements. The permit holders must submit reports of all monitoring at least every six months and compliance certifications at least every year.

In the Bay Area, state and District requirements are also applicable requirements and are included in the permit. These requirements can be federally enforceable or non-federally enforceable. All applicable requirements are contained in Sections I through VI of the permit.

The District issued the initial Title V permit to this facility on December 1, 2003.

The purpose of this action is to (1) remove a restriction upon barge loading at the Marine Terminals, S425 and S426 and (2) to approve an alternative monitoring plan for compliance with the H2S limit in the NSPS standard in 40 CFR 60, Subpart J, Section 104(a)(1) at the Marine Terminal Thermal Oxidizer, A420. This oxidizer controls VOC emissions from the marine terminal sources.

The removal of the restriction upon barge loading is a minor revision of the Major Facility Review permit for the following reasons:

- The change is not considered a major modification under 40 CFR Parts 51 (NSR) or 52 (PSD).
- The change is not considered a modification under 40 CFR Parts 60 (NSPS), 61 (NESHAPS), or Section 112 of the Clean Air Act (HAP).
- There is no significant change or relaxation of monitoring. The control system is subject to and will continue to be subject to continuous monitoring of temperature and static pressure. A one-time source test requirement is being imposed to determine compliance with the limits for barge loading, but a one-time requirement is not considered to be periodic or continuous monitoring.
- No term is established to allow the facility to avoid an applicable requirement.
- No case-by-case determination has been made.

- No facility-specific determination for ambient impacts, visibility analysis, or increment analysis on portable sources has been made.
- No new federal requirement has been imposed.

The approval of the alternative monitoring plan (AMP) is a significant revision because the NSPS standard requires continuous monitoring and periodic monitoring is proposed as an alternative, which is considered a relaxation in monitoring. The AMP is approvable because the vapors collected at the marine loading terminals are low in H2S. The District will require submittal of the first six months' data to confirm the low H2S concentrations. The District has the authority to approve AMPs because Subparts A and J of the NSPS have been delegated to the District and EPA has not reserved these specific authorities.

Amendments to BAAQMD Regulation 8, Rule 44, Marine Tank Vessel Operations, will be added in this action. Since this rule is not federally enforceable, it is not considered a significant revision.

The proposed changes to the permit are shown in "~~strikeout~~/underline" format. In this action, the District is soliciting public comment only on the revisions proposed in this action. When the permit is finalized, the tracking marks will be removed.

This statement of basis does not address the factual and legal basis for any other permit terms. These are addressed in the comprehensive statements of basis that were prepared for the initial issuance of the permit and subsequent reopenings and revisions. These are available on request.

B. Facility Description

The facility description can be found in the statement of basis that was prepared for the reopening issued on December 16, 2004. It is available on request from the Engineering Division of the District.

The revisions to the permit may cause an increase of up to 4.6 ton of organic compounds per year and up to 55 lb benzene per year. The emission calculations are in the evaluation for Application 13691, attached in Appendix A.

C. Permit Content

Additional information concerning the legal and factual basis of the Title V permit conditions is presented below. The information is organized by the relevant section of the Title V permit.

I. Standard Conditions

No changes to Section I are proposed.

II. Equipment

Following are the changes to the abatement device table. There are no changes to the "Permitted Sources" table or to the exempt source table. The limits in that were in BAAQMD Regulation
8-44-301 are now in 8-44-304. The existing parametric monitoring in BAAQMD Condition 4336 that shows compliance with the limits has been added.

The parametric monitoring in the Alternative Monitoring Plan has been added to the Subpart J requirement (40 CFR 60.104(a)(1).

The BACT requirement that was omitted in error from Application 15994 has been added.

Table II B – Abatement Devices

A#	Description	Source(s) Controlled	Applicable Requirement	Operating Parameters	Limit or Efficiency
420	Marine Terminal Thermal Oxidizer (30 MMbtu/hr)	S425 S426	BAAQMD 8-44-304~~301~~	Temperature: > 1300 F. for first 15 minutes; < 1400 F. for rest of loading event ~~None~~	2 pounds POC per 1,000 bbl loaded OR at least 95% by weight reduction of POC emissions
420	Marine Terminal Thermal Oxidizer	S425 S426	40 CFR 60.104(a)(1) NSPS 40 CFR 60 Subpart A	H2S concentration ~~None~~ None	fuel gas H2S concentration limited to 230 mg/dscm (0.10 gr/dscf) None

Table II B – Abatement Devices

A#	Description	Source(s) Controlled	Applicable Requirement	Operating Parameters	Limit or Efficiency
420	Marine Terminal Thermal Oxidizer	S425 S426	BAAQMD Condition 4336, part 9	Temperature: > 1300 F. for first 15 minutes; < 1400 F. for rest of loading event	At least 98.5% by weight reduction of POC emissions for loading of gasoline, gasoline blending stocks, aviation gas, aviation fuel (JP-4 type), and crude oil

III. Generally Applicable Requirements

No changes to this section are proposed in this action.

IV. Source-Specific Applicable Requirements

This section of the permit lists the applicable requirements for permitted or significant sources. These applicable requirements are contained in tables that pertain to one or more sources that have the same requirements. The order of the requirements is:

- District Rules
- SIP Rules (if any) listed following the corresponding District Rules. SIP rules are District rules that have been approved by EPA into the California State Implementation Plan. SIP rules are “federally enforceable” and a “Y” (yes) indication will appear in the “Federally Enforceable” column. If the SIP rule is the current District rule, separate citation of the SIP rule is not necessary and the “Federally Enforceable” column will have a “Y” for “yes”. If the SIP rule is not the current District rule, the SIP rule or the necessary portions of the SIP rule are cited separately after the District rule. The SIP portions will be federally enforceable; the non-SIP versions will not be federally enforceable, unless EPA has approved them through another program.
- Other District requirements, such as the Manual of Procedures, as appropriate.
- Federal requirements (other than SIP provisions)
- BAAQMD permit conditions. The text of BAAQMD permit conditions is found in Section VI of the permit.

- Federal permit conditions (unless they have been assigned a District permit condition number, in which case they are included as BAAQMD permit conditions). The text of Federal permit conditions, if any, is found in Section VI of the permit.

Section IV of the permit contains citations to all of the applicable requirements. The text of the requirements is found in the regulations, which are readily available on the District's or EPA's websites, or in the permit conditions, which are found in Section VI of the permit. All monitoring requirements are cited in Section IV. Section VII is a cross-reference between the limits and monitoring requirements. A discussion of changes to monitoring is included in Section C.VII of this permit evaluation/statement of basis.

Changes to permit:

Table IV - S
Source-specific Applicable Requirements
S425 – MARINE LOADING BERTH M1
S426 – MARINE LOADING BERTH M2

Applicable Requirement	Regulation Title or Description of Requirement	Federally Enforceable (Y/N)	Future Effective Date
BAAQMD Regulation 8, Rule 44	**Organic Compounds-Marine Tank Vessel Operations (12/7/05)**		
8-44-110	Exemption: loading events	N	
8-44-111	Exemption: marine vessel fueling	N	
8-44-115	Exemption, Safety/Emergency Operations	N	
8-44-116	Limited Exemption, Equipment Leaks	N	
8-44-301	Limitations on Marine Tank Vessel Loading and Lightering (until 1/1/07, applies to all gasoline, gasoline blending stocks, aviation gas, JP-4 fuel and crude oil)	N	
8-44-301	Limitations on Marine Tank Vessel Loading and Lightering (after 1/1/07, applies to all gasoline, gasoline blending stocks, aviation gas, JP-4 fuel and crude oil and any other organic compound or mixture of organic compounds that exists as a liquid at actual conditions of use or storage that has a flash point less than 100 degrees F)	N	1/1/07
8-44-302	Limitations on Marine Tank Vessel Ballasting (until 1/1/07, applies to all gasoline, gasoline blending stocks, aviation gas, JP-4 fuel and crude oil)	N	
8-44-302	Limitations on Marine Tank Vessel Ballasting (after 1/1/07, applies to all gasoline, gasoline blending stocks, aviation gas, JP-4 fuel and crude oil and any other organic compound or mixture of organic compounds that exists as a liquid at actual conditions of use or storage that has a flash point less than 100 degrees F)	N	1/1/07
8-44-303	Limitations on Marine Tank Vessel Venting (until 1/1/07, applies to all gasoline, gasoline blending stocks, aviation gas, JP-4 fuel and crude oil)	N	
8-44-303	Limitations on Marine Tank Vessel Venting (after 1/1/07, applies to all gasoline, gasoline blending stocks, aviation gas, JP-4 fuel and crude oil and any other organic compound or mixture of organic compounds that exists as a liquid at actual conditions of use or storage that has a flash point less than 100 degrees F)	N	1/1/07
8-44-304	Emission Control Requirements	N	
8-44-305	Equipment Leaks	N	
8-44-305.2	Leak requirements for marine vessels	N	

Table IV - S
Source-specific Applicable Requirements
S425 – MARINE LOADING BERTH M1
S426 – MARINE LOADING BERTH M2

Applicable Requirement	Regulation Title or Description of Requirement	Federally Enforceable (Y/N)	Future Effective Date
8-44-305.3	Inspection requirements during operation	N	1/1/07
8-44-305.4	Tagging, minimization, and repair requirements	N	
8-44-403	Notifications Regarding Safety/Emergency Exemption	N	
8-44-404	Notifications for Operations Conducted Other Than at Marine Terminals	N	
8-44-501	Recordkeeping	N	
8-44-501.1	Records for loading events	N	
8-44-501.1.1	Name of vessel	N	
8-44-501.1.2	Owner, country, operator, and agent	N	
8-44-501.1.3	Arrival and departure	N	
8-44-501.1.4	Tank identifying designation, type, and amount	N	
8-44-501.1.5	Flash point and temperature	N	1/1/07
8-44-501.1.6	Prior cargo	N	
8-44-501.1.7	Source of flash point data and copy of source document or analysis	N	
8-44-501.1.8	Condition of each tank	N	
8-44-501.1.9	Means used to comply with 8-44-304	N	
8-44-501.1.10	Date and time of inspections, identification equipment	N	1/1/07
8-44-501.2	Records for ballasting operations	N	
8-44-501.2.1.	Information in 8-44-501.1.1 through 8-44-501.1.3	N	
8-44-501.2.2	Tank identifying designation, amount of ballast water	N	
8-44-501.2.3	Prior cargo	N	
8-44-501.2.4	Means used to comply with 8-44-302	N	
8-44-501.2.5	Date and time of inspections, identification equipment	N	1/1/07
8-44-501.3	Records for venting operations	N	
8-44-501.3.1	Information in 8-44-501.1.1 through 8-44-501.1.3	N	
8-44-501.3.2	Tank identifying designation, prior cargo	N	
8-44-501.3.3	Activity leading to venting	N	
8-44-501.3.4	Means used to comply with 8-44-303	N	
8-44-501.3.5	Date and time of inspections, identification equipment	N	1/1/07
8-44-502	Record Keeping – Marine Tank Vessels	N	1/1/07
8-44-503	Record Keeping – Exemptions	N	
8-44-504	Burden of Proof	N	
8-44-603	Leak Determinations	N	
8-44-604	Flash Point Determinations	N	

Table IV - S
Source-specific Applicable Requirements
S425 – MARINE LOADING BERTH M1
S426 – MARINE LOADING BERTH M2

Applicable Requirement	Regulation Title or Description of Requirement	Federally Enforceable (Y/N)	Future Effective Date
SIP Regulation 8, Rule 44	**Organic Compounds-Marine Vessel Loading Terminals (8/30/93)**	**Y**	
8-44-110	Exemption: loading events	Y	
8-44-111	Exemption: marine vessel fueling	Y	
8-44-301	Marine Terminal Loading Limit	Y	
8-44-301.1	Limited to 5.7 gram per cubic meter (2 lb per 1000 bbl) of organic liquid loaded, or	Y	
8-44-301.2	POC emissions reduced 95% by weight from uncontrolled conditions	Y	
8-44-302	Emission control equipment	Y	
8-44-303	Operating practice	Y	
8-44-304	Equipment Maintenance	Y	
8-44-304.1	Certified leak free, gas tight and in good working order	Y	
8-44-304.2	Loading ceases any time gas or liquid leaks are discovered	Y	
8-44-402	Safety/Emergency Operations	Y	
8-44-402.1	Rule does not require act/omission in violation of Coast Guard/other rules	Y	
8-44-402.2	Rule does not prevent act/omission for vessel safety or saving life at sea	Y	
8-44-305	Ozone excess day prohibition	Y	
8-44-501	Record keeping	Y	
8-44-501.1	Name and location	Y	
8-44-501.2	Responsible company	Y	
8-44-501.3	Dates and times	Y	
8-44-501.4	Name, registry of the vessel loaded and legal owner	Y	
8-44-501.5	Prior cargo carried	Y	
8-44-501.6	Type, amount of liquid cargo loaded	Y	
8-44-501.7	Condition of tanks	Y	
8-44-502	Burden of proof	Y	
40 CFR 60 Subpart A	**General Provisions (03/16/1994)**		
60.13	Monitoring Requirements	Y	
60.13(i)	Approval of Alternative Monitoring	Y	
NSPS 40 CFR 60 Subpart J	**Standards of Performance for Petroleum Refineries (7/1/00)**		

