ENGINEERING EVALUATION
CONOCOPHILLIPS SAN FRANCISCO REFINERY; PLANT 16
APPLICATION 11293

1.0 BACKGROUND

ConocoPhillips has applied to modify the existing S-437/438 hydrogen plant to allow greater use of liquid feeds (isopentane and butane), resulting in an increase in hydrogen gas production capacity from 25 MM scf/day to 28.5 MM scf/day. S-437 is the source number assigned to the overall hydrogen plant, while S-438 is the source number assigned to the hydrogen reforming furnace within S-437. S-438 uses natural gas, refinery gas and liquid hydrocarbons as sources of elemental hydrogen for conversion to hydrogen gas. Hydrogen gas is used primarily in hydrotreating operations, in which petroleum feedstocks are reacted with hydrogen gas in the presence of a catalyst to remove sulfur from the feedstocks in the form of H2S, and to hydrogenate unsaturated organic compounds.

One of the required modifications for this project is an increase in the firing capacity of the S-438 reformer furnace from 210 MM BTU/hr to 250 MM BTU/hr. Other modifications include:

- installation of a pentane feed system
- replacement of the raw H2 trim cooler with a larger unit
- pressure swing adsorption (PSA) system valve replacements
- replacement of the S-438 waste heat boiler with a larger unit
- change type of catalyst used at the A-46 SCR system that abates S-438 emissions

S-438 was designed to use a liquid hydrocarbon feedstream in addition to natural gas, refinery gas and PSA offgas. However, design limitations in several components in S-437 and S-438 have not allowed the plant to operate at its current 25 MM scf/day capacity when liquid feed is used. The modifications proposed in this application will allow the plant to operate at its original design capacity when using liquid feed, and the capacity will increase to 28.5 MM scf/day when natural gas feed is used exclusively. Similarly, the firing rate at S-438 will increase to the original design basis of 210 MM BTU/hr when liquid feed is used and will increase to 250 MM BTU/hr when natural gas feed is used exclusively.

ConocoPhillips has stated that the purpose of the proposed modifications is not to increase overall hydrogen production capacity, although this will be one result of the modifications, but rather to allow more liquid hydrocarbons (isopentane and butane) to be used in place of purchased natural gas at S-438. Isopentane is generated at the refinery as a byproduct of the isomerization process at Unit 228. Butane is generated at the refinery as a product of fractionation and de-isobutanizer operations at Unit 215.

The ConocoPhillips refinery produces “California gasoline”, as well as “export gasoline” that does not meet CARB gasoline standards. There is high demand for California gasoline and lower distribution costs because it is used locally. Export gasoline is a commodity that competes for buyers with out-of-state refiners and that has higher distribution costs because it cannot be used locally. Therefore, California gasoline is a more profitable product. The proposed modifications in this application, in addition to reducing the amount of purchased natural gas feed required at S-438, will allow the refinery to produce more California gasoline relative to export gasoline. Specifically, the proposed modifications will allow some isopentane and butane that currently are used to blend export gasoline to instead be converted to hydrogen at S-438 and then used in hydrotreating operations to produce California gasoline.

This project will result in increased utility steam production at S-437, as well as increased demand for cooling water (1.9 gpm), reaction feed water (10.8 gpm) and miscellaneous utility water (0.5 gpm). Natural gas and refinery gas consumption as well as electricity consumption will increase nominally.

2.0 EMISSIONS

Emissions at process units like S-437 are generally limited to emissions of organics from related fugitive emission sources. The other project emission increase is related to the increase in firing capacity at the S-438 furnace (combustion emissions and ammonia emissions from SCR operation).

2.1 Annual Average Fugitive Emission Increase at S-437

ConocoPhillips has proposed to estimate fugitive emissions from new fugitive components by using the “correlation equation” method from the 1999 document “California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon Leaks at Petroleum Refineries”. This document, prepared by the California Air Resource Board and the California Air Pollution Control Officers Association, is the accepted District standard for estimating fugitive emissions. The correlation equation method is one of four methods described in this document, and is intended to be used to estimate emissions from an actual population of sources, using the measured emission concentrations from each source, and a corresponding emission factor. There are three possible types of emission factors: one corresponds to components with no measured leak, the second corresponds to non-pegged detected leaks, and the third corresponds to leaks that peg the analyzer high. Different sets of factors are provided for valves, pump seals, connectors, flanges, open-ended lines and “others” (a category that includes compressor seals). However, the service for each type of component (light liquid, heavy liquid or gas) is not considered.

Here, the intent is to estimate the emissions from fugitive sources that are not yet in service. ConocoPhillips has proposed to implement the correlation equipment method by assuming that each fugitive component will have a leak with the maximum allowed concentration (“screening value”) in ppm, as specified in District Regulation 8, Rule 18 (“Equipment Leaks”). Thus, the correlation equations that apply to non-pegged detected leaks will be used.

