

Significant Modification to a Covered Source
Review Summary

Application No.: 0088-23

Permit No.: 0088-01-C

Applicant: Chevron Products Company

Facility Title: Petroleum Refinery
Located at 91-480 Malakole Street, Kapolei, Oahu

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Application Dates: November 17, 2014 and additional information dated November 18, 2014 and January 9, 2015

Proposed Project:

SICC 2911 (Petroleum Refining)

Chevron Products Company is applying for a Significant Modification to a Covered Source Permit. The application is for the restart of a Catalytic Oxidation (CatOx) Unit that will treat the offgas from the refinery's Foul Water Treatment Plant (FWTP), which is currently burned in boilers F-5201 and F-5202. The FWTP offgas contains significant amounts of ammonia which is destroyed by the CatOx Unit. The CatOx Unit was previously operated as an insignificant activity starting in March 2011 but was shutdown in August 2012 after the refinery concluded that the operation of the unit was not an insignificant activity. After the August 2012 shutdown, the CatOx Unit was operated for troubleshooting purposes, but has since ceased operations as of January 2013.

The permit modification application fee of \$1,000.00 for a significant modification was submitted by the applicant and processed.

Equipment Description:

The CatOx Unit is an air pollution control device that destroys ammonia and VOCs contained in the FWTP offgas stream. In addition, the CatOx Unit has selective catalytic reduction catalyst for the control of NO_x formed through the oxidation of ammonia. The CatOx Unit consists of three (3) different sections containing different types of catalysts as follows.

Ceramic Guard Bed – The ceramic guard bed consists of three (3) split levels of uncoated alumina beads. These beads serve the function of absorbing possible catalyst poisons from the process air before they reach the downstream catalyst beds. This bed does not have any effect on the environmental or ammonia emissions through the system.

Ammonia and VOC Removal Catalyst – The second section of catalyst is a platinum based ammonia (NH₃) removal catalyst which oxidizes the ammonia and VOCs.

NO_x Removal Catalyst – The third section of catalyst is a Selective Catalytic Reduction (SCR) catalyst to remove NO_x formed by the oxidation of ammonia in the previous catalyst section.

The CatOx Unit will be equipped with a continuous process monitoring system including two (2) NO_x analyzers, which will determine NO_x and NH₃ concentrations. The stack readings will be used to control NH₃ injection for NO_x reduction. To show that CO and VOC emissions will be below their PSD significant levels, an initial stack test will be conducted. The stack test will show that when the process monitoring system demonstrates compliance with NO_x and NH₃, it also shows that the CO and VOC emission rates are consistent or lower than those used in the emission calculations presented in Appendix A of the application.

The offgas stream from the FWTP is considered a refinery fuel gas, and as such, the CatOx Unit is subject to the fuel gas combustion device requirements at 40 CFR §60.102a(g). Because the FWTP offgas is an inherently low-sulfur refinery fuel gas, it qualifies for the sulfur monitoring exemption provided by 40 CFR §60.107a(b)(1).

CatOx Unit Inlet Maximum Design Capacity

3000 scfm (process offgas and dilution air)
43.9 lb/hr ammonia
31.4 lb/hr VOC

The CatOx Unit does not use fuel. The energy required to heat the inlet process gas and air to oxidation temperatures is supplied by an electric heater.

The FWTP and CatOx Unit operate up to twenty-four (24) hours/day, 365 days/year.

Applicable Requirements:

Hawaii Administrative Rules (HAR)

Title 11, Chapter 59	Ambient Air Quality Standards
Title 11, Chapter 60.1	Air Pollution Control
Subchapter 1	General Requirements
Subchapter 2	General Prohibition
HAR 11-60.1-31	Applicability
HAR 11-60.1-39	Storage of Volatile Organic Compounds
Subchapter 5	Covered Sources
Subchapter 6	Fees for Covered Sources, Noncovered Sources, and Agricultural Burning

- HAR 11-60.1-111 Definitions
- HAR 11-60.1-112 General Fee Provisions for Covered Sources
- HAR 11-60.1-113 Application Fees for Covered Sources
- HAR 11-60.1-114 Annual Fees for Covered Sources
- HAR 11-60.1-115 Basis of Annual Fees for Covered Sources
- Subchapter 8 Standards of Performance for Stationary Sources