Table IV - S
Source-specific Applicable Requirements
S425 – Marine Loading Berth M1
S426 – Marine Loading Berth M2

Applicable Requirement	Regulation Title or Description of Requirement	Federally Enforceable (Y/N)	Future Effective Date
60.100	Applicability	Y	
60.104	Standards for Sulfur Oxides: Compliance Schedule	Y	
60.104(a)(1)	fuel gas H2S concentration limited to 230 mg/dscm (0.10 gr/dscf) except for gas burned as a result of process upset or gas burned at flares from relief valve leaks or other emergency malfunctions	Y	
~~60.105~~	~~Monitoring of Emissions and Operations~~	~~Y~~	
~~60.105(a)(4)~~	~~monitoring requirement for H2S (dry basis) in fuel gas prior to combustion (in lieu of separate combustion device exhaust SO2 monitors as required by 60.105(a)(3))~~	~~Y~~	
60.105(e)(3)(ii)	Excess H2S emission definitions for 60.7(c)	Y	
60.106(a)	Test methods and procedures	Y	
60.106(e)(1)	Method 11 shall be used to verify compliance with 60.104(a)(1)	Y	
NSPS 40 CFR 60 Appendix A	**Appendix A to Part 60 – Test Methods**	Y	
~~**NSPS 40 CFR 60 Appendix B**~~	~~**Performance Specifications**~~		
~~Performance Specification 7~~	~~H2S continuous emission monitoring systems~~	~~Y~~	
40 CFR 63	**National Emission Standards for Hazardous Air Pollutants for Source Categories**	Y	
NESHAPS Part 63 Subpart Y	**National Emission Standards for Marine Tank Vessel Loading Operations**		
63.560(a)	Maximum Achievable Control Technology (MACT) applicability	Y	
63.560(a)(2)	MACT does not apply to existing sources with emissions < 10 or 25 tons	Y	
63.560(a)(3)	Record keeping in 63.567(j)(4) and emission estimation in 63.565(l) apply to existing sources < 10 and 25 tons	Y	
63.565(l)	Emission estimation procedures	Y	
63.567(j)(4)	Retain records of emission estimates per 63.565(l), and actual throughputs, by commodity, for 5 years	Y	

Table IV - S
Source-specific Applicable Requirements
S425 – MARINE LOADING BERTH M1
S426 – MARINE LOADING BERTH M2

Applicable Requirement	Regulation Title or Description of Requirement	Federally Enforceable (Y/N)	Future Effective Date
BAAQMD Condition 4336			
Part 1	A420 oxidizer temperature requirements [Basis: Cumulative Increase]	Y	
Part 2	Monitoring requirements [Basis: Cumulative Increase]	Y	
Part 3	Prohibition against loading without A420 in service [Basis: Cumulative Increase]	Y	
Part 4	Leak test requirement [Basis: Cumulative Increase]	Y	
Part 5	Maximum loading pressure relative to relief valve setpoint [Basis: Cumulative Increase]	Y	
Part 6a	Throughput limit for regulated materials [Basis: Cumulative Increase]	Y	
Part 6b	Maximum loading rate [Basis: Cumulative Increase]	Y	
Part 7	Limit on receipts of crude oil via tanker (ship) [Cumulative increase]	Y	
Part 8	Recordkeeping requirement [Basis: Cumulative Increase]	Y	
Part 9	Destruction efficiency [Basis: BACT]	Y	
Part 10	Alternative monitoring for compliance with 40 CFR 60.104(a)(1) H2S limit [40 CFR 60.13(i), BAAQMD Regulation 2-6-501]	Y	
~~**BAAQMD Condition 20989, Part A**~~	~~Throughput limits for sources S425, S426 [Basis: 2-1-234.3]~~	~~Y~~	

The District amended BAAQMD Regulation 8, Rule 44, on December 7, 2005. The new requirements have been added to Section IV. The old requirements are equivalent to the SIP requirement as approved by EPA on August 30, 1993. These requirements have been added. The analysis of the new requirements is found in the evaluation for Application 13691, which forms part of this statement of basis and is attached in Appendix A.

The NSPS citations have been amended to show that approval of an alternative monitoring plan (AMP) is proposed for compliance with 40 CFR 60.104(a)(1). Therefore, the continuous monitoring in Section 105(a)(4) and the requirements in Appendix B, Performance Specification 7 have been removed. Section 60.13(i), Approval of Alternative Monitoring, has been added from Subpart A, General Provisions. The details of the AMP are fully explained in the evaluation for Application 13691, which forms part of this statement of basis and is attached in Appendix A.

BAAQMD Condition 4336, Part 6, has been split into two parts. The limit on barge loading has been deleted from part 6a. The citation of part 6b has been corrected to "maximum loading rate." A destruction efficiency requirement that was omitted from Application 15994 has been added as part 9. The alternative monitoring plan (AMP) requirements for compliance with 40 CFR 60.104(a)(1) have been added in part 11.

Sources 425 and 426 have been deleted from BAAQMD Condition 20989, part A. This condition lists sources that are "grandfathered." A limit of 25,000 barrels/day annual average was established in 1996 through Application 15994. Therefore, the sources are not grandfathered.

V. Schedule of Compliance

A schedule of compliance is required in all Title V permits pursuant to BAAQMD Regulation
2-6-409.10 that provides that a major facility review permit shall contain the following information and provisions:

"409.10 A schedule of compliance containing the following elements:

- 10.1 A statement that the facility shall continue to comply with all applicable requirements with which it is currently in compliance;
- 10.2 A statement that the facility shall meet all applicable requirements on a timely basis as requirements become effective during the permit term; and
- 10.3 If the facility is out of compliance with an applicable requirement at the time of issuance, revision, or reopening, the schedule of compliance shall contain a plan by which the facility will achieve compliance. The plan shall contain deadlines for each item in the plan. The schedule of compliance shall also contain a requirement for submission of progress reports by the facility at least every six months. The progress reports shall contain the dates by which each item in the plan was achieved and an explanation of why any dates in the schedule of compliance were not or will not be met, and any preventive or corrective measures adopted."

The schedule of compliance in the revised permit issued on March 2, 2006, contains the custom schedule of compliance below, which will be deleted when the alternative monitoring plan (AMP) proposed as BAAQMD Condition 4336, part 10, is issued.

~~B. CUSTOM SCHEDULE OF COMPLIANCE~~

~~The owner/operator is out of compliance with the requirement in 40 CFR 60 Subpart J 60.105(a)(4) to verify the H2S concentration in gas combusted at the A420 oxidizer. A420 abates displaced organic vapors from marine loading operations at berths S425 and S426. Therefore, the District is imposing the following Schedule of Compliance.~~

~~Milestones~~

~~The proposed alternative monitoring plan was submitted to U.S. EPA in a letter dated May 11, 2004.~~

~~Reporting Requirements~~

~~Progress reports shall be submitted on the last day of every month to the Director of Enforcement until a monitoring program is established. The progress reports shall contain the date by which the item in the custom schedule of compliance was achieved or an explanation of why the item was not achieved by the above date and any corrective measures adopted.~~

VI. Permit Conditions

Each permit condition is identified with a unique numerical identifier, up to five digits.

All changes to existing permit conditions are clearly shown in “strike-out/underline” format in the proposed permit. When the permit is issued, all 'strike-out' language will be deleted and all “underline” language will be retained, subject to consideration of comments received.

The existing permit conditions are derived from previously issued District Authorities to Construct (A/C) or Permits to Operate (P/O). Permit conditions may also be imposed or revised as part of the annual review of the facility by the District pursuant to California Health and Safety Code (H&SC) § 42301(e), through a variance pursuant to H&SC § 42350 et seq., an order of abatement pursuant to H&SC § 42450 et seq., or as an administrative revision initiated by District staff. After issuance of the Title V permit, permit conditions will be revised using the procedures in Regulation 2, Rule 6, Major Facility Review.

The regulatory basis is listed following each condition. The regulatory basis may be a rule or regulation. The District is also using the following terms for regulatory basis:

- BACT: This term is used for a condition imposed by the Air Pollution Control Officer (APCO) to ensure compliance with the Best Available Control Technology in Regulation 2-2-301.
- Cumulative Increase: This term is used for a condition imposed by the APCO that limits a source’s operation to the operation described in the permit application pursuant to BAAQMD Regulation 2-1-403.
- Offsets: This term is used for a condition imposed by the APCO to ensure compliance with the use of offsets for the permitting of a source or with the banking of emissions from a source pursuant to Regulation 2, Rules 2 and 4.
- PSD: This term is used for a condition imposed by the APCO to ensure compliance with a Prevention of Significant Deterioration permit issued pursuant to Regulation 2, Rule 2.

- TRMP: This term is used for a condition imposed by the APCO to ensure compliance with limits that arise from the District's Toxic Risk Management Policy.

The proposed changes to BAAQMD permit condition 4336 are in the evaluation report for Application 13691, which is attached and which is part of this statement of basis.

CONDITION 4336

CONDITIONS FOR S425, S426, MARINE LOADING BERTHS

1. For each loading event of "regulated organic liquid", ~~the~~ A420 shall be operated with a temperature of at least 1300 degrees F during the first 15 minutes of the loading operation. After the initial 15 minutes of loading, the A420 temperature shall be at least 1400 degrees F. [Cumulative Increase]

2. Instruments shall be installed and maintained to monitor and record the following:

   a. Static pressure developed in the marine tank vessel
   b. A420 temperature.
   c. Hydrocarbons and flow to determine mass emissions or a concentration measurement alone if it is demonstrated to the satisfaction of the APCO that concentration alone allows verification of compliance, or
   d. Any other device that verifies compliance, with prior approval from the APCO. [Cumulative Increase]

3. A "regulated organic liquid" shall not be loaded from this facility into a marine tank vessel within the District whenever A420 is not fully operational. A420 must be maintained to be leak free, gas tight, and in good working order. For the purposes of this condition, "operational" shall mean the system is achieving the reductions required by Regulation 8, Rule 44; "regulated organic liquids" include gasoline, gasoline blendstocks, aviation gasoline and JP-4 aviation fuel and crude oil. [Cumulative Increase]

4. A leak test shall be conducted on all vessels loading under positive pressure prior to loading more than 20% of the cargo. The leak test shall include all vessel relief valves, hatch cover, butterworth plates, gauging connections, and any other potential leak points. [Cumulative Increase]

5. Loading pressure shall not exceed 80% of the lowest relief valve set pressure of the vessel being loaded. [Cumulative Increase]

6a. No more than 25,000 barrels per day of gasoline, naphtha and C5/C6 shall be shipped across the wharf on an annual average basis. [Cumulative Increase]

1.~~a. When barges are used to ship gasoline, naphtha or C5/C6, the volume of these materials shipped during any reporting period is to be multiplied by a factor of~~

~~1.66 and included in the shipping totals to determine compliance with the throughput limits.~~Deleted Application 13690.

2.~~b.~~ When barges are used to lighter crude oil, the volume of oil lightered during any reporting period shall be multiplied by a factor of 0.42 and included in the shipping totals to determine compliance with the throughput limits. The vessel Exxon Galveston is considered a ship for the purposes of this condition.