COMPONENT	COMPONENT COUNT	CORRELATION EQUATION (KG/HR), PER COMPONENT	SCREENING VALUE (PPM)
VALVES	46	2.27E-6(screening value)^0.747	100
CONNECTORS	226	1.53E-6(screening value)^0.736	100

Notes:
1. Component counts are from Table 3 of the application
2. Screening values are taken from District Regulation 8, Rule 18.
3. All emissions from fugitive components are assumed to be POC compounds.

Thus, the resulting emissions are:

[(46)(2.27E-6(100)^0.747) + (226)(1.53E-6(100)^0.736)] kg/hr

x (2.205 lb/kg) (24 hr/day) = **0.71 lb/day POC = 0.13 ton/yr POC**

2.2 Annual Average Combustion Emission Increase at S-438

S-438 was originally permitted in Application 12412. In that application, the basis for emission calculations was a total fuel consumption of 2.04 E 12 BTU/yr of a blend of PSA offgas and refinery gas. The basis for the emission increase in this application will be the difference between the new maximum annual fuel consumption and the annual consumption in Application 12412.

The new maximum annual fuel consumption is:

(250 MM BTU/hr)(8,760 hr/yr) = 2.19 E 12 BTU/yr

Then, the increase in annual consumption is:

(2.19 – 2.04) E 12 BTU/yr = 0.15 E 12 BTU/yr

The same emission factors that were used in Application 12412 will be used here (a copy of page 25 of the evaluation for Application 12412 is attached), except that NOx and SO2 factors will be adjusted for the lower emission rate limits proposed as BACT in this application (see Section 6.0).

The adjusted NOx factor, corresponding to a 7 ppmv concentration limit instead of 10 ppmv, is:

(7/10)(0.0118 lb/MM BTU) = 0.0083 lb/MM BTU

SO2 emissions will be based on the proposed TRS content limit of the blended fuel gas (14 ppmv). From Application 12412, 230 ppmv TRS is equivalent to an emission factor of 0.027 lb/MM BTU. Therefore, for 14 ppmv, the factor is:

(14/230)(0.027 lb/MM BTU) = 0.0016 lb/MM BTU

NOx: 0.0083 lb/MM BTU
PM10: 0.004 lb/MM BTU
POC: 0.0023 lb/MM BTU
CO: 0.023 lb/MM BTU
SO2: 0.0016 lb/MM BTU

Ammonia slip emissions occur at the A-46 SCR system that abates S-438. These emissions are quantified in Section 5.0 (Toxics) since ammonia is only regulated as a toxic compound.

NOx: (0.15 E 12 BTU/yr)(0.0083 lb/MM BTU)/(365 day/yr)
= **3.41 lb/day** = **0.62 ton/yr**

CO: (0.15 E 12 BTU/yr)(0.023 lb/MM BTU)/(365 day/yr)
= **9.45 lb/day** = **1.72 ton/yr**

SO2: (0.15 E 12 BTU/yr)(0.0016 lb/MM BTU)/(365 day/yr)
= **0.66 lb/day** = **0.12 ton/yr**

POC: (0.15 E 12 BTU/yr)(0.0023 lb/MM BTU)/(365 day/yr)
= **0.95 lb/day** = **0.17 ton/yr**

PM10: (0.15 E 12 BTU/yr)(0.004 lb/MM BTU)/(365 day/yr)
= **1.64 lb/day** = **0.30 ton/yr**

2.3 Daily Fugitive Emissions at S-437

Daily emissions are calculated to determine if best available control technology (BACT) requirements are triggered. In accordance with District Regulation 2-2-301, BACT is triggered for any new or modified source with the potential to emit 10 pounds of emissions or more of any class of regulated pollutant (NOx, CO, POC, SO2, PM10) on any day.

Fugitive emissions are assumed to occur continuously and at a constant rate. Therefore, the daily emissions from fugitive components at S-437 are equivalent to the annual average emissions. Because BACT is triggered for a source, and not for a project, the existing fugitive emissions must be considered in addition to the new fugitive emissions. As shown on page 22 of the evaluation for Application 12412, the total existing fugitive emissions at S-437 are 6.42 lb/day POC. Therefore, the proposed new total is:

(0.71 + 6.42) lb/day POC = 7.13 lb/day POC

This total is still less than 10 lb/day and therefore fugitive emissions at S-437 do not trigger BACT.

2.4 Daily Combustion Emissions at S-438

Based on the new maximum firing rate at S-438, maximum daily emissions are:

NOx: (250 MM BTU/hr) (24 hr/day) (0.0083 lb/MM BTU) = **50 lb/day**

CO: (250 MM BTU/hr) (24 hr/day) (0.023 lb/MM BTU) = **138 lb/day**

SO2: (250 MM BTU/hr) (24 hr/day) (0.0016 lb/MM BTU) = **9.6 lb/day**

POC: (250 MM BTU/hr) (24 hr/day) (0.0023 lb/MM BTU) = **14 lb/day**

PM10: (250 MM BTU/hr) (24 hr/day) (0.004 lb/MM BTU) = **24 lb/day**

Therefore, BACT is triggered for NOx, CO, POC and PM10 emissions, as it was in Application 12412. BACT is discussed further in Section 5.0.