Federal Requirements

40 CFR Part 60 - Standards of Performance for New Stationary Sources (NSPS)

Subpart Ja – Standards of Performance for Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After May 14, 2007

The CatOx Unit is subject to the certain provisions of NSPS, Subpart Ja, since the oxidation section is a fuel gas combustion device. Applicable requirements include the fuel gas hydrogen sulfide concentration limitation in 40 CFR §60.102a(g)(1)(ii). The FWTP offgas is a low sulfur fuel gas stream and qualifies for the monitoring exemption in 40 CFR §60.107a(b). Pursuant to 40 CFR §60.107a(b)(2), the exemption is effective upon submission of the information required by 40 CFR §60.107a(b)(1)(i)-(iv). This information includes:

- i. A description of the fuel gas stream/system to be considered, including submission of a portion of the appropriate piping diagrams indicating the boundaries of the fuel gas stream/system and the affected fuel gas combustion device(s) or flare(s) to be considered;
- ii. A statement that there are no crossover or entry points for sour gas (high H₂S content) to be introduced into the fuel gas stream/system;
- iii. An explanation of the conditions that ensure low amounts of sulfur in the fuel gas stream (i.e., control equipment or product specifications) at all times;
- iv. The supporting test results from sampling the fuel gas stream/system demonstrating that the sulfur content is less than five (5) ppm H₂S; and
- v. A description of how the two (2) weeks of monitoring results compares to the typical range of H₂S concentration expected for the fuel gas stream/system going to the affected fuel gas combustion device or flare.

The required information is the same as submitted for the Alternative Monitoring Plan (AMP) approval to combust the FWTP offgas at Boilers F-5201 and F-5202 pursuant to 40 CFR §60.13(i) and EPA guidance.

The NO_x emission standard in 40 CFR §60.102a(g)(2) is not applicable because the CatOx Unit does not “transfer heat indirectly to process stream materials” and is therefore not a “process heater” as defined in 40 CFR §60.101a.

Non-Applicable Requirements:

Hawaii Administrative Rules (HAR)

Title 11, Chapter 60.1 Air Pollution Control

Subchapter 7 Prevention of Significant Deterioration Review

Subchapter 9 Hazardous Air Pollutant Sources

Federal Requirements

40 CFR Part 52.21 – Prevention of Significant Deterioration of Air Quality

40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants (NESHAPS)

40 CFR Part 63 – National Emission Standards for Hazardous Air Pollutants for Source Categories (MACT)

Best Available Control Technology (BACT):

A Best Available Control Technology (BACT) analysis is applicable only to new covered sources and significant modifications to covered sources that have the potential to emit or a net emissions increase above significant levels as defined in HAR §11-60.1-1. A BACT analysis is not applicable since there are no significant net emission increases.

Pollutant	Potential Emissions (tpy)	Significant Level (tpy)	Significant ?
NO _x	30.5	40	no
CO	32.4	100	no
VOC	2.8	40	no

Prevention of Significant Deterioration (PSD):

A PSD major modification is defined as a project at an existing major stationary source that will result in a significant emissions increase and a significant net emissions increase of any pollutant subject to regulations approved pursuant to the Clean Air Act as defined in 40 CFR §52.21. Since there are no significant emission increases for this modification, PSD is not triggered.

Air Emissions Reporting Requirements (AERR):

40 CFR Part 51, Subpart A – Air Emissions Reporting Requirements, is based on the emissions of criteria air pollutants from Type A and B point sources (as defined in 40 CFR Part 51, Subpart A), that emit at the AERR triggering levels as shown in the table below:

Pollutant	Type A Triggering Levels ^{1,2} (tpy)	Type B Triggering Levels ¹ (tpy)	Pollutant	In-house Total Facility Triggering Levels ¹ (tpy)
NO _x	≥2500	≥100	NO _x	≥25
SO ₂	≥2500	≥100	SO ₂	≥25
CO	≥2500	≥1000	CO	≥250
PM ₁₀ /PM _{2.5}	≥250/250	≥100/100	PM/PM ₁₀	≥25/25
VOC	≥250	≥100	VOC	≥25
Pb		≥5	Pb	≥5
			HAPS	≥5

¹ Based on potential emissions

² Type A sources are a subset of Type B sources and are the larger emitting sources by pollutant

The Chevron Hawaii petroleum refinery exceeds the Type A triggering levels. Therefore, AERR requirements are applicable.