6b. The maximum loading rate at any time at both S425 and S426 shall not exceed 20,000 barrels per hour to prevent overloading the A420 oxidizer. [Cumulative Increase]

7. The owner/operator shall not receive more than 30,000 bbl per day crude oil delivered by tanker or ship on a 12 month rolling average basis. [Cumulative increase, 2-1-403]

8. All throughput records required to verify compliance with Parts 6 and 7, including hourly loading rate records (total for S425, S426), monthly crude oil receipt records, and maintenance records required for A420, which are subject to Regulation 8, Rule 44, shall be kept on site for at least 5 years and made available to the District upon request. [Cumulative Increase]

9. The destruction efficiency of the A420 control system shall be at least 98.5% by weight over each loading event for gasoline, gasoline blending stocks, aviation gas, aviation fuel (JP-4 type), and crude oil. [BACT]

10. The purpose of part 10 is to implement an alternative monitoring plan to assure compliance with the H2S limit in 40 CFR 60.104(a)(1) at A420, Thermal Oxidizer. This part will apply whenever A420 is used to comply with BAAQMD Regulation 8, Rule 44, and whenever A420 is used to burn fuel gas as defined by 40 CFR 60.101(d). To ensure that the thermal oxidizer is not used to burn fuel gas that is high in H2S, the following activities are not allowed at the terminal: ballasting, cleaning, inerting, purging, and gas freeing. The owner/operator shall perform the following monitoring: One detection tube sampling shall be conducted on the vapors collected during the event for each marine vessel tank that is affected. The detector tube ranges shall be 0-10/0-100 ppm (N=10/1) unless the H2S level is above 100 ppm. If the H2S level is above 100 ppm, the owner/operator shall use a detection tube with a 0-500 ppm range. The owner/operator shall use ASTM Method 4913-00, Standard Practice for Determining Concentration of Hydrogen Sulfide by Reading Length of Stain, Visual Chemical Detectors. The owner/operator shall maintain records of the H2S detection tube test data for five years from the date of the record. In addition, the owner/operator shall monitor at least once every calendar day that the thermal oxidizer is used. Within 8 months of approval of this part pursuant to Application 13691, the owner/operator shall submit the first six months of results of the H2S analysis to the District's Engineering and Enforcement and Compliance Departments for review. [40 CFR 60.13(i), BAAQMD Regulation 2-6-501]

The limit on barge loading has been deleted from part 6a. The citation of part 6b has been corrected to "maximum loading rate." A destruction efficiency requirement that was omitted from Application 15994 has been added as part 9. The alternative monitoring plan requirements have been added in part 10.

Sources 425 and 426 have been deleted from BAAQMD Condition 20989, part A. This condition lists sources that are "grandfathered." A limit of 25,000 barrels/day annual average was established in 1996 through Application 15994. Therefore, the sources are not grandfathered.

FACILITY-WIDE REQUIREMENTS

CONDITION 20989

A. THROUGHPUT LIMITS

The following limits are imposed through this permit in accordance with Regulation 2-1-234.3. Sources require BOTH hourly/daily and annual throughput limits (except for tanks and similar liquid storage sources, and small manually operated sources such as cold cleaners which require only annual limits). Sources with previously imposed hourly/daily AND annual throughput limits are not listed below; the applicable limits are given in the specific permit conditions listed above in this section of the permit. Also, where hourly/daily capacities are listed in Table II-A, these are considered enforceable limits for sources that have a New Source Review permit. Throughput limits imposed in this section and hourly/daily capacities listed in Table II-A are not federally enforceable for grandfathered sources. Grandfathered sources are indicated with an asterisk in the source number column in the following table. Refer to Title V Standard Condition J for clarification of these limits.

In the absence of specific recordkeeping requirements imposed as permit conditions, monthly throughput records shall be maintained for each source.

source number	hourly / daily throughput limit	annual throughput limit (any consecutive 12-month period unless otherwise specified)
~~425~~	~~Table II-A~~	~~25,000 bbl/day at S425 and S426 (annual average)~~
~~426~~	~~Table II-A~~	~~25,000 bbl/day at S425 and S426 (annual average)~~

VII. Applicable Limits and Compliance Monitoring Requirements

This section of the permit is a summary of numerical limits and related monitoring requirements that apply to each source. The summary includes a citation for each monitoring requirement, frequency, and type. The applicable requirements for monitoring are completely contained in Sections IV, Source-Specific Applicable Requirements, and VI, Permit Conditions, of the permit.

Changes to permit:
See the evaluation for Application 13691 for the explanation of the changes regarding the marine tank vessel rule.

Table VII – S
Applicable Limits and Compliance Monitoring Requirements
S425 – MARINE LOADING BERTH M1
S426 – MARINE LOADING BERTH M2

Type of Limit	Citation of Limit	FE Y/N	Future Effective Date	Limit	Monitoring Requirement Citation	Monitoring Frequency (P/C/N)	Monitoring Type
POC	BAAQMD 8-44-304.1	N		POC Emission < 5.7 grams per cubic meter (2 lb/1000 barrel) loaded, or	BAAQMD Condition 4336, Part 1	C	A420 temperature
POC	BAAQMD 8-44-304.1	N		Controlled > 95% weight	BAAQMD Condition 4336, Part 1	C	A420 temperature
POC	SIP ~~BAAQMD~~ 8-44-301.1	Y		POC Emission ≤ 5.7 grams per cubic meter (2 lb/1000 barrel) loaded, or	BAAQMD Condition 4336, Part 1	C	A420 temperature
POC	SIP ~~BAAQMD~~ 8-44.301.2	Y		Controlled ≥ 95% weight	BAAQMD Condition 4336, Part 1	C	A420 temperature
POC	BAAQMD Condition 4336, Part 9	Y		Controlled > 98.5% weight	BAAQMD Condition 4336, Part 1	C	A420 temperature
POC	BAAQMD 8-44-305.2	N		Vessels hatches, P/V valves, connections, gauging ports and vents, and other equipment up to and including first connection < 3 drops/minute for liquid leak; < 10,000 ppm for gaseous leak	BAAQMD 8-44-305.3 & 8-44-603	P/E (after 1/1/07, during every operation)	inspection with portable VOC monitor

Table VII – S
Applicable Limits and Compliance Monitoring Requirements
S425 – MARINE LOADING BERTH M1
S426 – MARINE LOADING BERTH M2

Type of Limit	Citation of Limit	FE Y/N	Future Effective Date	Limit	Monitoring Requirement Citation	Monitoring Frequency (P/C/N)	Monitoring Type
POC	SIP ~~BAAQMD~~ 8-44-303	Y		Leak free and gas tight	Equipment leak inspections as specified in BAAQMD Regulation 8, Rule 18	P/Q	inspection with portable VOC monitor
POC	BAAQMD Condition 4336, Part 1	Y		1300 degrees F minimum temperature during startup not to exceed 15 minutes, 1400 degrees F minimum temperature after startup	BAAQMD Condition 4336, Part 2b	C	A420 temperature
POC	BAAQMD Condition 4336, Part 5	Y		maximum loading pressure relative to lowest relief valve setting (80%)	BAAQMD Condition 4336, Part 2a	C	loading pressure
POC	BAAQMD Condition 4336, Part 6a	Y		25,000 bbl/day of gasoline, naphtha and C5/C6 compounds, annual average basis	BAAQMD Condition 4336, Part 8	P/D	loading records
POC	BAAQMD Condition 4336, Part 6b	Y		20,000 bbl/hr of gasoline, naphtha and C5/C6 compounds	BAAQMD Condition 4336, Part 8	P/D	loading records
H2S	40 CFR 60 Subpart J 60.104(a)(1)	Y		fuel gas H2S concentration limited to 230 mg/dscm (0.10 gr/dscf) except for gas burned as a result of process upset or gas burned at flares from relief valve leaks or other emergency malfunctions; this requirement applies to sources installed/modified after 6/11/73 and burning refinery gas	~~40 CFR 60 Subpart J 60.105(a)(4)~~ 40 CFR 60.13(i); BAAQMD Condition 4336, part 11	~~N~~P/E	~~None~~ Detector tube analysis

Table VII – S
Applicable Limits and Compliance Monitoring Requirements
S425 – MARINE LOADING BERTH M1
S426 – MARINE LOADING BERTH M2

Type of Limit	Citation of Limit	FE Y/N	Future Effective Date	Limit	Monitoring Requirement Citation	Monitoring Frequency (P/C/N)	Monitoring Type
Through-put	BAAQMD Condition 4336, Part 7	Y		30,000 bbl/day of crude oil received on an annual average basis	BAAQMD Condition 4336, Part 8	P/D	loading records
~~Through-put~~	~~BAAQMD Condition 20989, Part A~~	~~Y~~		~~2.8 E 6 bbl/yr~~	~~BAAQMD Condition 20989, Part A~~	~~P/M~~	~~records~~

In addition to the changes explained in Section C.IV, the following corrections were made. The 25,000 barrel/day limit is part 6a of Condition 4336. The 20,000 barrel/hr limit in part 6b, omitted in error, was added to this table. The monitoring was already contained in part 8. The BACT limit was added as part 9.

The alternative monitoring plan in BAAQMD Condition 4336, part 10, has been substituted for the continuous monitoring requirement in 40 CFR 60.105(a)(4).

Sources 425 and 426 have been deleted from BAAQMD Condition 20989, part A. This condition lists sources that are "grandfathered." A limit of 25,000 barrels/day annual average was established in 1996 through Application 15994. Therefore, the sources are not grandfathered.

VIII. Test Methods

This section of the permit lists test methods that are associated with standards in District or other rules. It is included only for reference. In most cases, the test methods in the rules are source test methods that can be used to determine compliance but are not required on an ongoing basis. They are not applicable requirements. If a rule or permit condition requires ongoing testing, the requirement will also appear in Section VI of the permit.

<u>Changes to permit</u>:
Test methods have been added for BAAQMD Regulation 8, Rule 44, as amended on December 7, 2005, the SIP rule, and the amendments to BAAQMD Condition 4336. The old methods for BAAQMD Regulation 8, Rule 44, have been deleted.

Table VIII
Test Methods

Applicable Requirement	Description of Requirement	Acceptable Test Methods
BAAQMD Regulations		
~~8-44-301.1~~ ~~8-44-301.2~~	~~POC emission rate limitation during marine tank vessel loading~~	~~Manual of Procedures, ST-34, Bulk Marine Loading Terminals, Vapor Recovery Units~~
~~8-44-303~~	~~Tank vessel is leak free and gas tight~~	~~EPA Method 21~~
8-44-304.1	POC emission rate limitation during marine tank vessel loading	Manual of Procedures, ST-34, Bulk Marine Loading Terminals, Vapor Recovery Units or EPA Method 25, Determination of Total Gaseous Nonmethane Organic Emissions , or EPA Method 25A, Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer, or alternate method approved in writing by the APCO and U.S. EPA
8-44-305	Tank vessel is leak free and gas tight	EPA Method 21, Determination of Volatile Organic Compounds Leaks
8-44-603	Leak Tests and Gas Tight Determinations	EPA Method 21, Determination of Volatile Organic Compounds Leaks
8-44-604	Flash Point Determinations	ASTM Standard Test Method D56 ("Standard Test Method for Flash Point by Tag Closed Cup Tester") or ASTM Standard Test Method D93 ("Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester"), whichever is applicable, or by an alternate method approved in writing by the APCO and U.S. EPA.
SIP Regulations		
8-44-301.1 8-44-301.2	POC emission rate limitation during marine tank vessel loading	Manual of Procedures, ST-34, Bulk Marine Loading Terminals, Vapor Recovery Units
8-44-303	Tank vessel is leak free and gas tight	EPA Method 21, Determination of Volatile Organic Compounds Leaks
8-44-603	Leak Tests and Gas Tight Determinations	EPA Method 21, Determination of Volatile Organic Compounds Leaks
BAAQMD Conditions		
Condition 4336, part 4	Leak test	EPA Method 21, Determination of Volatile Organic Compounds Leaks

Table VIII
Test Methods

Applicable Requirement	Description of Requirement	Acceptable Test Methods
Condition 4336, part 9	POC emission rate limitation during barge loading	Manual of Procedures, ST-34, Bulk Marine Loading Terminals, Vapor Recovery Units or EPA Method 25, Determination of Total Gaseous Nonmethane Organic Emissions , or EPA Method 25A, Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer, or alternate method approved in writing by the APCO and U.S. EPA
Condition 4336, part 11	Alternative monitoring for compliance with 40 CFR 60.104(a)(1) H2S limit	ASTM Method 4913-00, Standard Practice for Determining Concentration of Hydrogen Sulfide by Reading Length of Stain, Visual Chemical Detectors

IX. Permit Shield:

No changes to permit shields are proposed in this revision.

X. Revision History

The revision history will be updated when the minor revision is issued.

XI. Glossary

No changes to the glossary are proposed in this revision.

D. Alternate Operating Scenarios

No alternate operating scenario has been requested for this facility.

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APPENDIX A

ENGINEERING EVALUATION FOR APPLICATION 13691

FINAL
ENGINEERING EVALUATION
CONOCOPHILLIPS SAN FRANCISCO REFINERY; PLANT 16
APPLICATION 13691

BACKGROUND

ConocoPhillips has applied for a change in BAAQMD Condition 4336 for the following sources:

S425, Marine Loading Berth M1 abated by A420, Thermal Oxidizer
S426, Marine Loading Berth M2 abated by A420, Thermal Oxidizer

The facility has requested that the following language be deleted:

6a. When barges are used to ship gasoline, naphtha or C5/C6, the volume of these materials shipped during any reporting period is to be multiplied by a factor of 1.66 and included in the shipping totals to determine compliance with the throughput limits.