2.5 Related Emissions at Other Sources

Changes to equipment capacity and allowed throughput at one or more sources may result directly in emission increases at these sources, or indirectly in emission increases at other sources. Direct emission increases at S-437 and S-438 are quantified in Sections 2.1 through 2.4. Indirect emission increases at other sources may occur to the extent that the proposed changes cause or allow other sources to produce more emissions.

As discussed in Section 1.0, the proposed changes will have the net effect of reducing demand for purchased natural gas as a feed material at the S-438 reformer furnace and also of shifting production from export gasoline to California gasoline. The reduction in natural gas demand may be assumed to have no emissions effect. The production shift from export to California gasoline will require additional processing of gasoline intermediates to meet CARB gasoline standards. In Application 12412, ConocoPhillips applied to modify the refinery in order to perform the additional processing required for production of California gasoline. These processing requirements are summarized in Table 3-3 of the EIR for that project (copy attached). The proposed modifications in this application may be viewed as a continuation or extension of the modifications in Application 12412, since the purpose of both applications is the same: to allow increased production of California gasoline instead of export gasoline. The infrastructure for production of California gasoline was permitted in Application 12412, resulting emissions of POC, NOx and SO2 were offset, and permit conditions limiting emissions, directly or indirectly with throughput limits or design requirements, were established. ConocoPhillips has applied to modify only the production capacities and annual throughputs for S-437 and S-438 and will offset the resulting direct emission increases in this application. Because all other sources related to production of California gasoline, as permitted in Application 12412, continue to operate under direct or indirect emission limits that have been fully offset, it may be assumed that no indirect emission increases will result.

3.0 CUMULATIVE INCREASE

Current cumulative increase values are taken from the District database. Proposed increases are as calculated in Sections 2.1 and 2.2.

POLLUTANT	CURRENT (TON/YR)	PROPOSED (TON/YR)	OFFSET RATIO (NOTE 2) (TON/YR)	OFFSET AMOUNT (NOTE 3) (TON/YR)	NEW TOTAL AFTER OFFSETS (TON/YR)
POC	0.002	0.30	1.15	0.347	0.00
NOx	0.00 (note 1)	0.62	1.15	0.713	0.00
SO2	0.00	0.12	1.0	0.00	0.12 (note 2)
CO	160.2	1.72	NA	0.00	161.90
PM10	12.34	0.30	NA	0.00	12.64

Notes:

1. The database entry for NOx is actually -0.007. However, in accordance with the definition in Regulation 2-2-212, a cumulative increase is a positive number or zero. Therefore, a value of zero is used here.
2. Offset ratios are from Regulations 2-2-302 (for POC and NOx) and 2-2-303 (for SO2). Offsets are not required for PM10 because this is not a Major Facility for PM10 (100 ton/yr of emissions or more). Offsets are not required for SO2 until the cumulative increase amount exceeds 1.0 ton/yr. Offsets are not required for CO. Offsets are discussed further in Section 6.0.
3. The offset amount is the sum of the proposed emission increases, plus the pre-existing cumulative increase, multiplied by the offset ratio

4.0 TOXIC RISK MANAGEMENT

In accordance with District Regulation 2-1-316, if “project emissions” of any compound that is identified in Table 2-1-316 of Regulation 2, Rule 1 exceeds the indicated “trigger level”, then a risk analysis is required. “Project emissions” include emissions from new sources and increased emissions from modified sources. The purpose of a risk analysis is to verify that the resulting toxic risk is not excessive. The District Toxic Risk Management Policy requires that emissions of all toxic air contaminants (TACs) associated with a project be included in the risk analysis if any single TAC exceeds its trigger level. Because trigger levels are expressed in units of “lb/yr”, the annual average emission rates from new and modified sources are the appropriate basis for project emissions. Also, emissions from “related projects” must also be considered. Related projects, according to the District Toxic Risk Management Policy, include all projects within the two-year period preceding an application, unless the emissions are demonstrated to be unrelated to those in the application.

4.1 S-438 Combustion Emissions

Toxic emission factors for S-438 are the same as were used in Application 5814. These factors were taken from the Shell Reformulated Fuels Project (Application 8407) with PAH, xylene and toluene factors increased by a factor of 10 as discussed in the Health Risk Assessment (HRA) protocol for Application 12412. These factors are based on Shell source test data and data compiled by Almega Corporation.
Because S-437 and S-438 have been in service for more than 2 years (since 1997), the existing emissions do not constitute a "related project". Therefore, the appropriate basis for estimating toxic risk at S-438 is the incremental risk related to the proposed increase in annual fuel usage (0.15 E 12 BTU/yr).

