**PROPOSED**

**PERMIT APPLICATION REVIEW**
**COVERED SOURCE PERMIT (CSP) NO. 0649-01-C**
**Initial Application No. 0649-01**

**Applicant:** Imperium Renewables, LLC

**Facility:** Kalaeloa Barbers Point Harbor Biodiesel Facility
**Location:** Along Malakole Road, Kalaeloa Barbers Point Harbor, Oahu
UTM – 591,580 Meters East and 2,357,800 Meters North, Zone 4 (NAD-27)

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## 1. Background

1.1 Imperium Renewables, LLC has applied for an initial covered source permit to construct and operate a 100 million gallon per year biodiesel plant at Kalaeloa, Barbers Point Harbor, Oahu. The biodiesel will be produced by reacting feedstock, such as vegetable oil, with methanol and sodium methylate to produce biodiesel and glycerin (glycerol). Excess methanol will be used to drive the reaction to completion. Two 38 MMBtu/hr thermal fluid heaters will operate at the facility to generate heat used to manufacture boidiesel. The heaters will be fired on either biodiesel or fuel oil No. 2 in combination with methanol gas. The maximum specified sulfur content of the biodiesel and fuel oil No. 2 is 0.05% by weight to minimize sulfur dioxide ($SO_2$) emissions. The thermal fluid heaters will also be equipped with low-$NO_X$ burners to control nitrogen oxide ($NO_X$) emissions. Vapors discharged from

process equipment will be condensed by a vapor recovery system, consisting of two (in series) water cooled condensers. Liquid methanol collected by the vapor recovery system will be recycled back into the process. Non-condensable methanol vapor passing through the vapor recovery system will be routed to the thermal fluid heaters for additional control at 99.5% or greater VOC destruction efficiency. The thermal fluid heaters will be the primary equipment to control VOCs from process equipment and storage tanks. Either one of two units being considered by the applicant will be used as a secondary control device for controlling VOCs from vent stream gas. Both secondary units considered for the project will provide at least 98% VOC reduction and be fired on fuel oil No. 2 or biodiesel with 0.05% by weight maximum sulfur content. Methanol vapors discharged at ambient temperature from the methanol and catalyst storage tanks will be routed directly to the combustion unit(s) for control. As indicated for the application, the vapor recovery system condensers are only effective for recovering methanol from hot vapors, such as those from the process units. The standard industrial classification code (SICC) for this facility is 2869 (Industrial Organic Chemicals, Not Elsewhere Classified).

1.2 Imperium Renewables, LLC has selected two identical thermal fluid heaters for the project. A total combined heater firing rate limit of 525,600 MMBtu/yr is proposed to prevent the units from exceeding the best available control technology (BACT) threshold for $NO_x$ worst-case. Also, the burning of methanol gas will be limited to prevent the facility from exceeding the major source threshold for any single hazardous air pollutant (HAP) of 10 TPY for methanol worst-case. Thermal fluid heaters are listed as follows:

| THERMAL FLUID HEATERS | | | | |
|---|---|---|---|---|
| Unit | Manufacturer | Model No. | Heat Input Capacity | Burner |
| 1 & 2 | American Heating Company, Inc. | AHE-3000-DF | 38 MMBtu/hr | low $NO_X$ high-ash compatible |

1.3 Imperium Renewables, LLC may submit a permit modification for firing the thermal fluid heaters on biodiesel bottoms. It was stated that the fuel is a residual waste product from the biodiesel refining process that contains higher amounts of nitrogen, sulfur, and ash than biodiesel or fuel oil No. 2. Manufacturer's specifications indicate that two heaters are necessary to burn biodiesel bottoms. It was stated that the ash content of biodiesel bottoms is as high as 0.5%. Periodic shut-down of each heater will be necessary if firing the units on biodiesel bottoms to enable operation of one unit while ash is cleaned from the other unit. Imperium Renewables, LLC will use data after start-up of another similar 100 million gallon per year biodiesel plant at Grays Harbor in Washington State to predict emissions for firing biodiesel bottoms. If firing the thermal fluid heaters on biodiesel bottoms is considered feasible, an application for modification may be submitted after issuance of the initial covered source permit, but prior to initial plant start-up. As such, high-ash compatible burners have been purchased. Plans show that a baghouse may be necessary for complying with the federal particulate and opacity standards that apply to the thermal fluid heaters. Pursuant to 40 CFR, Subpart Dc, §60.47.c(a), a continuous opacity monitoring system (COMS) is required for the higher sulfur content fuels.