Application 28740 imposed this restriction in 1983 because the uncontrolled VOC emissions during loading of barges are higher than they are during the loading of ships. Chapter 5.2 of AP-42, Transportation and Marketing of Petroleum Liquids, dated January 1995, states that the uncontrolled emissions are 2.6 lb/1000 gal and 3.9 lb/1000 gal, for loading into ships and barges, respectively.

BAAQMD Regulation 8, Rule 44, Marine Vessel Loading Terminals, was adopted in 1989. Section 301 of this rule limited the emissions of VOC from loading of all gasoline, gasoline blending stocks, aviation gas and aviation fuel (JP-4 type) and crude oil to 2 lb/1000 barrels or a 95% reduction by weight from uncontrolled conditions. The rule allowed the owner/operator to comply with either limit. The limit applied equally to the loading of ships and barges. Application 4332 evaluated the installation of a thermal oxidizer to control the marine loading in 1990. The District tested the control system on 12/7/91 and determined that the control efficiency at that time was 99.9% for NMOC. The test report appears to indicate that the test was performed during ship, not barge, loading.

In 1996, Conoco (then Unocal) submitted Application 15994 for a throughput increase at the marine terminal from 14,900 to 25,000 barrels/day. The evaluation states that the control device would meet the current BACT limit of 98.5% destruction. No distinction was made between ships and barges. The BACT limit in 1995 is the same as the current BACT limit. However, the BACT limit was not explicitly imposed via permit conditions. The permit condition will be corrected to impose the BACT limit, but will be limited to the loading of the liquids for which the BACT limit was considered. Offsets were provided for the calculated emissions increase.

Conoco has submitted this application because the emission limit is the same for both barges and ships, even though uncontrolled emissions from barges are greater than uncontrolled emissions from ships.

On December 7, 2005, the District amended BAAQMD Regulation 8, Rule 44. ConocoPhillips is obligated to comply with the new rule.

EMISSION CALCULATIONS

Loading of gasoline, naphtha and C5/C6

The emission factors for loading these products, established in Application #28740, are 168 lb VOC/1000 barrels for barges and 101 lb VOC/1000 barrels for ships. The BACT abatement factor is 98.5% control. Conoco is limited to shipping 25,000 barrels/day, on an annual average basis, which is equivalent to 9,125,000 barrels/year. If all of these products are loaded onto ships, the estimated emissions are 6.9 tons/year. If all of these products are loaded onto barges, the estimated emissions are 11.5 tons/year. The difference is 4.6 tons VOC/year.

Cargo Carrier Emissions

Removal of the restriction on barge loading could create an incentive to ship more products via barges instead of ships. This would have the effect of increasing the emissions from cargo carriers if the emissions of the tugboats that move the barges are much higher than the emissions of the ship engines.

Conoco stated in Application 28740 that the facility would use ships instead of barges for transport. In fact, reducing the amount of loading into barges and lightering provided offsets for the application. However, a limit was not placed on the number of barges that could load products at the Marine Terminal. Instead, recognizing that barges would sometimes be necessary, the District imposed the restriction on barge loading in BAAQMD Condition 4336, part 6.

Application 28740 was completed in 1983. At that time, the emissions from a cargo carrier's engines were not considered to be part of the facility. On July 17, 1991 , a new definition of facility was added to BAAQMD Regulation 2, Rule 2 that included the emissions of cargo carriers, except for motor vehicles. The definition was added to BAAQMD Regulation 2, Rule 1 on November 3, 1993. Therefore, increases in the emissions of cargo carriers are subject to offsets. BAAQMD Regulation 2-2-206 exempts cargo carriers from BACT.

Conoco has submitted calculations that show that the ship cargo carrier emissions are higher than the barge cargo carrier emissions. The basis is EPA Publication EPA420-R-00-002, Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data, February 2000. Chapter 5, Emission Factor Summary, is attached in Appendix 1. EPA has developed emission factors that take the following variables into account:

- Vessel class
- Deadweight tons (DWT)
- Load factors (normal cruise, slow cruise, maneuvering, and hoteling)
- Time spent at each load

Using Conoco's data and the EPA analysis, the District actually concludes that the ship emissions are not very different from the barge emissions.

Barges do not have engines and are dependent on tugboats for motive power. The emissions from barge trips are based on an average of 13 hours operation for the assigned tugboat and an additional 2 hours for an "assist" tugboat during maneuvering. Barges carry an average of 75,000 barrels. There are no "hoteling" emissions, which means running an engine while the barge is at the dock. Conoco concluded that the emission factors for barge loading were:

NOX: 8.48 lb/1000 bbl
SO2: 10.77 lb/1000 bbl
PM: 0.21 lb/1000 bbl
HC: 0.15 lb/1000 bbl
CO: 1.17 lb/1000 bbl

Conoco assumed that the average ship has a DWT capacity of 44,000 tons, which is roughly equivalent to 335,200 barrels of gasoline at 6.25 lb/gal. However, Conoco also assumed that the ship would only load 116,000 barrels- 34% of the possible load, while attributing all of the emissions to the gasoline load. For the purpose of developing a per barrel emission factor, the District will assume that the entire ship is loaded with gasoline.

The ship is escorted by one tugboat for 7 hours and assisted by three tugboats when maneuvering. Conoco also assumed that the ship would have hoteling emissions for 30 hours per ship. At least 16.75 hours would be required for this volume because Conoco can only load at a rate of 20,000 barrels per hour, due to the capacity of the thermal oxidizer. Therefore, this estimate is reasonable. Adding the estimated emissions of the ship and the tugboats, the District concludes that the emission factors for ship loading of gasoline for Conoco are:

NOX: 8.22 lb/1000 bbl
SO2: 10.36 lb/1000 bbl
PM: 0.21 lb/1000 bbl
HC: 0.12 lb/1000 bbl
CO: 1.01 lb/1000 bbl

There are many uncertainties surrounding these emission factors, such as the engine ratings of the tugboats and the ships, and the length of trips. These factors are based on the average length of trips for ships and barges for Conoco for gasoline loading. The barge trip average is lower because many barge trips will be to terminals or facilities that are located on the bay, whereas the ship trips will be to locations outside the bay. Because of the uncertainties, it is not useful to restrict barge or ship loading based on the cargo carrier emissions and no new limits or offsets will be imposed based on these estimates.

CUMULATIVE INCREASE AND OFFSETS

The increase for this change is 4.6 tons POC.

The cumulative increase for the last application for these sources that had an increase, Application 15994, was 3.690 ton VOC/yr. This increase was calculated on the basis of 2.0 lb VOC/1000 barrels, the limit in BAAQMD Regulation 8-33-301. This increase was offset at a 1:1.15 ratio, so 4.240 tons of VOC offsets were provided.

If the increase had been calculated as shown above, the increase would have been 2.79 tons per year based on an increase of 10,100 barrels/day, 101 lb VOC/1000 barrels for ships, and 98.5% control, as shown below.

10,100 bbl/day x 365 days/yr x 101 lb VOC/1000 bbl x 0.015 x ton/2000 lb =
2.79 ton VOC/yr

Therefore, the VOC emissions were overestimated by 0.900 tpy and an excess of 1.035 tpy VOC offsets were supplied. Therefore, the cumulative increase for this application will be reduced by 0.900 to 3.700 tpy.

In accordance with BAAQMD Regulation 2-2-302, POC offsets must be provided at a ratio of 1.15:1. The cumulative increase at the facility will remain at 0. 4.255 tons of VOC offsets will come from Certificate 921.

TOXIC RISK MANAGEMENT

As described above, an increase in throughput at the marine terminals was approved in 1996 via Application 15994. In that application, an increase in benzene of 74 lb/yr was calculated based on 1% benzene in the gasoline vapors. The benzene vapors must have been overestimated because in 1994, CARB dropped the concentration of benzene in liquid gasoline to 1%, and the concentration in the vapors is lower.

The concentration of benzene in the headspace of gasoline tanks is currently about 0.3%. Since ConocoPhillips loads other products besides CARB gasoline into marine vessels, they have opted to use the conservative factor of 0.6%. If the emissions of benzene had been calculated in the same manner for Application 15994, the emissions calculated would have been, as follows.

> 10,100 bbl/day x 365 days/yr x 101 lb VOC/1000 bbl x 0.015 x 0.006 = 33.5 lb benzene/yr

The increase for Application 13691 is based on 25,000 bbl/day on an annual average basis shipped via barge instead of ships:

> 25,000 bbl/day x 365 days/yr x (168 lb VOC-101 lb VOC)/1000 bbl x 0.015 x 0.006 = 55.0 lb/yr

The definition of project in BAAQMD Regulation 2, Rule 5, adopted on June 15, 2005, requires that the increase permitted in Application 15994 be added to the increase for Application 13691 for the purpose of meeting the project standard in Section 2-5-302, Project Risk Requirement.

Therefore, the total increase is the sum of the increases for Applications 15994 and 13691 or **88.5 lb benzene/yr.**

The above increase is calculated in accordance with BAAQMD Regulation 2-5-602.1, which states:

> "For a source that has, contained in a permit condition, an emission cap or emission rate limit, the baseline throughput and baseline emission rate (expressed in the units of mass of emissions per unit of throughput) shall be based on the levels allowed by the permit condition."

Section 602.3 does not apply because the reductions in the CARB ATCM were prior to the increases for Application 15995 and 13691.

<u>The hourly emissions have not increased because ConocoPhillips currently loads some barges and there is an hourly throughput limit based on the capacity of the thermal oxidizer.</u>

<u>The District completed a risk assessment based on the increase in benzene. The maximum cancer risk is 0.01 in a million. The chronic non-cancer hazard index is less than 0.00001. The change in conditions therefore passes the risk screen.</u>

STATEMENT OF COMPLIANCE
BAAQMD REGULATION 8, RULE 44

The rule was amended on December 7, 2005. Following is an assessment of compliance with the rule as amended.

Section 8-44-222: The definition of organic liquid has changed and is now entitled "regulated organic liquid." The definition to January 1, 2007, is " all gasoline, gasoline blending stocks, aviation gas, JP-4 fuel and crude oil." The definition after January 1, 2007, is " all gasoline, gasoline blending stocks, aviation gas, JP-4 fuel and crude oil, and any other organic compound or mixture of organic compounds that exists as a liquid at actual conditions of use or storage that has a flash point less than 100 degrees F."

Sections 8-44-301, 8-44-302, and 8-44-303 place limitations on marine tank vessel loading and lightering, ballasting, and venting. They apply to operations with regulated organic liquids.

Section 8-44-304.1 is equivalent to the requirement that was previously in Section 8-44-301. A new requirement has been added in Section 8-44-304.2 to use emission control equipment during loading, ballasting, or venting.

Section 8-44-305, Equipment Leaks, replaces old sections 8-44-303, Operating Practice, and 8-44-304, Equipment Maintenance. The definition of a leak has been moved from Sections 8-44-208 and 8-44-209 to Section 8-44-305. The liquid leak definition has been tightened from 4 drops per minute to three drops per minute. The "gas tight" definition has been tightened from 10,000 ppm to 1,000 ppm for all equipment associated with the operation up to, but not including, the first connection at the vessel being loaded. However, this equipment is not subject to the standard in Section 8-44-305.1 because it is subject to BAAQMD Regulation 8, Rule 18, and is therefore exempt in accordance with the limited exemption in Section 8-44-116. Starting January 1, 2007, the owner/operator will have to inspect the vessel at least once during every operation. The old rule required cessation of loading whenever a leak was discovered. This amendment requires minimization within 4 hours of discovery and repair prior to commencement of the next operation. This standard is more stringent because the vessel will be inspected during every operation. The old rule required no periodic inspections.

Sections 8-44-501, 8-44-502, 8-44-503, and 8-44-504 require additional recordkeeping. Section 8-44-601 adds EPA Methods 25 and 25A to determine compliance with the destruction efficiency standards in Section 8-44-304.1. A requirement to conduct any test for at least 6 hours and during the final 50% of a loading event was added because emissions are higher at the end of the event.

ConocoPhillips will be able to comply with the above requirements.

The old requirements are still in the California SIP. The new requirements will not be in the SIP until the District submits the new rule to ARB for approval and submittal to EPA, and EPA approves the rule. Until then, the old rule remains in place and is the federally enforceable rule. The new rule is not federally enforceable.