COMPOUND	EMISSION FACTOR (LB/MM BTU)	EMISSIONS (NOTE 1) (LB/YR)	TRIGGER LEVEL (LB/YR)
acetaldehyde	2.06E-06	0.31	72
ammonia	1.36E-03	204	(note 2)
arsenic	9.77E-08	0.01	0.025
benzene	7.36E-06	1.1	6.7
benzo(a)anthracene	1.02E-08	0.0015	0.044
benzo(a)pyrene	5.90E-09	0.0009	0.044
benzo(b)fluoranthene	6.60E-09	0.0010	0.044
benzo(k)fluoranthene	5.90E-09	0.0009	0.044
cadmium	4.16E-08	0.006	0.046
copper	6.13E-07	0.092	0.046
dibenzo(a,h)anthracene	5.90E-09	0.0009	0.044
formaldehyde	5.12E-05	7.7	33
hexavalent chromium	4.71E-08	0.0071	0.0013
hydrogen sulfide	0.00E+00	0.0	8,100
indeno(1,2,3-cd)pyrene	5.90E-09	0.0009	0.044
lead	3.84E-07	0.058	16
manganese	9.84E-07	0.15	77
mercury	4.85E-08	0.007	58
naphthalene	3.12E-06	0.468	270
nickel	1.50E-07	0.023	0.73
phenol	1.87E-06	0.28	8,700
selenium	0.00E+00	0.0	97
toluene	3.34E-04	50.1	39,000
xylenes	3.40E-04	51.0	58,000
zinc	3.57E-06	0.54	6,800

Notes:

1. Based on proposed increase in annual fuel consumption of 0.15 E 6 MM BTU/yr
2. See Section 4.2 for combined S-438/A-46 ammonia emissions

Emissions of each compound are less than the associated risk screening trigger level. Therefore, no risk screening is required.

4.2 Ammonia Slip Emissions from A-46

Ammonia is present in the exhaust stream of the A-46 SCR system associated with S-438. Because the aqueous ammonia used at A-46 is not completely reacted, there is some amount of ammonia "slip" in the SCR exhaust. ConocoPhillips has proposed to limit slip to 10 ppmv @ 3% O2.

As in Section 4.1, the appropriate basis for estimating toxic risk at S-438 is the incremental risk related to the proposed increase in annual fuel usage (0.15 E 12 BTU/yr). The ammonia emissions related to the increase in S-438 fuel usage in Section 4.1 will also be considered here.

Convert ammonia "ppm" to "lb/MM scf":

This conversion may be done using the EPA "Fd" factor from 40 CFR Part 60 test methods, for example Method 19, Table 19-1-F. Fd is the ratio of the volume of dry flue gas to the heat value of the fuel used to produce the flue gas. Fd for natural gas is 8,710 dscf/MM BTU (from Method 19), Fd for refinery fuel gas is 8,700 dscf/MM BTU (from application Appendix B-2). Emission factors will be based on refinery fuel gas since this yields the higher emission factor. The conversion assumes that the flue gas is ideal (since flue gas molar volume is assumed to be 359 cf/lbmole) which is a valid assumption because of the relatively high temperature and low pressure of the flue gas. The conversion includes a correction of the pollutant concentrations from 3% O2 to 0% O2 (in accordance with District procedure ST-13A) since the flue gas volume assumes stoichiometric combustion (zero excess air and O2).

Ammonia Emission Factor (molecular weight 17.03):

(10/MM)(20.95%-0%/(20.95%-3%))(8,700 ft3/MM BTU)

(lbmole/359 ft3)(17.03 lb/lbmole) = **0.0048 lb/MM BTU**

The proposed increase in fuel usage at S-438 is 0.15 E 6 MM BTU/yr. Therefore, annual ammonia emissions would be:

(0.0048 lb/MM BTU)(150,000 MM BTU/yr) = **720 lb/yr**

When added to the ammonia emissions related to the increase in S-438 fuel usage (Section 4.1), the total ammonia emission increase is:

(204 + 720) lb/yr = **924 lb/yr**

The trigger level for ammonia in Table 2-1-316 of Regulation 2, Rule 1 is 19,000 lb/yr. Therefore, a risk screening is not required for ammonia emissions.

4.3 Organic Compounds in Fugitive Emissions

The toxic emission factors for fugitive components are taken from the California Air Resources Board document "Organic Gas Speciation Profiles". Specifically, speciation profiles are taken from the spreadsheet ORGPROF_03_19_03.xls ("Refinery pipes/valves/flanges – composite"). This spreadsheet includes profiles for many classes of sources. Because the new fugitive components will be all valves and connectors in isopentane and butane service, the most appropriate profile is number 316. The table below shows the composition data for compounds with assigned risk screening trigger levels in Regulation 2, Rule 1, and the resulting emissions based on the total fugitive emission rate (259 lb/yr) from Section 2.1:

COMPOUND	PROFILE 316 COMPOSITION (WT %)	TOTAL POC EMISSIONS (LB/YR)	COMPOUND EMISSIONS (LB/YR)	TRIGGER LEVEL (LB/YR)
benzene	0.1	259	0.26	6.7
n-hexane	3.4	259	8.81	83,000
toluene	0.5	259	1.30	39,000
total xylene	0.2	259	0.52	58,000

Emissions of each compound are less than the associated risk screening trigger level. Benzene is also emitted from S-438 (Section 4.1). However, combined benzene emissions from S-438 and fugitive sources are still below the benzene trigger level. Therefore, no risk screening is required.