1.4 Imperium Renewables, LLC will select one of the combustion units listed below as a secondary control device for reducing VOCs from process/tank vent stream gas. A 2,000 hour per year operating limit is proposed for the combustion/control unit selected. As per information from manufacturing representatives, the maximum heat rate input capacities of

the thermal oxidizer and incineration system are 12 MMBtu/hr and 4 MMBtu/hr, respectively.

| SECONDARY CONTROL DEVICE | | | |
|---|---|---|---|
| Unit | Manufacturer and Description | Model No. | Heat Input Capacity |
| 1 | John Zink thermal oxidizer | ZCT-2-8-35-2/8-X-X-W/6 | 12 MMBtu/hr |
| 2 | A.H. Lundberg Associates, Inc. incineration system | ---------- | 4.0 MMBtu/hr |

1.5 Fixed roof tanks for the permit are listed below. Tanks will be equipped with closed vent systems to receive vapors. Collected vapors will be vented to combustion/control equipment for VOC reduction.

| STORAGE TANKS | | | |
|---|---|---|---|
| Tank No. | Volume (gallons) | Product | Tank Description |
| T-2100 | 100,000 | sodium methylate (catalyst) | vertical fixed cone roof |
| T-2200 | 1,000,000 | methanol | vertical fixed cone roof |
| T-2300 | 1,000,000 | methanol | vertical fixed cone roof |
| T-2400 | 1,000,000 | methanol | vertical fixed cone roof |

1.6 Methanol gas from process equipment will be routed to a vapor recovery system to control VOCs. Further control of non-condensable vapors passing through the vapor recovery system will be provided by combustion equipment. Processing units are listed below.

a. Reactor equipment includes:

| REACTOR EQUIPMENT | | | |
|---|---|---|---|
| Equipment No. | Capacity (gallons) | Service | Description |
| 220-R-1000 | 16,000 | transesterification reaction | first stage reactor |
| 220-D-1100 | 8,000 | glycerin recovery | first stage decanter |
| 220-R-2000 | 16,000 | transesterification reaction | second stage reactor |
| 220-D-3000 | 215,000 | glycerin recovery | second stage decanter |
| ---------- | ---------- | upstream of biodiesel flash tanks | reactor and recovery system heat exchangers |
| ---------- | ---------- | material flow - heavy liquid, light liquid, and gas service | reactor and recovery system miscellaneous pumps, pipes, valves, connectors, etc. |
| 220-T-3200 | 470 | surge storage to feed glycerin to methanol recovery flash tank #1 | crude glycerin surge standpipe |
| 310-T-1100 | 800 | methanol | glycerin stream methanol recovery flash tanks |
| 310-T-1300 | 800 | | |
| T-1100 | 300,000 | storage – heavy liquid service | glycerin storage tank |
| ---------- | ---------- | material flow – heavy liquid and light liquid service | glycerin delivery system miscellaneous pumps, pipes, valves, connectors, etc. |
| T-2000 | 3,000 | store recovered methanol and feed first stage reactor | methanol recovery tank |
| ---------- | ---------- | methanol vapor from condenser to NCG cooler | methanol vapor blower |

| | | | |
|---|---|---|---|
| 310-CD-3200 | ---------- | second methanol recovery equipment and pump to methanol recovery tank | NCG cooler |

b. Distillation equipment includes:

| DISTILLATION EQUIPMENT | | | |
|---|---|---|---|
| Equipment No. | Capacity (gallons) | Service | Description |
| 320-C-2000 | 32,000 -39,000 | final glycerin separation step and biodiesel fractionation | biodiesel distillation column |
| 320-T-2600 | 1,700 | phase separation - glycerin to storage - biodiesel reintroduced to distillation column | distillation column reflux tank |
| ---------- | ---------- | throughout process (biodiesel flash tanks for distillation) | distillation and recovery system heat exchangers |
| ---------- | ---------- | material flow - heavy liquid, light liquid, and gas service | distillation and recovery system miscellaneous pumps, pipes, valves, connectors, etc. |
| 220-T-3200 | 470 | surge storage to feed glycerin | crude glycerin surge standpipe |
| T-1100 | 300,000 | storage – heavy liquid service | glycerin storage tank |
| ---------- | ---------- | material flow – heavy liquid and light liquid service | glycerin delivery system miscellaneous pumps, pipes, valves, connectors, etc. |
| T-2000 | Approx. 3,000 | store recovered methanol and feed first stage reactor | methanol recovery tank |
| ---------- | ---------- | methanol vapor from condenser to NCG cooler | methanol vapor blower |
| ---------- | ---------- | material flow – light liquid and gas service | recovery system miscellaneous pumps, pipes, valves, connectors, etc. |
| ---------- | ---------- | vacuum for distillation column | methanol ejector vacuum system |
| ---------- | ---------- | velocity accelerators to create vacuum | methanol jet ejectors |
| 320-CD-4200 | 60 | liquid to receiver tank | knockout pot |
| 320-V-4430 | ---------- | provide vacuum to knockout pot and condensers | vacuum pump seal oil separator |
| 320-VP-4450 | ---------- | provide vacuum to knockout pot and condensers | liquid ring vacuum pump |
| 320-V-4250 | 350 | methanol storage to feed reboiler | receiver tank |
| 310-CD-3200 | ---------- | second methanol condensing attempt and pump to methanol recovery tank | NCG cooler |