BACT

In 1996, Conoco (then Unocal) submitted Application 15994 for a throughput increase at the marine terminal from 14,900 to 25,000 barrels/day. The evaluation states that the control device would meet the current BACT limit of 98.5% destruction. (The BACT limit in 1995 is the same as the current BACT limit.) No distinction was made between ships and barges. However, the BACT limit was not explicitly imposed via permit conditions. The permit condition will be corrected to impose the BACT limit.

ConocoPhillips conducted a source test in connection with this application. The thermal oxidizer continues to meet the BACT limit.

NSPS

Marine loading of petroleum liquids is not subject to NSPS. However, the combustion of fuel gas as defined in 40 CFR 60, Subpart J, Section 101(d) is subject to the 230 mg/dscm H2S limit in Section 104(a)(1). The vapors burned by A420, Marine Loading Thermal Oxidizer, are considered to be fuel gas. The facility is not in compliance with the requirement in Section 105(a)(4) for continuous H2S monitoring. Instead, the facility has submitted a petition for an alternative monitoring plan (AMP) to EPA on May 11, 2004. The letter is attached in Appendix 2. The plan proposes monitoring the vapors once with detection tubes. The rationale for the plan is that that the gasoline and gasoline blend stocks that are loaded are low-sulfur products and do not contain high levels of H2S. If the facility loads these products into tanks that have only held similar products or are clean, the resulting vapors that are burned would be low in H2S.

The situation has changed since the AMP was proposed. BAAQMD Regulation 8, Rule 44, was amended on December 7, 2005. The rule now requires control when loading into a marine tank that had a prior load that was a regulated liquid, during lightering (transfer of organic liquid from one vessel to another), ballasting, or venting of marine vessel tanks. Following is an analysis of the potential impact of the changes on the AMP.

- Loading into a tank that had contained a regulated liquid: The prior cargo may be high in H2S, even if the liquid that is loaded is low in H2S.
- Ballasting: Ballasting is defined as the loading of seawater into a marine tank vessel cargo tank to obtain proper propeller, rudder and hull immersion or to provide clearance under bridges or other potential

obstacles. Ballasting can generate high-H2S vapors if the tank contained a liquid that contained H2S.

- Venting: Venting is defined as the release of hydrocarbon gases from a marine tank vessel cargo tank through the manual or automatic opening of tank vents, hatches, or other openings for the purpose of reducing tank internal pressure or in connection with inerting, purging, tank cleaning, or gas freeing. These activities can generate high-H2S vapors if the tank contained a liquid that contained H2S.
- Lightering: Lightering occurs in open waters, not at terminals, so it is not performed at Conoco's terminal.

Conoco's proposed AMP contained the following elements:

- One detection tube sampling on the commercial natural gas
- One detection tube sampling on the vapors for each grade of gasoline and blend stock
- Detector tube ranges proportional to the level of H2S found
- ASTM Method 4913-00, Standard Practice for Determining Concentration of Hydrogen Sulfide by Reading Length of Stain, Visual Chemical Detectors

When the AMP was proposed, the facility was only obligated to control when gasoline, gasoline blending stocks, aviation gas, and aviation fuel (JP-4 fueltype) and crude oil were loaded. The definition of regulated organic liquid has been expanded effective January 1, 2007, and the facility is now required to control venting and ballasting if the marine vessel tank contained a regulated organic liquid before these operations. Therefore, the AMP has been modified to ensure compliance with 40 CFR 60.104(a)(1) under these circumstances. The monitoring plan was developed following the guidance in EPA's memorandum: "Alternative Monitoring Plan for NSPS Subpart J Refinery Fuel Gas," which is attached in Appendix 3.

Periodic monitoring will be required at least once for all events, not just loading. Conoco will take a sample before the vapors are mixed with natural gas and determine the H2S content using detection tubes.

Since the composition of the vapors depends on the contents of the vessels before the event as well as the liquid that is loaded, monitoring will be required for each marine vessel that is vented to the thermal oxidizer. Because these events may take more than one day, monitoring will be required at least once every 24 hours for each event. Conoco will be required to submit the first six months' data to the District to confirm that the vapors have a low H2S concentration. This requirement is particularly important because Conoco has submitted no real data to substantiate the claim that the vapors are low in H2S;

however, the District agrees that the loading of low-sulfur products is unlikely to generate vapors that are high in H2S.

Conoco states that 4 to 6 loading events occur per month.

Upon approval of the AMP and its inclusion into the Title V permit, Conoco will be in compliance with the H2S monitoring requirements for 40 CFR 60, Subpart J, at A420, Thermal Oxidizer.

MONITORING ANALYSIS

In addition to the AMP discussed above under the "NSPS" caption, the control system is subject to and will continue to be subject to continuous monitoring of temperature and static pressure. .

CEQA

This application is not subject to CEQA because it is considered ministerial pursuant to BAAQMD Permit Handbook Chapter 3.1.

NESHAPS

S425 and S426, Marine Loading, are subject to 40 CFR 63, Subpart Y, but are not subject to the emission limits in Sections 63.562(b) and (d). They are subject to the recordkeeping requirements of Section 63.567(j)(4) and the emission estimation requirements of Section 63.565(l). These requirements are in the Major Facility Review permit. The citation of applicability will be corrected from: " MACT does not apply to existing sources with emissions < 10 or 25 tons" to "Emission limits do not apply to existing sources with emissions < 10 or 25 tons."

PSD

PSD is not triggered.

PERMIT CONDITIONS

CONDITION 4336

CONDITIONS FOR S425, S426, MARINE LOADING BERTHS

1. For each loading event of "regulated organic liquid", ~~the~~ A420 shall be operated with a temperature of at least 1300 degrees F during the first 15 minutes of the loading operation. After the initial 15 minutes of loading, the

A420 temperature shall be at least 1400 degrees F.
[Cumulative Increase]

2. Instruments shall be installed and maintained to monitor and record the following:

a. Static pressure developed in the marine tank vessel
b. A420 temperature.
c. Hydrocarbons and flow to determine mass emissions or a concentration measurement alone if it is demonstrated to the satisfaction of the APCO that concentration alone allows verification of compliance, or
d. Any other device that verifies compliance, with prior approval from the APCO.

[Cumulative Increase]

3. A "regulated organic liquid" shall not be loaded from this facility into a marine tank vessel within the District whenever A420 is not fully operational. A420 must be maintained to be leak free, gas tight, and in good working order. For the purposes of this condition, "operational" shall mean the system is achieving the reductions required by Regulation 8, Rule 44; "regulated organic liquids" include gasoline, gasoline blendstocks, aviation gasoline and JP-4 aviation fuel and crude oil.
[Cumulative Increase]

4. A leak test shall be conducted on all vessels loading under positive pressure prior to loading more than 20% of the cargo. The leak test shall include all vessel relief valves, hatch cover, butterworth plates, gauging connections, and any other potential leak points.

[Cumulative Increase]

5. Loading pressure shall not exceed 80% of the lowest relief valve set pressure of the vessel being loaded.
[Cumulative Increase]

6a. No more than 25,000 barrels per day of gasoline, naphtha and C5/C6 shall be shipped across the wharf on an annual average basis.
[Cumulative Increase]

1.~~a. When barges are used to ship gasoline, naphtha or C5/C6, the volume of these materials shipped during any reporting period is to be multiplied by a factor of 1.66 and included in the shipping totals to determine compliance with the throughput limits.~~Deleted Application ~~13690~~13691.

~~2.b. When barges are used to lighter crude oil, the volume of oil lightered during any reporting period shall be multiplied by a factor of 0.42 and included in the shipping totals to determine compliance with the throughput limits. The vessel Exxon Galveston is considered a ship for the purposes of this condition.~~

6b. The maximum loading rate at any time at both S425 and S426 shall not exceed 20,000 barrels per hour to prevent overloading the A420 oxidizer. [Cumulative Increase]

7. The owner/operator shall not receive more than 30,000 bbl per day crude oil delivered by tanker or ship on a 12 month rolling average basis. [Cumulative increase, 2-1-403]

~~8. All throughput records required to verify compliance with Parts 6 and 7, including hourly loading rate records (total for S425, S426), monthly crude oil receipt records, and maintenance records required for A420, which are subject to Regulation 8, Rule 44, shall be kept on site for at least 5 years and made available to the District upon request. [Cumulative Increase]~~

9. The destruction efficiency of the A420 control system shall be at least 98.5% by weight over each loading event for gasoline, gasoline blending stocks, aviation gas, aviation fuel (JP-4 type), and crude oil. [BACT]

10. The purpose of part 10 is to implement an alternative monitoring plan to assure compliance with the H2S limit in 40 CFR 60.104(a)(1) at A420, Thermal Oxidizer. This part will apply whenever A420 is used to comply with BAAQMD Regulation 8, Rule 44, and whenever A420 is used to burn fuel gas as defined by 40 CFR 60.101(d). To ensure that the thermal oxidizer is not used to burn fuel gas that is high in H2S, the following activities are not allowed at the terminal: ballasting, cleaning, inerting, purging, and gas freeing. The owner/operator shall perform the following monitoring: One detection tube sampling shall be conducted on the vapors collected during the event for each marine vessel that is affected. The detector tube ranges shall be 0-10/0-100 ppm (N=10/1) unless the H2S level is above 100 ppm. If the H2S level is above 100 ppm, the owner/operator shall use a detection tube with a 0-500 ppm range. The owner/operator shall use ASTM Method 4913-00, Standard Practice for Determining Concentration of Hydrogen Sulfide by Reading Length of Stain, Visual Chemical Detectors. The owner/operator shall maintain records of the H2S detection tube test data for five years from the date of the record. In addition, the owner/operator shall monitor at least once every calendar day that the thermal oxidizer is used. Within 8 months of approval of this part pursuant to Application 13691, the owner/operator shall submit the first six months of results of the H2S analysis to the District's Engineering and Enforcement and Compliance Departments for review. [40 CFR 60.13(i), BAAQMD Regulation 2-6-501]

FACILITY-WIDE REQUIREMENTS

CONDITION 20989

A. THROUGHPUT LIMITS

The following limits are imposed through this permit in accordance with Regulation 2-1-234.3. Sources require BOTH hourly/daily and annual throughput limits (except for tanks and similar liquid storage sources, and small manually operated sources such as cold cleaners which require only annual limits). Sources with previously imposed hourly/daily AND annual throughput limits are not listed below; the applicable limits are given in the specific permit conditions listed above in this section of the permit. Also, where hourly/daily capacities are listed in Table II-A, these are considered enforceable limits for sources that have a New Source Review permit. Throughput limits imposed in this section and hourly/daily capacities listed in Table II-A are not federally enforceable for grandfathered sources. Grandfathered sources are indicated with an asterisk in the source number column in the following table. Refer to Title V Standard Condition J for clarification of these limits.

In the absence of specific recordkeeping requirements imposed as permit conditions, monthly throughput records shall be maintained for each source.

source number	**hourly / daily throughput limit**	**annual throughput limit (any consecutive 12-month period unless otherwise specified)**
~~425~~	~~Table II-A~~	~~25,000 bbl/day at S425 and S426 (annual average)~~
~~426~~	~~Table II-A~~	~~25,000 bbl/day at S425 and S426 (annual average)~~

Sources 425 and 426 have been deleted from BAAQMD Condition 20989, part A. This condition lists sources that are "grandfathered." A limit of 25,000 barrels/day annual average was established in 1996 through Application 15994. BACT was imposed and offsets were provided. Therefore, the sources are not grandfathered.

RECOMMENDATION

Waive the authority to construct and issue a permit to operate for the following sources:

S425, Marine Loading Berth M1 abated by A420, Thermal Oxidizer
S425, Marine Loading Berth M2 abated by A420, Thermal Oxidizer

Modify BAAQMD conditions 4336 and 20989 as shown above.

By: ____

Brenda Cabral Date
Senior Air Quality Engineer

Appendix 1

Chapter 5, Emission Factor Summary, from EPA Publication EPA420-R-00-002, Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data, February 2000

5. EMISSION FACTOR SUMMARY

The analysis presented in this report derives new emission factors for marine vessels, based on data from the Lloyds Marine Exhaust Emissions Research Program, and the Coast Guard Test Program. Unlike marine emission factors that were historically specified in units of fuel consumption, the emission factors are specified in units of work (kW-hr) and are dependent on engine load factor, which is the ratio of actual output to rated output based on the maximum continuous rating.

The computation of emissions (and fuel consumption, if required) can be performed by ship type for a given port and requires the following inputs:

- The number of calls to the port by vessel class and deadweight tonnage.
- The time spent, by ship type, in each of four operating modes defined as: normal cruise, slow cruise, maneuvering and hoteling.