5.0 BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

As determined in Section 2.4, BACT is triggered for NOx, CO, POC and PM10 emissions at the S-438. S-438 previously triggered BACT for these same pollutants in Application 12412 in 1995. The following table shows current BACT measures required at S-438 (and included in Condition 1694, Part E), as well as current BACT guidelines from BACT determination 94.3.1.

POLLUTANT	CURRENT BACT – CONDITION 1694	BACT DETERMINATION 94.3.1 (NOTE 1)
NOx	10 ppmv @ 3% O2 in exhaust gas, accomplished with low-NOx burners and SCR	BACT 1: Not determined BACT 2: same as current BACT for S-438
PM10	none	BACT 1: Not determined BACT 2: natural gas or treated refinery gas fuel
POC	none	BACT 1: Not determined BACT 2: Not specified (good combustion practice recommended)
CO	32 ppmv @ 3% O2 (daily average) in exhaust gas	BACT 1: Not determined BACT 2: 50 ppmv @ 3% O2 in exhaust gas

Notes:

1. BACT 1 measures may be imposed if technologically feasible and cost effective; BACT 2 measures have been achieved in practice

Current BACT measures are at least equivalent to those in the current BACT determination for this class of source.

To determine if other, more current BACT measures are appropriate, U.S. EPA's RACT/BACT/LAER Clearinghouse and CARB's BACT Clearinghouse were searched for applicable determinations in the category of refinery heaters larger than 50 MM BTU/hr. The EPA clearinghouse has no applicable determinations. CARB's clearinghouse includes 2 determinations from the South Coast AQMD for hydrogen reformer furnaces. The first, in Application 341340, is for a furnace that fires only natural gas and refinery gas. Since S-438 fires a large amount of low-BTU PSA offgas, this BACT determination is not applicable. However, the second determination, in Application 326118, appears to be applicable and is included as Attachment 1. This determination includes NOx, SO2 and ammonia emission limits. Only the NOx limit is more stringent than the existing limit at S-438. The limit in Application 326118 is: 7 ppmv @ 3% O2 (15-minute average). However, compliance with this limit was verified only on a 1-hour average basis by source test. Based on this determination, BACT will be as described in the table above for current BACT, however, the NOx emission limit will be reduced to 7 ppmv @ 3% O2 with a 1-hour averaging period (S-438 is equipped with a NOx CEM).

6.0 OFFSETS

As determined in Section 3.0, offsets are required for NOx, POC and SO2 emissions, as required in Regulation 2-2-302 and 2-2-303. The required offsets and source of these offsets is as follows:

POLLUTANT	REQUIRED OFFSETS (TONS)	BANKING CERTIFICATES / AVAILABLE BALANCES
POC	0.347	Certificate 921 (69.877 tons POC)
NOx	0.713	Certificate 920 (13.27 tons NOx, 64.62 tons CO, 6.65 tons PM10)

7.0 CEQA and Other Regulations

This application is considered to be ministerial under the District's CEQA guidelines (Regulation 2-1-311) and therefore is not subject to CEQA review. The engineering review for this project requires only the application of standard permit conditions and standard emission factors in accordance with Permit Handbook Chapters 2.4 and 3.4.

S-437 and S-438 will remain subject to the same applicable requirements shown in Part IV of the Major Facility Permit, except for those changes to Conditions 1694 and 20989 indicated in Section 8.0. Other minor changes to the Major Facility Permit are shown in Section 8.2 to reflect the proposed new firing rates, production capacities and annual throughputs. No new District or federal rules will apply to these sources, and the specific requirement of District or federal rules that currently apply to these sources will not change.

8.0 PERMIT CONDITIONS / PERMIT REVISIONS

8.1 Permit Conditions

A “future” condition will be created, based on current Condition 1694 for the proposed Authority to Construct. The current version of Condition 1694 is the version issued in Application 10116. This condition, amended to include any other changes made to the condition in the intervening time, will replace the current version of Condition 1694 when modifications permitted in the Authority to Construct are completed. The future condition is shown here as a revision of Condition 1694 in strikethrough/underline format.

The ConocoPhillips refinery operates under an “SO2 bubble” included in Condition 1694, Part A. Since the new SO2 emissions in this application will be offset, the cap could be managed in two ways: 1) the cap amount could be increased by the amount of offset emissions, with new emissions included under the cap, or 2) the cap amount could be left unchanged, with new emissions not required to be included under the cap. Since the first option will result in the simplest recordkeeping, this option will be implemented and the cap amount will be increased by 0.66 lb/day.