The Clean Air Branch also requests annual emissions reporting from those facilities that have facility-wide emissions of a single air pollutant exceeding in-house triggering levels or is a covered source. Annual emissions reporting for the facility will be required for in-house recordkeeping purposes since this is a covered source.

Compliance Assurance Monitoring (CAM):

No change from Covered Source Permit No. 0088-01-C.

Synthetic Minor Source:

No change from Covered Source Permit No. 0088-01-C.

Insignificant Activities:

The insignificant activities list from Covered Source Permit No. 0088-01-C should be revised to exclude the Catalytic Oxidation Unit.

Alternate Operating Scenarios:

No change from Covered Source Permit No. 0088-01-C.

Project Emissions:

The following tables present the estimated maximum, average, and annual weighted average emissions from the CatOx Unit. The parameters shown in the column for “SCR Outlet” are representative of the emissions from the stack. The material balance data and estimated emissions for NH₃, VOC, and NO_x were provided by the CatOx Unit vendor. CO emissions were estimated from CatOx Unit stack testing conducted in November 2011 and represents worse case emissions. The maximum emission case represents the highest expected NH₃ and VOC offgas flow rates from the FWTP, and the average emissions case the average expected NH₃ and VOC offgas flow rates from the FWTP. The maximum emissions rate is expected to occur twenty-five (25) percent of the time.

CatOx Maximum Emissions Case

Parameter	FWTP Offgas	Dilution Air	Oxidizer Inlet	Oxidizer Outlet	Cooling Air	NH3 Injection	SCR Inlet	SCR Outlet	TPY Emitted
scfm	240	2760	3000	3000	500	14.0	3514	3514	
NH ₃ – lb/hr	43.9	0	43.9	0.9	0	37.8	38.7	0.77	3.4
VOC – lb/hr	31.4	0	31.4	0.6	0		0.6	0.63	2.8
NO _x – lb/hr	0	0	0	46.5	0		46.5	7.0	30.5
CO – lb/hr								7.4	32.4

CatOx Average Emissions Case

Parameter	FWTP Offgas	Dilution Air	Oxidizer Inlet	Oxidizer Outlet	Cooling Air	NH3 Injection	SCR Inlet	SCR Outlet	TPY Emitted
scfm	240	1760	2000	2000	500	4.0	2504	2504	
NH ₃ – lb/hr	20.4	0	20.4	0.4	0	10.1	10.5	0.21	0.9
VOC – lb/hr	9.7	0	9.7	0.2	0		0.2	0.2	0.8
NO _x – lb/hr	0	0	0	21.6	0		21.6	2.2	9.5
CO – lb/hr								2.7	11.9

CatOx Weighted Annual Average Emissions Case (25% maximum, 75% average)

Parameter	TPY Emitted
NH ₃	1.5
VOC	1.3
NO _x	14.7
CO	17.0

Greenhouse Gas (GHG) Emissions:

The CatOx Unit is not expected to produce GHG emissions, since Chevron’s vendor has stated that there should be no products of “partial combustion” forming in the process. This assumes the process is running properly. Although Chevron considers the foul water offgas feeding the CatOx Unit as a fuel in terms of NSPS Ja, the CatOx Unit is not burning the stream – the unit is electrically heated. The vendor said that they cannot model scenarios where the process is running incorrectly and if partial combustion is occurring (as was in the original design).

Ambient Air Quality Assessment (AAQA):

A modeling analysis was performed by the applicant for the proposed CatOx Unit using EPA’s AERMOD model (ver. 14134), AERMET (ver. 14134) with Kalaeloa Airport data, and AERMAP with USGS NED data. AEMOD was run in rural mode. The BPIP model was used to generate appropriate building dimensions for input into AERMOD. Five (5) years (2008 – 2012) of meteorological data from Kalaeloa Airport was used, with upper air data from Lihue, Kauai.