1.7 Imperium Renewables, LLC and Parametrix personnel disclosed the following information:

a. Methanol will be supplied to the facility at marine distribution terminal and piped into

the three 1,000,000 gallon methanol storage tanks. Several methanol shipments per year are anticipated for the plant.

b. Sodium methylate (70% methanol and 30% sodium methanolate) will be transported inside portable tanks by ship and delivered to the facility by tank truck. The sodium methylate will be pumped into the 100,000 gallon catalyst tank through a tank truck load rack.

c. Biodiesel will be supplied to customers through a tank truck loading rack, by marine distribution terminal, and through pipelines. Negotiations are being made with Hawaiian Electric Company, Inc. (HECO) for supplying biodiesel via pipeline to HECO's 270 MW plant in Campbell Industrial Park that is planned to be constructed by 2009.

d. The glycerol by-product from converting feedstock into biodiesel has uses such as for fuel and for making soap. It was indicated that the ratio of glycerol to biodiesel produced is generally around 10%. Therefore, the potential glycerol capacity in TPY for a 100,000,000 gallon per year capacity biodiesel plant is as follows:

(100,000,000 gal biodiesel/yr)(7.3 lb biodiesel/gal)(10 lb glycerol /100 lb biodiesel) = 73,000,000 lb/yr glycerol

(73,000,000 lb glycerin/yr)(ton/2,000 lb) = <u>36,500 TPY glycerol capacity</u>

e. It was indicated that 21.9 gpm methanol is used to produce 198 gpm biodiesel. This is a ratio of methanol to biodiesel of 11.06%. As such, the amount of methanol used for a 100,000,000 gallon per year capacity biodiesel plant is as follows:

(100,000,000 gallon biodiesel)(0.1106 gallon methanol/gallon biodiesel) = 11,060,606 gallons methanol

f. Anti-oxidant is a biodiesel additive.

g. For the requirements of 40 Code of Federal Regulations (CFR), Part 60, New Source Performance Standards (NSPS), Subparts Kb, NNN, and RRR, the applicant has elected to comply with the provision requiring a total organic compound (TOC) emission rate (less methane and ethane) reduction of at least 98 weight percent, or reduction in TOC to a concentration not to exceed 20 ppmv on a dry basis corrected to 3 percent oxygen.

h. Closed vent systems for receiving process vent stream gas is constructed from hard-piping and is not constructed of ductwork.

i. Equipment leak emissions will be controlled with leak detection and repair requirements rather than a control/combustion unit.

1.8 As indicated in the permit application, biodiesel feed stock typically consists of triglycerides which are esters of free fatty acids with trihydric alcohol (glycerol). Also, biodiesel is produced by replacing glycerol with a short chain alcohol, such as methanol, in a step known as transesterification. To increase the reaction rate, a sodium methylate catalyst will be used. After the reaction, glycerol is produced as a by-product. Available literature (Air Quality and Biodiesel Production, Nebraska Department of Environmental Quality, March 2007), shows the transesterification reaction to be as follows:

$$\text{triglyceride + alcohol} \xrightarrow{\text{catalyst}} \text{methyl esters + glycerol + excess alcohol}$$

1.9 Methanol and catalyst storage tank emissions will not be vented to the atmosphere without control during two week facility shutdowns. Pursuant to NSPS, Subpart Kb, all VOC vapors and gases discharged from storage tanks are to be collected by the associated closed vent system.

1.10 Mr. Bill Cooper from the Department of Health had an opportunity to tour the Imperium Renewables Grays Harbor facility during his vacation in Seattle, Washington. Pictures from the July 7, 2007 site visit are shown in Enclosure (1).