Permit Condition 1694, Parts A and E:

A. Heater Firing Rate Limits and General Requirements

1. Each heater listed below shall not exceed the indicated daily firing rate limit (based on higher heating value of fuel) which are considered maximum sustainable firing rates. The indicated hourly firing rate is the daily limit divided by 24 hours and is the basis for permit fees and is the rate listed in the District database.

District Source Number	Refinery ID Number	Daily Firing Limit (MM BTU/day)	Hourly Firing Rate (MM BTU/hr)
S-2	U229/B301	528	22
S-3	U230/B201	1,488	62
S-4	U231/B101	2,304	96
S-5	U231/B102	2,496	104
S-7	U231/B103	1,536	64
S-8	U240/B1	6,144	256
S-9	U240/B2	1,464	61

S-10	U240/B101	5,352	223
S-11	U240/B201	2,592	108
S-12	U240/B202	1,008	42
S-13	U240/B301	4,656	194
S-14	U240/B401	13,344	556
S-15 thru S19	U244/B501 thru B505	5,754	239.75
S-20	U244/B506	552	23
S-21	U244/B507	194.4	8.1
S-22	U248/B606	744	31
S-29	U200/B5	2,472	103
S-30	U200/B101	1,200	50
S-31	U200/B501	480	20
S-43	U200/B202	5,520	230
S-44	U200/B201	1,104	46
S-336	U231/B104	2,664	111
S-337	U231/B105	816	34
S-351	U267	2,424	101
S-371/372	U228/B520 and B521	1,392	58
S-438	U110	**6,000**~~5,040~~	**250**~~210~~

[Regulation 2-1-234.3 **except for S-438, Cumulative Increase for S-438**]

2a. All sources shall use only refinery fuel gas and natural gas as fuel, EXCEPT for S-438 which may also use pressure swing adsorption (PSA) off gas as fuel, and EXCEPT for S-3 and S-7 which may also use naphtha fuel.
[Regulation 9-1-304 (sulfur content), Regulation 2, Rule 1]

2b. Sources S-3 and S-7 are permitted to use naphtha fuel. These sources shall be monitored for visible emissions during tube cleaning. If any visible emissions are detected when the operation commences, corrective action shall be taken within one day, and monitoring shall be performed after the corrective action is taken. If no visible emissions are detected, monitoring shall be performed on an hourly basis. [Regulation 2-6-409.2]

2c. Sources S-3 and S-7 are permitted to use naphtha fuel. These sources shall be monitored for visible emissions before each 1 million gallons of liquid fuel is combusted at each source. If an inspection documents visible emissions, a Method 9 evaluation shall be completed within 3 working days, or during the next scheduled operating period if the specific unit ceases firing on liquid fuel within the 3 working day time frame.
[Regulation 2-6-409.2]

3a. 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. As an alternative to GC TRS analysis, the fuel gas total sulfur content may be measured with a dedicated total sulfur analyzer (Houston Atlas or equivalent), and TRS concentration estimated based on the total sulfur/TRS ratio, with the TRS estimate increased by a 5% margin for conservatism. The total sulfur/TRS ratio shall be determined at least on a monthly basis through GC analyses of total sulfur and TRS values, and the most recent ratio shall be used to estimate TRS concentration. [SO2 Bubble]

3b. The average of the 3 daily refinery fuel gas TRS sample results shall be reported to the District in a table format each calendar month, with a separate entry for each daily average.

Sample reports shall be submitted to the District within 30 days of the end of each calendar month. Any omitted sample results shall be explained in this report.[SO2 Bubble]

4. Emissions of SO2 shall not exceed **1,612**~~1,611~~ lb/day on a monthly average basis from non-cogeneration sources burning fuel gas or liquid fuel. [SO2 Bubble]

5. The following records shall be maintained in a District-approved log for at least 5 years and shall be made available to the District upon request:

a. Daily and monthly records of the type and amount of fuel combusted at each source listed in Part A.1. [Regulation 2, Rule 1]
b. TRS sample results as required by Part A.3 [SO2 Bubble]
c. SO2 emissions as required by Part A.4 [SO2 Bubble]
d. The operator shall keep records of all visible emission monitoring required by Part 2b, shall identify the person performing the monitoring and shall describe all corrective actions taken. [Regulation 2-6-409.2]
e. The operator shall keep records of all visible emission monitoring required by Part 2c, of the results of required visual monitoring and Method 9 evaluations on these sources, shall identify the person performing the monitoring and shall describe all corrective actions taken. [Regulation 2-6-409.2]

E. S-438 FURNACE

1. The S-438 furnace shall be abated by the A-46 SCR unit at all times, except that S-438 may operate without SCR abatement on a temporary basis for periods of planned or emergency maintenance. A District-approved NOx CEM shall monitor and record the S-438 NOx emission rate whenever S-438 operates without abatement. All emission limits applicable to S-438 shall remain in effect whether or not it is operated with SCR abatement. [BACT, Cumulative Increase]

2. Total fuel fired in S-438 shall not exceed **2.19**~~2.04~~ E 12 BTU in any rolling consecutive 365 day period. [Cumulative Increase]

3. Pressure swing adsorption (PSA) off gas used as fuel at S-438 shall not exceed 1.0 ppm (by weight) total reduced sulfur (TRS). TRS shall include hydrogen sulfide, methyl mercaptan, methyl sulfide, dimethyl disulfide. [BACT, Cumulative Increase]

4. The following emission concentration limits from S-438 shall not be exceeded. These limits shall not apply during startup periods not exceeding 24 hours (72 hours when drying refractory or during the first startup following catalyst replacement) and shutdown periods not exceeding 24 hours. The District may approve other startup and shutdown durations.