The receptor grid consisted of three Cartesian grids. The first Cartesian grid extended to approximately five (5) km from the fence in all directions. Receptors in this region were spaced at 100 m intervals. The second grid extended to ten (10) km. Receptor spacing in this region was 250 m. The third grid extended to approximately fifteen (15) km with a spacing of 500 m. The grid was designed such that maximum refinery impacts fall within the 100 m spacing of receptors. Receptors were also placed along the fenceline at fifty (50) m intervals.

Compliance with the one-hr (1-hr) NO₂ standard was assessed based upon the form of the standard which is the 98th percentile (the eighth highest value) of the annual distribution of the daily maximum one-hr (1-hr) values from the five-year (5-year) meteorological dataset. Compliance with the annual standards was based upon the highest value from the five-year (5-year) dataset. The EPA Tier 2 Ambient Ratio Method values for NO_x to NO₂ conversion of 0.75 for the annual average and 0.80 for the 1-hr average were employed. The results were combined with the maximum values from CY 2011-2013 DOH monitoring data (background data) to produce final estimates for comparison with the NAAQS/SAAQS. The ambient air quality assessment showed that the facility will be in compliance with all Federal and State ambient air quality standards.

Stack Parameters

Unit	Stack Height (ft)	Stack Diameter (ft)	Stack Velocity (ft/s)	Stack Temperature (°F)	NO _x (lb/hr)	CO (lb/hr)
CatOx Unit	30.83	1.11	61.0	305	7.0	7.4

Comparison of Modeled Impacts with NAAQS/SAAQS

Pollutant	Averaging Period	Modeled Result (µg/m ³)	Background Concentration (µg/m ³)	Total Concentration (µg/m ³)	SAAQS (µg/m ³)	Percent of SAAQS (%)
NO ₂	1-hr (98 th)	104.0	43	147	188	78.2
	Annual	5.6	6	11.6	70	16.6
CO	1-hr	266.5	1,718	1984.5	10,000	19.8
	8-hr	77.7	1,217	1294.7	5,000	25.9

Notes:

1. Background data from Kapolei monitoring station (max value from CY 2011-2013).
2. Only the State Ambient Air Quality Standards (SAAQS) are shown as they are the same or more restrictive than the National Ambient Air Quality Standards (NAAQS).

Significant Permit Conditions:

Attachment II(A), Special Condition No. B.5

5. The Catalytic Oxidation Unit is subject to the provisions of the following federal regulations:
 - a. 40 CFR Part 60, New Source Performance Standards (NSPS),
 - i. Subpart A, General Provisions; and
 - ii. Subpart Ja, Standards of Performance for Petroleum Refineries for Which Construction, Reconstruction, or Modification Commenced After May 14, 2007.

The permittee shall comply with all applicable requirements of these standards, including all emission limits, notification, reporting, monitoring, testing and recordkeeping requirements. The major requirements of these standards are detailed in the special conditions of this permit.

Reason: The CatOx Unit is subject to the certain provisions of NSPS, Subpart Ja, since the oxidation section is a fuel gas combustion device. Applicable requirements include the fuel gas hydrogen sulfide concentration limitation in 40 CFR §60.102a(g)(1)(ii). The FWTP offgas is a low sulfur fuel gas stream and qualifies for the monitoring exemption in 40 CFR §60.107a(b). Pursuant to 40 CFR §60.107a(b)(2), the exemption is effective upon submission of the information required by 40 CFR §60.107a(b)(1)(i)-(iv).

Attachment II(A), Special Condition No. C.9

9. Catalytic Oxidation Unit - Offgas
 - a. The offgas from the Foul Water Treatment Plant shall be routed to the Catalytic Oxidation Unit at all times, except during periods of maintenance, in which the foul water shall be stored in permitted storage tanks.
 - b. The permittee shall not oxidize in the Catalytic Oxidation Unit any offgas from the Foul Water Treatment Plant that contains H₂S in excess of 162 ppmv determined hourly on a three-hour (3-hour) rolling average basis and H₂S in excess of sixty (60) ppmv determined daily on a 365 successive calendar day rolling average basis.

Reason: 40 CFR Subpart 60 Subpart Ja applicable requirements include the fuel gas hydrogen sulfide concentration limitation in 40 CFR §60.102a(g)(1)(ii).