Alternatively, if ship horsepower is directly available for each ship, classification by deadweight tonnage is not required. In addition, the user may define alternative modes of operation and typical engine load factors by mode.

The basic equations used for the calculation are:

$$TIME_{VCC,\,DWT,\,MODE} = CALLS_{VCC,\,DWT} \times LENGTH_{VCC,DWT} \times \%TIME_{VCC,\,DWT,\,MODE}/100$$

$$EMISSIONS_{VCC,DWT,MODE} = (EF)(LF_{MODE}) \times (HP)(DWT) \times LF_{MODE} \times TIME_{VCC,\,DWT,\,MODE}$$

where:

VCC is the vessel class (tanker, RORO, etc.)
DWT is the deadweight tons
EF is the emissions factor
LF is the mode specific load factor

For the calculation, the TIME equation requires port specific inputs, while this report provides the EF and HP relationships.

The emission factors and fuel consumption rates are derived from substantially more data than earlier emission factors, and represent an improvement over the current fuel based emission factors. However, the emission factors derived are subject to the following cautions:

- A significant portion of the database had measurements that yielded inconsistent values of air-fuel ratio depending on the calculation methodology employed. These records were excluded from the analysis, but the remaining database was still adequate for analysis.

  Some of the data reported suspiciously low values of HC concentrations (below one ppb), but these data were retained in the analysis. However, the number of records with low HC values is small.

  There are concerns regarding the determination of output power at each test mode, for about ten percent of the records.
- Most of the data analyzed is on engines rated at less than 8000 kW. Most of the data points eliminated from analysis due to errors are from higher output engines, which are mostly two-stroke engines. Hence, the applicability of the derived emission factors to all engine sizes is not firmly established.

The emissions factor algorithms derived are of the form:

$$\mathbf{E\ (g/kW\text{-}hr) = a\ (Fractional\ Load)^{-x} + b}$$

where E is the emissions rate per unit of work. The data analysis showed no statistically significant differences in emissions rates by engine size or output range, or by two-stroke/four-stoke, subject to the caveats detailed above. Emissions rates for SO_2 are based on (fuel consumption *x* sulfur content of fuel) since all SO_2 emissions are fuel derived. Table 5-1 provides a summary of HC, CO, NO_x, NO_2, PM, CO_2, and SO_2 emission factors and fuel consumption as a function of load. The fuel consumption factor algorithm (derived from the same database as the emission factors) is also in the same equation form as emission factor algorithms. These emissions factor and fuel consumption rate algorithms are applicable to all engine sizes since the emissions data showed no statistically significant difference across engine sizes. In all cases (including fuel consumption), the algorithms provide the rates per unit of work, i.e. per kW-hr. In order to obtain the absolute emission or fuel consumption level in grams, it is

TABLE 5-1
MARINE ENGINE EMISSION FACTOR
AND FUEL CONSUMPTION ALGORITHMS
(in g/kW-hr, for all marine engines)

Pollutant	Exponent (x)	Intercept (b)	Coefficient (a)
PM	1.5	0.2551	0.0059
NO_x	1.5	10.4496	0.1255
NO_2	1.5	15.5247	0.18865
SO_2	n/a	n/s	2.3735
CO	1	n/s	0.8378
HC	1.5	n/s	0.0667
CO_2	1	648.6	44.1

1 All regressions but SO_2 are in the form of:
Emissions Rate (g/kW-hr) = a (Fractional Load)$^{-x}$ + b

2. Fractional load is equal to actual engine output divided by rated engine output.

3. The SO_2 regression is the form of:
Emissions Rate (g/kW-hr) = a (Fuel Sulfur Flow in g/kW-hr) + b

4. **Fuel Consumption (g/kW-hr) = 14.12/(Fractional Load) + 205.717**

5. n/a is not applicable, n/s is not statistically significant.

necessary to multiply the rates per unit of work by the work in kilowatts and the time in hours, as indicated by the equation listed on page 5-1 for emissions.

While the rederivation of emission factors and fuel consumption rate are central to this report, the relationship of engine rated horsepower to ship type and deadweight tonnage was also investigated. Oceangoing ships were classified into four types and their horsepower was related to deadweight (DWT) using linear regressions. The results are:

(1) Bulk Carriers and Tankers: HP = 9070 + 0.101 (DWT)
(2) General Cargo Ships: HP = 3046 + 0.288 (DWT)
(3) Container/RORO/Auto Carriers/Refrigerated Ships: HP = 2581 + 0.719 (DWT)
(4) Passenger Ships: HP = -4877 + 6.81 (DWT)

The relationship for the passenger ship category is the most uncertain since the sample of ships in this category was very small (40).

For all non-ocean going vessels, the empty weight or deadweight is generally not available in the Lloyd's registration data, so that for these classes of vessels, only an average horsepower across the class was computed. The values are based on a sample of about 100 vessels in each category and the results are:

- fishing vessels 1106 HP;
- tugs 4268 HP;
- ferries 2415 HP;
- yachts 1863 HP;
- harbor operations 5046 HP;

The values could be used as default values in the absence of actual HP data on the vessels operating at a specific port.

Operating modes were divided into four types:

- normal cruise;
- slow cruise;
- maneuvering;
- docking (hoteling).

No independent data analysis was performed on the load factors for the engines (main and auxiliary) at these operating modes. Results from literature are summarized, and the best source of load factor data is from a recent report by Arcadis. Nevertheless, this data relies on a number of assumptions that may not be true, especially for a specific port. The auxiliary engine loads (in absolute kilowatts) may be the most arbitrary as they are specified independent of ship size or weight.

Computation of emissions from auxiliary engines require the use of the same emission factors specified in Table 5-1, and are evaluated at a load factor equal to one (i.e., at full load). Hence, the equation for emission from auxiliary engines is given by

$$\text{Emissions} = (\text{EF})(\text{LF}=1) \times \text{Auxiliary Power (kW)} \times \text{Time}_{\text{VCC,DWT,HOTEL}}$$

Table 5-2 shows the suggested load factors for both ocean-going vessels and non-ocean-going vessels. While these values could be reasonable default values, the use of port specific load factors is preferable, if available.

TABLE 5-2
SUGGESTED LOAD FACTORS
(as percent of maximum continuous rating)

Vessel Type	Cruise	Slow Cruise	Maneuvering
Bulk Carriers & Tankers	80	40	20
General Cargo	80	35	20
Passenger	80	20	10
Container/RORO/Reefer/Auto Carrier	80	30	15
All non-oceangoing	80	40	20

SUGGESTED AUXILIARY LOADS IN KW
(ocean-going vessels only)*

	Slow Cruise	Maneuvering	Hoteling
Passenger Ships	5000	5000	5000
All others	750	1250	1000

* Non-oceangoing vessels do not have separate auxiliary loads of significance.

Appendix 2

ConocoPhillips Letter of May 11, 2004 from Philip C. Stern to Deborah Jordan
Subject: Alternative Monitoring Plans for 40 CFR 60, Subpart J
ConocoPhillips San Francisco Refinery

ConocoPhillips

San Francisco Refinery
1380 San Pablo Avenue
Rodeo, CA 94572-1299

May 11, 2004

ESDR-190-04
03-MT-02-A
03-110-02-A
03-SPP-02-A

VIA CERTIFIED MAIL – 7002 3150 0003 9827 2388

Ms. Deborah Jordan, Director
Air Division
U.S. EPA Region IX
75 Hawthorne Street
San Francisco, CA 94105

Subject: Alternative Monitoring Plans for 40 CFR 60, Subpart J ConocoPhillips San Francisco Refinery

Dear Ms Jordan:

ConocoPhillips Company ("ConocoPhillips") is submitting four alternative monitoring plans for 40 CFR 60 Subpart J at its San Francisco Refinery (Bay Area Air Quality Management District (BAAQMD) Plant #A0016). Sources are in compliance with the hydrogen sulfide (H_2S) limit at 40 CFR 60.104(a)(1) due to the low concentration of H_2S in these fuel gas streams. ConocoPhillips is requesting approval of these alternative monitoring plans; these plans will not alter any of the other NSPS Subpart J requirements that may apply to the facility.

1. Alternative Monitoring Plan for Thermal Oxidizer (TO). The TO is used for loading volatile materials and for loading cargoes that previously held volatile materials. The TO was installed to comply with BAAQMD Regulation 8-44, Marine Vessel Loading Terminals. Because gasoline and gasoline blendstocks are compatible with only certain types of cargoes, the H_2S content of these cargoes is low.

2. Alternative Monitoring Plan for Pressure Swing Adsorber (PSA) off-gas. The Hydrogen Plant H-1 furnace (Unit 110 H-1, BAAQMD source #438) uses PSA off-gas as a fuel source. This stream is inherently low in H2S content.

3. Alternative Monitoring Plan for Unicracker (UK) Sweet Gas. The Hydrogen Plant H-1 furnace (Unit 110 H-1, BAAQMD source #438) and the combustion turbines and duct burners at the Steam Power Plant (BAAQMD sources #352 to 357) use UK sweet gas. This stream is used as fuel source due to its low sulfur content in addition to our main refinery fuel gas for these sources.

4. Alternative Monitoring Plan for Commercial Natural Gas. The combustion turbines and duct burners at the Steam Power Plant (BAAQMD Sources 352 to 357) can utilize purchased natural gas as a supplemental fuel source which is blended with refinery fuel gas or as an independent fuel source. This stream is guaranteed by the supplier to be low in H2S content.

If you have any questions, please contact Ms. Valerie Uyeda at (510) 245-5249.

Sincerely,

Philip C. Stern
Environmental Superintendent

Attachments

cc: Mr. Kelly Wee
Director of Compliance and Enforcement
Bay Area Air Quality Management District
939 Ellis Street
San Francisco, CA 94109

Mr. Julian Elliot
Air Permit Engineer
Bay Area Air Quality Management District
939 Ellis Street
San Francisco, CA 94109

bcc: 03-MT-02-A Alternative Monitoring Plan for Thermal Oxidizer (NEW)
(keywords: A-420, NSPS J, Marine Terminal, fuel gas)
03-110-02-A Alternative Monitoring Plan for PSA off-gas (NEW)
(keywords: S-438, U-110, NSPS J, fuel gas)
03-SPP-02-A Alternative Monitoring Plan for Unicracker Sweet Gas (NEW)
(keywords: A-420, NSPS J, SPP, turbines, duct burners, fuel gas, natural gas)

html links only:

J. Purcell, Bulk Operations
R. Harbison, Bulk Operations
P. Stern, Environmental
J. Ahlskog, Environmental
V. Row, Environmental
V. Uyeda, Environmental

Attachment A

Marine Terminal Thermal Oxidizer
Alternative Monitoring Plan

Process Description

The Marine Terminal Thermal Oxidizer (TO) (A-420) controls vapors emitted from loading gasoline and gasoline blend stocks onto ships and barges at the ConocoPhillips San Francisco Refinery at Rodeo, California. The TO was installed in 1991 to comply with regulation 8-44 of the Bay Area Air Quality Management District.

The displaced vapors from ship or barge tank loading are collected in dedicated collection lines and directed through flame and detonation arrestors and a water seal to the TO. The TO contains a single burner fired solely on commercial natural gas. Natural gas is also added when vapors enter the piping on the Marine Terminal (see diagram below) to ensure vapors are always above the explosive limit for safety purposes. The only other connection to this system is nitrogen for purging the system.

The TO is used whenever gasoline or gasoline blend stocks are loaded or other material is loaded into tanks which previously held volatile material (e.g., gasoline, crude oil or similar materials).

Piping Diagram

See Attachment A-I for configuration of the TO piping.

Basis for low H_2S content

Gasoline and gasoline blend stocks by nature do not contain levels of H_2S which would be of concern. Product specifications limit the composition of gasoline and gasoline blend stocks. These same limitations limit what products can be mixed with gasoline. Therefore these materials are only loaded into tanks which have been cleaned or which have previously contained similar material. We have reviewed loading records since January 2002 and found no loading event where loading was done into a tank which had the potential to contain H_2S.

Suggested Process Parameter Monitoring for Compliance Determination

In accordance with the EPA guidance found in the August 9, 2000 document "Alternative Monitoring Plan for NSPS Subpart J Refinery Fuel Gas" the following monitoring is suggested.

1 One detection tube sampling shall be conducted on the commercial natural gas, and the vapors collected during a loading event for each grade of gasoline and blend stock (including ethanol or MTBE or similar material).