NOx: 7~~10~~ ppmv @ 3% oxygen, averaged over any **1-hr**~~3 hour~~ period
CO: 32 ppmv @ 3% oxygen, averaged over any calendar day
POC: 0.0023 lb/MM BTU of fuel used [BACT, Cumulative Increase]

5. The concentration of TRS in the blended fuel gas shall not exceed **14**~~50~~ ppmv averaged over any calendar month. [BACT, Cumulative Increase]

6. 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. [**Cumulative Increase**~~Recordkeeping~~]

7. **No later than 90 days from the startup of the S-438, the owner/operator shall conduct District-approved source tests to determine initial compliance with the limits in Part 4 for NOx, CO and POC. The owner/operator shall conduct the source tests in accordance with Part 8. The owner/operator shall submit the source test results to the District staff no later than 60 days after the source test. [BACT, Cumulative Increase]**

8. **The owner/operator shall obtain approval for all source test procedures from the District's Source Test Section prior to conducting any tests. The owner/operator shall comply with all applicable testing requirements for continuous emissions monitors as specified in Volume V of the District's Manual of Procedures. The owner/operator shall notify the District's Source Test Section, in writing, of the source test protocols and projected test dates at least 7 days prior to testing. [BACT, Cumulative Increase]**

8.2 Other Changes to Permit

In addition to the changes to Condition 1694 described in Section 8.1, the following parts of the Major Facility Permit must be revised through a significant revision. A significant revision is necessary in accordance with Regulation 2-6-226.5 because the BACT analysis for S-438 in Section 5.0 constitutes a case-by-case emission limit determination. The following parts of the permit require revision:

8.2.1 Table II-A (only revised entries are shown)

Table II A - Permitted Sources

Each of the following sources has been issued a permit to operate pursuant to the requirements of BAAQMD Regulation 2, Permits. The capacities in this table are the maximum allowable capacities for each source, pursuant to Standard Condition I.J and Regulation 2-1-301.

S-#	Description	Make or Type	Model	Capacity
437	Hydrogen Manufacturing Unit			**28.5**~~25~~ million scf/day
438	U110, H-1 (H2 Plant Reforming) Furnace (natural gas, refinery fuel gas, PSA offgas)	**John Zinc PFFG burners**~~Claudius Peters~~	reforming furnace	**250**~~210~~ MM BTU/hr

8.2.2 Condition 20989 (only revised entries are shown)

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 limit	hourly / daily throughput limit	annual throughput (any consecutive 12-month period period unless otherwise specified)
437	Table II-A	10.4~~9.1~~ E 9 ft3

8.2.3 Table VII-N (only revised entries are shown)

Table VII – N
Applicable Limits and Compliance Monitoring Requirements

Type of Limit	Citation of Limit	FE Y/N	Future Effective Date	Limit	Monitoring Requirement Citation	Monitoring Frequency (P/C/N)	Monitoring Type
throughput	BAAQMD Condition 20989, Part A	Y		S-304: 3.47 E 6 bbl/yr (only until modified in accordance with A/C 5814) S-305: 9.23 E 6 bbl/yr S-306: 5.66 E 6 bbl/yr S-307: 1.39 E 7 bbl/yr S-435: 6.6 E 6 bbl/yr S-436: 4.7 E 6 bbl/yr S-437: **10.4**~~9.1~~ E 9 ft3/yr	BAAQMD Condition 20989, Part A	P/M	records

8.2.4 Table II-B (only revised entries are shown)

Table II B – Abatement Devices

A-#	Description	Source(s) Controlled	Applicable Requirement	Operating Parameters	Limit or Efficiency

Table II B – Abatement Devices

A-#	Description	Source(s) Controlled	Applicable Requirement	Operating Parameters	Limit or Efficiency
46	SCR System	S-438	BAAQMD Condition 1694, Part E	NOx, O2 CEMs	**7**~~10~~ ppmv NOx at 3% O2 (**1**~~3~~-hr average)

8.2.5 Table IV-A.34 (only revised entries are shown)

Table IV – A.34
Source-specific Applicable Requirements
S-438 – Unit 110, H-1 Furnace