Attachment II(A), Special Condition No. C.10

10. Catalytic Oxidation Unit – Visible Emissions

For any six (6) minute averaging period, the Catalytic Oxidation Unit shall not exhibit visible emissions of twenty (20) percent opacity or greater, except as follows: during start-up, shut-down, or equipment breakdown, the Catalytic Oxidation Unit may exhibit visible emissions not greater than sixty (60) percent opacity for a period aggregating not more than six (6) minutes in any sixty (60) minutes.

Reason: The Catalytic Oxidation Unit is subject to Hawaii's opacity requirements.

Attachment II(A), Special Condition No. C.11

11. Catalytic Oxidation Unit – Maximum Emission Limits

The permittee shall not discharge or cause the discharge into the atmosphere from the Catalytic Oxidation Unit emissions in excess of the following emission limits:

Pollutant	Emission Limits (lb/hr) ¹
NO _x	7.0
CO	7.4
VOC	0.63

¹ Based on a 3-hr average

Reason: The applicant has requested the addition of federally enforceable emission limits for NO_x, CO, and VOC from the Catalytic Oxidation Unit.

Attachment II(A), Special Condition No. C.12

12. Foul Water Treatment Plant

The permittee shall maintain the pH of the Foul Water Treatment Plant effluent water greater than or equal to 9 and the temperature of the Foul Water Treatment Plant effluent water between 210 °F and 250 °F. The permittee shall also maintain the H₂S concentration of the Foul Water Treatment Plant offgas less than five (5) ppm.

Reason: The applicant has proposed a minimum pH level and a medium temperature range that will ensure that H₂S will not be liberated in the Foul Water Treatment Plant offgas. The Foul Water Treatment Plant offgas is a low sulfur fuel gas stream and qualifies for the monitoring exemption in 40 CFR §60.107a(b) based on a sulfur content of less than five (5) ppm H₂S (40 CFR §60.107a(b)(1)(iv)).

Attachment II(A), Special Condition No. D.24

24. Catalytic Oxidation Unit – H₂S Monitoring

- a. The permittee shall install, operate, calibrate and maintain an instrument for continuously monitoring and recording the concentration by volume (dry basis) of H₂S in the offgas from the Foul Water Treatment Plant before being oxidized in the Catalytic Oxidation Unit.
- b. The permittee may apply for an exemption from the H₂S monitoring requirements described above for a fuel gas stream that is inherently low in sulfur content. A fuel gas stream that is demonstrated to be low-sulfur is exempt from the H₂S monitoring requirements described above until there are changes in operating conditions or stream composition.
 - i. The permittee shall submit to the Department of Health and U.S. EPA Region 9 a written application for an exemption from monitoring. The application must contain the following information:
 - (1) A description of the fuel gas stream/system to be considered, including submission of a portion of the appropriate piping diagrams indicating the

- boundaries of the fuel gas stream/system and the affected fuel gas combustion device(s) or flare(s) to be considered;
- (2) A statement that there are no crossover or entry points for sour gas (high H₂S content) to be introduced into the fuel gas stream/system;
 - (3) An explanation of the conditions that ensure low amounts of sulfur in the fuel gas stream (i.e., control equipment or product specifications) at all times;
 - (4) The supporting test results from sampling the fuel gas stream/system demonstrating that the sulfur content is less than five (5) ppm H₂S; and
 - (5) A description of how the two (2) weeks of monitoring results compares to the typical range of H₂S concentration expected for the fuel gas stream/system going to the affected fuel gas combustion device or flare.
- ii. The effective date of the exemption is the date of submission of the information required above.
 - iii. No further action is required unless refinery operating conditions change in such a way that affects the exempt fuel gas stream/system (e.g., the stream composition changes). If such a change occurs, the permittee shall follow the procedures in 40 CFR §60.107a(b)(3).
- c. The permittee shall keep records of the specific exemption determined to apply for each fuel stream that is exempted. The permittee shall keep a copy of the application as well as the letter from the Department of Health and U.S. EPA Region 9 granting approval of the application.

Reason: The FWTP offgas is a low sulfur fuel gas stream and qualifies for the monitoring exemption in 40 CFR §60.107a(b). Pursuant to 40 CFR §60.107a(b)(2), the exemption is effective upon submission of the information required by 40 CFR §60.107a(b)(1)(i)-(iv).