2. Detector tube ranges shall be 0-10/0-100 ppm (N=10/1), unless the H_2S level is above 100 ppm then a 0-500 ppm range shall be used. We propose to use ASTM 4913-00 Standard Practice for Determining Concentration of Hydrogen Sulfide by Reading Length of Stain, Visual Chemical Detectors in-lieu of the Gas Processors Association's: Test for Hydrogen Sulfide and Carbon Dioxide in Natural Gas Using Length of Stain Tubes, 1986 revision.

3. Upon agency request, ConocoPhillips San Francisco Refinery, shall conduct a test audit for any gas stream with an approved AMP. For the Marine Terminal Thermal Oxidizer the audit shall consist of detector tube H2S sampling of 3 consecutive loading events.

4. Records of the H_2S detection tube test data shall be maintained and kept for at least five years.

Attachment B

Pressure Swing Adsorber (PSA) Off-Gas
Unit 110 Heater
(BAAQMD S-438)

Process Description

The Unit 110 hydrogen plant is designed to produce 24 million SCFD of very high purity hydrogen (99.99+% pure) from natural gas and steam.

The hydrogen is produced by the natural gas/steam reforming process. Natural gas/Butane feed and superheated steam react over a catalyst at high temperature and pressure to produce hydrogen and some byproducts. The hydrogen is then cooled and purified before export to Units 228, 240 and MP-30.

There are two main fuel supplies to the Hydrogen Reformer Heater, H-1 (S-438). The heater utilizes Pressure Swing Adsorber (PSA) off-gas and a blend of Refinery Fuel Gas combined with Unit 240 Unicracker Sweet Gas. (See the next section of this alternative monitoring plan request for details regarding the Refinery Fuel Gas / Unit 240 Unicracker Sweet Gas blends). The off-gas is a low Btu by-product of the PSA process. The use of this off-gas in the Reformer Heater is an effective means for using this material.

Piping Diagrams

See Attachment B-I for simplified flow diagram of fuel addition systems for the Unit 110 H-1 Heater. In addition see Attachment B-II for Process & Instrument Diagrams (P&ID's) which show detailed drawings of fuel gas tie-ins for the heater.

Current Process Parameter Monitoring

The Bay Area Air Quality Management District (BAAQMD) has issued the facility various permits over the years which require multiple means of fuel gas monitoring to take place. The following is an overview of the current monitoring taking place for the off-gas.

Fuel Stream	Monitoring & Limits
PSA Off-Gas	Overview: Lab Analysis – Grab Sampling, 3 x week typical Required By: BAAQMD, Plant 16, Title V – VI. Permit Condition 1694-E3, E5, & E6 Requirements: Pressure swing adsorption (PSA) off gas used as fuel at S-438 shall not exceed 1.0 ppm (by weight) total reduced sulfur (TRS), averaged over any calendar month. TRS shall include hydrogen sulfide, methyl mercaptan, methyl sulfide, dimethyl disulfide. (E3) The concentration of TRS in the blended fuel gas shall not exceed 50 ppmv averaged over any calendar month. (E5) Daily records of the type and amount of fuel combusted at S-438 and of the TRS and hydrogen sulfide concentration in the blended fuel gas, and monthly records of average blended fuel gas TRS concentration, shall be maintained for at least five years and shall be made available to the District upon request. (E6)

Basis for Unit 110 PSA Off-Gas Low H_2S Content

Unit 110 was relocated from Colorado and put into service at the Refinery in early 1996. When the unit was permitted, BAAQMD required that periodic Total Reduced Sulfur (TRS) samples be collected on the off-gas. TRS concentration of this stream is limited by permit to 1 ppm.

Feed to the Unit 110 is comprised of purchased Natural Gas and Butane that is low in Hydrogen Sulfide. Hydrogen Sulfide (H_2S) is a poison to Unit 110 Hydrogen Reformer catalyst. A H_2S removal system is engineered on the front end of the unit to ensure trace amounts of TRS and H_2S are removed. The removal system consists of a hydrotreating reactor to convert TRS to H_2S followed by two H_2S removal absorbent beds.

Hydrogen (H_2) produced at Unit 110 is purified in the Pressure Swing Adsorber (PSA). The PSA produces high purity hydrogen and off-gas. Off-gas is composed primarily of CO2, H_2, and Methane (by Volume). Thus, the H_2S content of the off-gas must be low due to low H_2S feed and the sulfur sensitive catalyst operated at high temperature and pressure.

Suggested Process Parameter Monitoring for Compliance Determination

Existing monitoring required by BAAQMD is believed to be sufficient for this off-gas. The existing monitoring being conducted ensures that TRS and related H_2S levels are low as well as ensuring emission limits are met.

Attachment C

Unit 240 Sweet Unicracker Gas
Steam Power Plant, Unit 110 Heater
(BAAQMD S-352/355, 353/356, 354/357, S-438)

Process Description

Overview

The Unit 110 Hydrogen Reformer and Steam Power Plant Turbines use a combination of Refinery Fuel Gas from Unit 233 and Unit 240 Sweet Unicracker (UK) Gas as fuel sources. (As described above, PSA Off-Gas is also used as a fuel source for Unit 110). Unit 233 Fuel Gas Center is the main source of fuel gas to the refinery heaters and Steam Power Plant. Prior to exiting Unit 233, the fuel gas is analyzed by a NSPS J H_2S Monitor to ensure compliance with 60.104(a)(1) limits. For the Steam Power Plant Turbines, the Unit 240 Sweet UK Gas is a desirable gas to be blended with the Unit 233 Fuel Gas. The low H_2S levels in the gas enhance the performance of the Selective Catalytic Reduction (SCR) system for controlling NOx emissions to levels required by local regulations. This gas helps reduce the formation of salts that can plug the SCR catalyst beds.

Unit 240 Sweet UK Gas Overview

Unit 240 Sweet UK Gas is primarily utilized as a feed to the Unit 240, Plant 4 Hydrogen Plant (Reformer), with natural gas as an alternate feed. The source of this gas is from Unit 240 (Hydrocracking Unit), Plant 3 (Fractionation Section) Depropanizer and Butane Absorber overheads. These overhead gas streams are combined and treated at an H_2S Absorber (D401). The H_2S Absorber removes organic sulfur compounds and H_2S through DiGlycolAmine (DGA) agent contact. The target H_2Scontent exiting the D-401 tower is less than 5 ppm. Additional H_2S removal takes place downstream of the D-401 tower. H_2S acts as a poison to the Hydrogen Reforming catalyst in levels as low as 0.1 ppm. Thus, care is taken to treat and monitor H_2S content of feed streams to ensure the reformer catalyst is not poisoned. The H_2S content of the Unit 240 Sweet UK Gas is monitored from a process control standpoint to ensure catalyst poisoning does not occur. High inlet H_2S levels could require more frequent shutdowns to replace downstream zinc oxide absorber catalyst, which is undesirable for both process and environmental reasons.

H_2S levels in the Sweet UK Gas are constrained by the process need to keep these levels low. If high H_2S levels are detected in this Sweet UK Gas a Standard Operating Procedure (SOP) in place which directs operators to redirect this gas to the Refinery Fuel Gas system for clean-up prior to use as fuel, natural gas is then used as Hydrogen plant feed.

Records (1/1/2003 to present) of H_2S process analyzer indicate that the H_2S values of this stream are consistently below 3 ppm.

Piping Diagrams

See Attachment C-I for simplified flow diagram of fuel addition systems for the Turbines. In addition, see Attachment C-II for Process & Instrument Diagrams (P&ID's) which show detailed drawings of fuel gas tie-ins for the turbines. See the previously referenced drawings B-I and B-II for the Unit 110 fuel gas drawings, which show the location of fuel sources for the U110 Reformer Heater.

Current Process Parameter Monitoring

The Bay Area Air Quality Management District (BAAQMD) has issued the facility various permits over the years which require several means of fuel gas monitoring to take place. In addition, some of the affected streams are currently monitored as a key process parameter. The following is an overview of the current monitoring taking place.

Fuel Stream	Current Monitoring
Unit 240 Sweet Unicracker Gas	Overview: Process H2S Analyzer (continuous) Analyzer is in place to monitor H_2S content of process stream. Process alarms on the digital control system (DCS) are in place to warn operators of potential higher than normal H_2S values for the stream.
	Overview: Draeger Tube Sampling (weekly typical) Periodic draeger tube samples are collected in order to monitor H_2S content of process stream.
Blended Unit 233 Refinery Fuel Gas & Unit 240 Sweet Unicracker Gas	Overview: Fuel Gas Total Sulfur Sampling Required By: BAAQMD, Plant 16, Title V – VI. Permit Condition 1694: 3a Requirements: The refinery fuel gas shall be tested for total reduced sulfur (TRS) concentration by GC analysis at least once per 8 hour shift (3 times per calendar day). At least 90% of these samples shall be taken each calendar month. No readable samples or sample results shall be omitted. TRS shall include hydrogen sulfide, methyl mercaptan, methyl sulfide, dimethyl disulfide.

Basis for Unit 240 Sweet Unicracker Gas Low H_2S Content

As described above, H_2S levels in the Sweet UK Gas are constrained by the process Unit 240 Hydrogen Reformer needs to keep these H_2S levels low. If high H_2S levels are detected in this Sweet UK Gas there is a Standard Operating Procedure (SOP) in place which directs operators to redirect this gas to the Refinery Fuel Gas system for clean-up prior to use as fuel, natural gas is then used as Hydrogen plant feed.

Records (1/1/2003 to present) of H_2S process analyzer indicate that the H2S values of this stream are consistently below 3 ppm. It is noted that this typical value is lower than our purchased natural gas guaranteed H_2S content.

Suggested Process Parameter Monitoring for Compliance Determination

ConocoPhillips believes it is appropriate to continue with the usage of the H_2S analyzer. The analyzer seems to be the most appropriate monitoring tool for a long-term basis. Draeger sampling may continue to be utilized as a secondary basis for monitoring H_2S levels periodically and if the continuous analyzer experiences temporary outages.

ConocoPhillips has a process incentive to keep H_2S levels as low as possible (3 ppm typical vs. the 162 ppm standard). In addition, the Steam Power Plant Sulfur Dioxide (SO_2) emissions are limited based on existing permit conditions; emissions are reported to EPA on a quarterly basis. These previously established emission limits and reporting requirements are sufficient to ensure compliance.

Fuel Stream	Monitoring
Unit 240 Sweet UK Gas	H2S Analyzer
	H2S Draeger Samples *(secondary)*

Attachment D

Commercial-Grade – Purchased Natural Gas
Steam Power Plant
(BAAQMD S-352/355, 353/356, 354/357, S-438)

Process Description

Overview

Purchased, commercial-grade natural gas is used as one of the fuels supplied to the Steam Power Plant Turbines. The natural gas is blended with Refinery Fuel Gas and Unit 240 Unicracker Sweet Gas before it is burned in the Steam Power Plant Gas Turbines. The blend ratio of Natural gas and Refinery produced gas is based on economics and operating objectives. Additionally, the natural gas can be utilized in case of emergency, if limited Unit 233 Refinery Fuel Gas and Unit 240 Unicracker Sweet Gas is not available. The purchased natural gas is guaranteed to be low in H_2S by the supplier.

Piping Diagrams

See Attachment C-I for simplified flow diagram of fuel addition systems for the Turbines. In addition see Attachment C-II for Process & Instrument Diagrams (P&ID's) which show detailed drawings of fuel gas tie-ins for the turbines.

Current Process Parameter Monitoring

No regular monitoring takes place for this material. The supplier has a provided a guaranteed Hydrogen Sulfide limit of 0.25 grains/100 SCF (equivalent to 4 ppmv). This is significantly lower than the allowable limit of 0.10 grains/SCF [60.104(a)(1)].

Basis for Low H_2S Content

As described above, the supplier of the natural gas has provided a guarantee on the level of H_2S in the fuel gas. This gas is provided to many different users, such as residential customers, who also expect and demand low H_2S content.

Suggested Process Parameter Monitoring for Compliance Determination

In accordance with the EPA guidance found in the August 9, 2000 document "Alternative Monitoring Plan for NSPS Subpart J Refinery Fuel Gas" the following monitoring is suggested.

1 One detection tube sampling shall be conducted on the commercial natural gas.

2. Detector tube ranges shall be 0-10/0-100 ppm (N=10/1), unless the H_2S level is above 100 ppm then a 0-500 ppm range shall be used. We propose to use ASTM 4913-00 Standard Practice for Determining Concentration of Hydrogen Sulfide by Reading Length of Stain, Visual Chemical Detectors in-lieu of the Gas Processors Association's: Test for Hydrogen Sulfide and Carbon Dioxide in Natural Gas Using Length of Stain Tubes, 1986 revision.