Applicable Requirement	Regulation Title or Description of Requirement	Federally Enforceable (Y/N)	Future Effective Date
BAAQMD Condition 1694			
Part A.1	Heat ratings, firing limits [Basis: Regulation 2-1-234.3]	N	
Part A.2a	Fuel restrictions [Basis: Regulation 2, Rule 1]	Y	
Part A.3a	TRS testing requirement [Basis: SO2 Bubble]	Y	
Part A.3b	TRS reporting requirements [Basis: SO2 Bubble]	Y	
Part A.4	SO2 emission limit [Basis: SO2 Bubble]	Y	
Part A.5	Records [Basis: Regulation 2, Rule 1; SO2 Bubble; Regulation 2-6-409.2]	Y	
Part E.1	S-438 abatement requirement [Basis: BACT, Cumulative Increase]	Y	
Part E.2	S-438 annual firing limit [Basis: Cumulative Increase]	Y	
Part E.3	S-438 PSA offgas fuel TRS limit [Basis: BACT, Cumulative Increase]	Y	
Part E.4	S-438 NOx~~, and~~ CO **and POC** emission limits [Basis: BACT, Cumulative Increase]	Y	
Part E.5	S-438 fuel gas TRS limit [Basis: BACT, Cumulative Increase]	Y	
Part E.6	S-438 Records [Basis: **Cumulative Increase**~~Recordkeeping~~]	Y	
Part E.7	**S-438 modification startup source test requirement [Basis: BACT, Cumulative Increase]**	**Y**	**90 days after S-438 startup following modification**
Part E.8	**S-438 modification startup source test requirement [Basis: BACT, Cumulative Increase]**	**Y**	**prior to conducting source test in part E.7**

8.2.6 Table VII-A.34 (only revised entries are shown)

Table VII – A.34
Applicable Limits and Compliance Monitoring Requirements
S-438 – UNIT 110, H-1 FURNACE

Type of Limit	Citation of Limit	FE Y/N	Future Effective Date	Limit	Monitoring Requirement Citation	Monitoring Frequency (P/C/N)	Monitoring Type
NOx	BAAQMD Condition 1694, Part E.4	Y		7~~10~~ ppmv NOx at 3% O2 over any 1~~3~~ hour~~s~~, except startups and shutdowns~~, at S-438~~	None	C	CEM
All combustion emissions	BAAQMD Condition 1694, Part A.1	N		heat ratings, firing limits (see condition)	BAAQMD Condition 1694, Part A.5	P/D	records
all combustion emissions	BAAQMD Condition 1694, Part E.2	Y		**2.19**~~2.04~~ E 12 BTU/yr fuel combustion~~ at S-438~~	BAAQMD Condition 1694, Part E.6	P/D	records
O2		Y		No limit	None	C	O2 Monitor
CO	BAAQMD Condition 1694, Part E.4	Y		32 ppmv CO at 3% O2 over any 24 hr, except startups and shutdowns~~, at S-438~~	None	N	None
TRS	BAAQMD Condition 1694, Part E.3	Y		1 ppmw TRS in PSA offgas used as fuel~~, at S-438~~	Overall fuel TRS monitored by BAAQMD Condition 1694, Part E.5	P/D	records
TRS	BAAQMD Condition 1694, Part E.5	Y		14~~50~~ ppmv TRS over any month, in fuel gas, at S-438	BAAQMD Condition 1694, Part E.5	P/3 times per day	TRS analysis

Table VII – A.34
Applicable Limits and Compliance Monitoring Requirements
S-438 – UNIT 110, H-1 FURNACE

Type of Limit	Citation of Limit	FE Y/N	Future Effective Date	Limit	Monitoring Requirement Citation	Monitoring Frequency (P/C/N)	Monitoring Type
Opacity	BAAQMD 6-304	Y		During tube cleaning, Ringelmann No. 2 for 3 min/hr and 6 min/billion BTU in 24 hours; applies to sources rated over 140 MM BTU/hr (with tubes)	None for gaseous-fueled sources	N	None
Opacity	BAAQMD 6-301	Y		Ringelmann 1 for no more than 3 minutes in any hour	None for gaseous-fueled sources	N	None
FP	BAAQMD 6-305	Y		Prohibition of nuisance	None	N	None
FP	BAAQMD 6-310.3	Y		0.15 grain/dscf @ 6% O2	None for gaseous-fueled sources	N	None
SO2	BAAQMD Condition 1694, Part A.4	Y	startup of S-36, S-461 for modified limit	1,558 lb/day SO2 over any month (1,611 lb/day after startup of S-36 and S-461**, 1,612 lb/day after modification of S-438**)	BAAQMD Condition 1694, Part A.3a	P/3 times per day	TRS analysis
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 40 CFR 60.105(a)(4)	C	H2S analyzer

8.0 RECOMMENDATION

Grant Authority to Construct to ConocoPhillips for:

S-437 Unit 110 Hydrogen Plant: Increase capacity to 25 MM scf/day when using liquid feed, 28.5 MM scf/day when using natural gas feed exclusively

S-438 Unit 110 Hydrogen Reformer Furnace: Increase maximum firing rate to 250 MM BTU/hr, change type of catalyst

A-46 SCR Unit for S-438: Change catalyst type

By: ______________________________

J. Julian Elliot
Senior Air Quality Engineer

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