## 2. Applicable Requirements

2.1 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 Prohibitions
  - 11-60.1.31 Applicability
  - 11-60.1-32 Visible Emissions
  - 11-60.1-38 Sulfur Oxides from Fuel Combustion
  - 11-60.1-39 Storage of Volatile Organic Compounds
- Subchapter 5 - Covered Sources
- Subchapter 6 - Fees for Covered Sources, Noncovered Sources, and Agricultural Burning
  - 11-60.1-111 Definitions
  - 11-60.1-112 General Fee Provisions for Covered Sources
  - 11-60.1-113 Application Fees for Covered Sources
  - 11-60.1-114 Annual Fees for Covered Sources
- Subchapter 8 - Standards of Performance for Stationary Sources
  - 11-60.1-161 New Source Performance Standards

2.2 40 CFR, Part 60 – NSPS, Subpart Dc, Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units is applicable to the thermal fluid heaters because each unit has a maximum design heat rate input that is greater than 10 MMBtu/hr. The two 38 MMBtu/hr thermal fluid heaters meet the definition of a steam generating unit because the thermal fluid heaters will supply heat to the heat transfer fluid that is pumped to various plant operations for processing biodiesel. The following also apply:

a. The maximum 0.05% by weight sulfur content specified for fuel oil No. 2 and biodiesel is in compliance with the 0.5% by weight sulfur limit specified for oil pursuant to 40 CFR, §60.42c(d) and the sulfur limit specified in 40 CFR, §60.42c(e)(2).

b. The thermal fluid heaters are subject to a 0.03 lb/MMBTU particulate matter emissions limit in accordance with 40 CFR, 60.43c(e).

c. Pursuant to 40 CFR, §60.45c(c) and based on the low sulfur content of the fuels fired by the thermal fluid heaters, performance tests for particulate matter and opacity are not required if supplier certifications of the sulfur content of the fuels burned are maintained.

d. Pursuant to 40 CFR, §60.47c(b), installation of a continuous opacity monitor (COMS) is not required for the thermal fluid heaters based on the low sulfur content of the fuels fired.

2.3 40 CFR, Part 60 – NSPS, Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines is applicable to the emergency and firewater pump engines. These engines will be included in the insignificant activity section of the permit (see Paragraphs 3.1.a and 3.1.b).

2.4 40 CFR, Part 60, NSPS, Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984 is applicable to the three 1,000,000 gallon methanol storage tanks and the one 100,000 gallon sodium methylate catalyst tank. Subpart Kb is applicable to these tanks because the tank capacities are greater than 151 $m^3$ (greater than 40,000 gallons) and the true vapor pressures of methanol and sodium methylate (assumed to be all methanol as worst-case) are above 0.507 psi. Tank 4.09d printouts indicate that the vapor pressure of methanol at the daily average tank surface temperature is 3.1948 psia. The following also apply:

a. Based on the manufacturer's guarantee, the combustion/control equipment will comply with 40 CFR, §60.112b(3)(ii) that specifies a 95% VOC reduction or greater for control equipment.

b. Closed vent systems for the tanks are inspected in accordance with NSPS, Subpart VV.

2.5 40 CFR, Part 60, NSPS, Subpart VVa – Standards of Performance for Equipment Leaks of VOC Emissions in the Synthetic Organic Chemical Manufacturing Industry (SOCMI) is applicable to this facility because the glycerol by-product from the biodiesel process is a chemical listed in 40 CFR, §60.489. Also, the potential glycerol by-product capacity for the plant is greater than 1,102 tons per year (see Paragraph 1.6.d). Subpart VV applies to each pump, compressor, pressure relief device, sampling connection system, open ended valve or line, valve, and flange or other connector in VOC service (piece of equipment that contains or contacts a process fluid that is at least 10% VOC by weight) and any devices or systems required by Subpart VV. As indicated by the applicant's consultant, closed vent systems and control devices are not used to comply with Subpart VV. It was indicated that compliance with Subpart VV will be accomplished through the applicable equipment leak inspection and repair requirements. Also, the closed vent systems for the facility will be constructed with hard piping rather than ductwork.

2.6 40 CFR, Part 60, NSPS, Subpart NNN – Standards of Performance for VOC Emissions from SOCMI Distillation Operations is applicable because the glycerol by-product from the biodiesel process is one of the chemicals listed in 40 CFR §60.667. Also, the potential glycerol by-product capacity for the plant is greater than 1,100 tons per year (see Paragraph 1.7.d). Additionally, the plant is not designed to perform batch operations. The affected facility is the distillation unit and vapor recovery system into which its vent stream is discharged. Based on the manufacturer's guarantee, combustion/control equipment will comply with 40 CFR §60.662(a) that specifies a 98% total organic compound (TOC) reduction efficiency from control equipment.