Attachment II(A), Special Condition No. D.25

25. Catalytic Oxidation Unit - Visible Emissions (VE)

The permittee shall conduct **monthly** (calendar month) VE observations for the Catalytic Oxidation Unit by a certified reader in accordance with 40 CFR Part 60, Appendix A, Method 9, or U.S. EPA approved equivalent methods, or alternate methods with prior written approval from the Department of Health. For each month, two (2) consecutive six (6) minute observations shall be taken at fifteen (15) second intervals. Records shall be completed and maintained in accordance with the **Visible Emissions Form Requirements**.

Reason: The Catalytic Oxidation Unit is subject to Hawaii's opacity requirements.

Attachment II(A), Special Condition No. D.26

26. Catalytic Oxidation Unit – Continuous Process Monitoring System for NO_x and NH₃

The permittee shall install, operate, calibrate, and maintain a continuous process monitoring system including two NO_x analyzers, for continuously monitoring and recording the NO_x and NH₃ concentrations downstream of the Catalytic Oxidation Unit. The continuous process monitoring system must be in continuous operation whenever the Catalytic Oxidation Unit is in operation. The NH₃ concentration downstream of the Catalytic Oxidation Unit will be used to determine the CO and VOC concentrations downstream of the Catalytic Oxidation Unit using correlation factors for CO and VOC that are to be

established during the source performance test specified in Special Condition No. F.3 of this Attachment.

Reason: The applicant has proposed a continuous process monitoring system downstream of the Catalytic Oxidation Unit to monitor for NO_x and NH₃. The CO and VOC will be monitored indirectly using the monitoring for NH₃ and the results of the source performance test specified in Attachment II(A), Special Condition No. F.3.

Attachment II(A), Special Condition No. D.27

27. Foul Water Treatment Plant Monitoring and Recordkeeping

The permittee shall monitor the Foul Water Treatment Plant effluent water for pH and temperature on a daily basis. The permittee shall also monitor the Foul Water Treatment Plant offgas for H₂S concentration using colorimetric indicator tubes at least twice per year and when the pH drops below 9. Records shall be kept of the effluent water pH and temperature and of the offgas H₂S concentration.

Reason: The applicant has proposed to conduct monitoring/recordkeeping of the effluent water and the offgas from the Foul Water Treatment Plant to show compliance with Attachment II(A), Special Condition No. C.12.

Attachment II(A), Special Condition No. F.1

1. **Within sixty (60) days after** achieving the maximum production rate of the Catalytic Oxidation Unit, **but not later than one-hundred eighty (180) days after** initial startup of the Catalytic Oxidation Unit, the permittee shall conduct or cause to be conducted performance tests on the offgas from the Foul Water Treatment Plant to determine compliance with the hourly H₂S limit in Special Condition No. C.9.b of this Attachment.

Reason: 40 CFR Part 60 Subpart Ja requires a performance test to be performed to demonstrate initial compliance with Attachment II(A), Special Condition No. C.9.b.

Attachment II(A), Special Condition No. F.3

3. **Within sixty (60) days after** achieving the maximum production rate of the Catalytic Oxidation Unit, **but not later than one-hundred eighty (180) days after** initial startup of the Catalytic Oxidation Unit and annually thereafter, the permittee shall conduct or cause to be conducted performance tests for nitrogen oxides (NO_x), carbon monoxide (CO), and volatile organic compounds (VOC) on the Catalytic Oxidation Unit outlet stack.

Reason: This performance test will be used to demonstrate initial and annual compliance with Attachment II(A), Special Condition No. C.11.

Conclusion and Recommendations:

Recommend issuance of the significant modification to existing Covered Source Permit No. 0088-01-C, subject to the significant permit conditions above. All other permit conditions issued with CSP No. 0088-01-C on February 22, 1999 and amended on January 22, 2002, April 16, 2002, March 3, 2003, June 28, 2006, April 24, 2007, August 13, 2007, November 8, 2007, July 22, 2008, September 11, 2009, November 4, 2009, and April 22, 2013 shall not be affected and shall remain valid. A thirty-day (30-day) public comment period and a forty-five day (45-day) EPA review period are also required.

PROPOSED

Reviewer: Darin Lum
Date: 2/2015