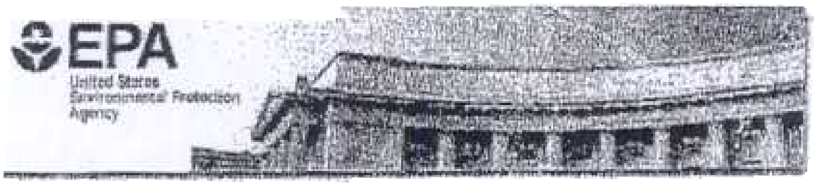
3. Certification of the natural gas supplier's H_2S content commitment will be provided, upon request.

Records of the H_2S detection tube test data shall be maintained and kept for at least five years.

Fuel Stream	Monitoring / Certifications
Supplied Natural Gas	Contract Commitment - H2S Level Specification
	Detection Tube Sampling – One Time

Appendix 3

Alternative Monitoring Plan for NSPS Subpart J Refinery Fuel Gas



ALTERNATIVE MONITORING PLAN

for NSPS Subpart J Refinery Fuel Gas

Conditions for Approval of the Alternative Monitoring Plan for Miscellaneous Refinery Fuel Gas Streams

Refinery fuel gas streams/systems eligible for the Alternative Monitoring Plan (AMP) should be inherently low in H_2S content, and such H_2S content should be relatively stable. The refiner requesting an AMP should provide sufficient information to allow for a determination of appropriateness of the AMP for each gas stream/system requested. Such information should include, but need not be limited to:

- A description of the gas stream/system to be considered including submission of a portion of the appropriate piping diagrams indicating the boundaries of the gas stream/system, and the affected fuel gas combustion device(s) to be considered and an identification of the proposed sampling point for the alternative monitoring;

- A statement that there are no crossover or entry points for sour gas (high H_2S content) to be introduced into the gas stream/system. (This should be shown in the piping diagrams);

  An explanation of the conditions that ensures low amounts of sulfur in the gas stream (i.e., control equipment or product specifications) at all times;

- The supporting test results from sampling the requested gas stream/system using appropriate H_2S monitoring (i.e., detector tube monitoring following the Gas Processor Association's: Test for Hydrogen Sulfide and Carbon Dioxide in Natural Gas Using Length of Stain Tubes, 1986 Revision), at minimum:

  - for frequently operated gas streams/systems - two weeks of daily monitoring (14 samples);

  - for infrequently operated gas streams/systems, 7 samples shall be collected unless other additional information would support reduced sampling.

  Note: All samples are grab samples.

- A description of how the two weeks (or seven samples for infrequently operated gas streams/systems) of monitoring results compares to the typical range of H_2S concentration (fuel quality) expected for the gas stream/system going to the affected fuel gas combustion device. (e.g., The two weeks of daily detector tube results for a frequently operated loading rack included the entire range of products loaded out, and, therefore, should be representative of typical operating conditions affecting H_2S content in the gas stream going to the loading rack flare);

- Identification of a representative process parameter that can function as an indicator of a stable and low H_2S concentration for each fuel gas stream/system, (e.g., review of gasoline sulfur content as an indicator of sulfur content in the vapors directed to a loading rack flare);

  Suggested process parameter limit for each stream/system, the rationale for the parameter limit and the schedule for the acquisition and review of the process parameter data. The refiner will collect the proposed process parameter data in conjunction with the testing of the fuel gas stream's stable and low H_2S concentration.

The following shall be used for measuring H_2S in fuel gas within these types of AMPs unless the refiner requests, in writing, for approval of an alternative methodology:

- Conduct H_2S testing using detector tubes ("length-of-stain tube" type measurement);

- Detector tube ranges 0-10/0-100 ppm (N =10/1) shall be used for routine testing; and

- Detector tube ranges 0-500 ppm shall be used for testing if measured concentration exceeds 100 ppm H_2S.

<u>Data Range and Variability Calculation and Acceptance Criteria</u>

For each step of the monitoring schedule, sample range and variability will be determined by calculating the average plus 3 standard deviations for that test data set.

- If the average plus 3 standard deviations for the test data set is less than 81 ppm H_2S, the sample range and variability are acceptable and the refiner can proceed to the next step of the monitoring schedule.

  Note: 81 ppm is one-half the maximum allowable fuel gas standard under NSPS Subpart J, and the Agency believes that using 81 ppm acceptance criteria provides a sufficient margin for ensuring that the emission limit is not exceeded under normal operating conditions.

- If the data shows an unacceptable range and variability at any step (the average plus 3 standard deviations is equal to or greater than 81 ppm H_2S), then move to Step 7. Agency approval is required to proceed to the next step if the average plus 3 standard deviations is between 81 ppm and 162 ppm H_2S. As an example, approval may be granted based on a review of the test data and any pertinent information which demonstrates that sample variability during the test period was due to unusual circumstances. Supplemental test data may be taken to demonstrate that process variability is within the plan requirements. Data may be removed from the variability calculations for cause after agency approval.

- For Steps 3 and 4, if the data shows an unacceptable range and variability (the average plus 3 standard deviations is equal to or greater than 81 ppm H_2S), the source will drop back to the previous step's monitoring schedule.

  If at any time, one detector tube sample value is equal to or greater than 81 ppm H2S, then begin sampling as specified in Step 6. Note: Standard deviation cannot be calculated for a data set containing one point.

<u>Monitoring Schedule for Approved AMPs</u>

For gas streams which must meet product specifications for sulfur content, one time only detection tube sampling along with a certification that the gas stream is subject to product or pipeline specifications is sufficient for the AMP. If the gas stream composition changes (i.e., new gas sources are added), or if the gas stream will no longer be required to meet product or pipeline specifications, then the gas stream must be resubmitted for approval under the AMP.

The following are examples of streams needing one time only monitoring:

- Certified commercial grade natural gas;
- Certified commercial grade LPG;
- Certified commercial grade hydrogen;
- Gasoline vapors from a loading rack that only loads gasoline meeting a product specification for sulfur content.

For other gas streams, the H_2S content of each refinery fuel gas stream/system with an approved AMP shall be monitored per the following schedule:

Step 1:

The refiner will monitor the selected process parameter for each stream/system, according to the established process parameter monitoring or review schedule approved by the agency in the AMP, and at times when conducting H_2S detector tube sampling.

Step 2

The refiner will conduct random detector tube sampling twice per week for each stream/system for a period of six months (52 samples). For fuel gas streams infrequently generated and combusted in affected fuel gas combustion devices (i.e., less frequent than bi-weekly), detector tube samples shall be taken each time the fuel gas stream is generated and combusted. A total of at least 24 samples shall be collected for infrequently generated gas streams. Monitor and record the selected process parameter in accordance with the established schedule, and at times when conducting H_2S testing. Move to Step 3 if the calculated range and variability of the data meets the established acceptance criteria. Submit test data (raw measurements plus calculated average and variability) to the agency quarterly.

Step 3:

The refiner will conduct random H_2S sampling once per quarter for a period of six quarters (6 samples) with a minimum of 1 month between samples. A minimum of 9 samples are required for infrequently generated and combusted fuel gas streams before proceeding to

Step 4. Continue to monitor and record the selected process parameter in accordance with the established schedule, and at times when conducting H_2S testing. Move to Step 4 if the calculated range and variability of the data meets the established acceptance criteria. Submit test data (raw measurements plus calculated average and variability) to the agency quarterly.

Step 4:

The refiner will conduct random H_2S sampling twice per year for a period of two years (4 samples); sample randomly in the 1st and 3rd quarters with a minimum or 3 months between samples. Continue to monitor and record the selected process parameter in accordance with the established schedule, and at times when conducting H_2S testing. Move to Step 5 if the calculated range and variability of the data meets the established criteria. Submit test data (raw measurements plus calculated average and variability) to the agency semiannually.

Step 5:

The refiner will continue to conduct testing on semi-annual basis. Testing is to occur randomly once every semiannual period with a minimum of 3 months between samples. Continue to monitor and record the selected process parameter in accordance with the established schedule, and at times when conducting H_2S testing. If any one sample is equal to or greater than 81 ppm H_2S, then proceed to the sampling specified in Step 7. Note: Standard deviation cannot be calculated for a data set containing one point.

Step 6:

If, at any time, the selected process parameter data indicates a potential change in H_2S concentration, or a single detector tube sample value is equal to or greater than 81 ppm H_2S, then the fuel gas stream shall be sampled with detector tubes on a daily basis for 7 days (or for infrequently generated gas streams - 7 samples during the same period of an indicated change in H_2S concentration, or as otherwise approved by the agency). If the average detector tube result plus 3 standard deviations for those seven samples is less than 81 ppm H_2S, the date and value of change in the selected process parameter indicator and the sample results shall be included in the next quarterly report, and the refiner shall resume monitoring in accordance with the schedule of the current step. If the average plus 3 standard deviations for those seven samples is equal to or greater than 81 ppm H_2S, sampling shall follow the requirements of Step 7.

Step 7:

If sample detector tube data indicates a potential for the emission limit to be exceeded (the average plus 3 standard deviations is equal to or greater than 81 ppm H_2S), as determined in the Data Range and Variability Calculation and Acceptance Criteria or in Step 6, the refiner shall notify the agency of those results before the end of the next business day following the last sample day. The fuel gas stream shall subsequently be tested daily for a two week period (or 14 samples during the same event or as otherwise approved by the agency for infrequently generated gas streams). After the two week period is complete, sampling will continue once per week, until the agency approves a revised sampling schedule or makes a determination to withdraw approval of the gas stream/system from the AMP. Note: At any time, a detector tube value in excess of the 162 ppm limit is evidence that the emission standard has been exceeded.

General Provisions of Approved AMPs

Upon agency request, the refiner shall conduct a test audit for any gas stream with an approved AMP. The audit shall consist of daily detector tube samples collected over a one week period (7 samples). For fuel gas streams infrequently generated and combusted in affected fuel gas combustion devices, an audit shall consist of 3 consecutive sampling events. (e.g., Rail loading may occur once per month, an audit would consist of 3 consecutive loading events.) The United States Environmental Protection Agency, with due notice, reserves the right to withdraw approval of the AMP for any gas stream/system.

The source shall keep records of the H_2S detector tube test data and the representative process parameter data and fuel source for at least two years.

If a new fuel gas stream is introduced into a fuel gas stream with an approved AMP, the refiner shall again apply for an AMP and repeat Steps 1 - 5.

Example:

An AMP Application for a Hydrogen Plant PSA Off-Gas Stream Combusted Exclusively in the Hydrogen Plant Process Heater:

Process Description

Hydrogen production for the refinery by the steam methane reforming process. CO_2 is the primary impurity in the hydrogen produced; small amounts of CO and methane are also present. Unpurified hydrogen is passed over molecular sieve absorbent beds to remove these impurities. The off gas from regeneration of the absorbent beds is called PSA off-gas. It is sent to the hydrogen plant heater to recover heat and control CO emissions.

Piping Diagrams

Piping diagrams should be supplied to show monitoring location and to demonstrate that there is no potential for cross over or entry points for sour gas.

Basis for PSA Off-Gas Low H_2S Content

Since PSA off-gas is a byproduct of hydrogen purification, any H_2S in the PSA purge gas must come from the hydrogen unit feed. Levels of H_2S in the PSA gas are negligible because H_2S must be controlled to prevent

deactivation of the unit's catalyst

H_2S is a permanent catalyst poison. The hydrogen unit has 2 scrubbers to remove H_2S from the feed gas to protect the unit's catalyst from H_2S poisoning. The scrubbers are operated in series. The lead scrubber must exhibit at least a 70% reduction in H_2S content. If not, the scrubber is taken off line and the absorbent is replaced. After the absorbent is replaced, the scrubber is placed on line as the second scrubber in series. This maximizes the amount of H_2S removal and assures maximum scrubbing potential when one scrubber is off line for absorbent replacement.

Process Parameter Monitoring and Suggested Process Parameter Limit

Operation of the scrubbers is checked on a monthly basis with detector tubes. The feed gas H_2S content is measured at the inlet and outlet of the lead scrubber. If natural gas is used as hydrogen plant feed; both readings are below the 1 ppm detection limit. If refinery fuel gas is the feed gas, 30 ppm to 40 ppm H_2S is normally detected at the inlet. A lead scrubber outlet reading of 10 -12 ppm H_2S would trigger absorbent replacement. The suggested process parameter limit is 20 ppm H_2S at the lead H_2S absorber outlet. Absorber outlet H_2S measurements will be taken in conjunction with the PSA gas measurements during Steps 2 and 3.

Last Updated: August 9, 2000
URL: http://es.epa.gov/oeca/metd/ampn.html