2.7 40 CFR, Part 60, NSPS, Subpart RRR – Standards of Performance for VOC Emissions from SOCIM Reactor Processes is applicable because the glycerol by-product is one of the chemicals listed in 40 CFR §60.707. Also, the potential glycerol by-product capacity for the plant is greater than 1,100 tons per year (see Paragraph 1.7.d). The affected facility is each combination of a reactor process and the common recovery system into which their vent streams are discharged. Based on the manufacturer's guarantee, combustion/control will comply with 40 CFR §60.702(a) that specifies a 98% TOC reduction efficiency for control equipment.

2.8 The facility is not a major source for hazardous air pollutants (HAPs) and is not subject to National Emissions Standards for Hazardous Air Pollutants (NESHAPS) or Maximum Achievable Control Technology (MACT) requirements under 40 CFR, Parts 61 and 63. Facility-wide HAP emissions are less than 10 TPY single HAP and 25 TPY combined HAP. The firing of the combustion/control equipment on methanol gas is limited to prevent an exceedance of the major source threshold of 10 TPY for any single HAP. The following NESHAPs would apply if HAP emissions were above major source thresholds:

a. 40 CFR, Part 63, Subpart A – General Provisions;

b. 40 CFR, Part 63, Subpart UU – National Emission Standards for Hazardous Air Pollutants for Equipment Leaks, Level 2;

c. 40 CFR, Part 63, Subpart FFFF – National Emission Standards for Hazardous Air Pollutants: Miscellaneous Organic Chemical Manufacturing; and

2.9 The purpose of Compliance Assurance Monitoring (CAM) is to provide reasonable assurance that compliance is being achieved with large emission units that rely on air pollution control device equipment to meet an emissions limit or standard. Pursuant to 40 CFR, Part 64, for CAM to be applicable, the emissions unit must: (1) be located at a major source; (2) be subject to an emissions limit or standard; (3) use a control device to achieve compliance; (4) have potential pre-control emissions that are greater than the major source level; and (5) not otherwise be exempt from CAM. Although the thermal fluid heaters and secondary control device will be used to comply with federal VOC emission limits (VOC emission limits are specified in Subpart Kb, Subpart NNN, and Subpart RRR), CAM is not applicable because operational limits will be imposed to restrict this facility from exceeding the major source threshold for methanol worst-case.

2.10 Prevention of Significant Deterioration (PSD) review applies to new major stationary sources and major modifications to these types of sources. The facility is not a major source for any single air pollutant. As such, PSD review is not required.

2.11 Annual emissions reporting will be required because this facility is a covered source.

2.12 The consolidate emissions reporting rule (CERR) is not applicable because emissions from the facility do not exceed reporting levels pursuant to 40 CFR 51, Subpart A (see table below).

| CERR APPLICABILITY | | | |
|---|---|---|---|
| Pollutant | Facility Emissions | CERR Triggering Levels (TPY) | |
| | | 1 year cycle (type A sources) | 3 year cycle (type B sources) |
| $PM_{10}$ | 6.3 | ≥ 250 | ≥ 100 |
| $SO_2$ | 16.1 | ≥ 2,500 | ≥ 100 |
| $NO_X$ | 43.1 | ≥ 2,500 | ≥ 100 |
| VOC | 14.0 | ≥ 250 | ≥ 100 |
| CO | 20.9 | ≥ 2,500 | ≥ 1,000 |

2.13 A best available control technology (BACT) analysis is required for new sources or modifications to existing sources that would result in a net emission increase above significant levels as defined in HAR, §11-60.1-1. Although $NO_X$ emissions from the facility are above the significant level, a BACT analysis is not considered feasible because the total combined $NO_X$ emission from the thermal fluid heaters and total $NO_X$ emission from the secondary control device is below 40 TPY. The table below shows facility emissions in comparison to the significant emission levels.

| BACT APPLICABILITY | | |
|---|---|---|
| Pollutant | Emissions (TPY) | Significant Level (TPY) |
| $SO_2$ | 16.1 | 40 |
| $NO_X$ | 43.1 | 40 |
| CO | 20.9 | 100 |
| VOC | 14.0 | 40 |
| PM | 7.9 | 25 |
| $PM_{10}$ | 6.3 | 15 |

2.14 The facility is a synthetic minor source because operational limits restrict methanol emissions to prevent the facility from exceeding the major source threshold for any single HAP of 10 tons per year.

## 3. Insignificant Activities

3.1 Insignificant activities identified by the applicant are as follows:

a. A 250 kW emergency engine generator fired on fuel oil No. 2 or biodiesel is an insignificant activity in accordance with HAR §11-60.1-82(f)(5).

b. A 250 hp firewater pump engine fired on fuel oil No. 2 or biodiesel is an insignificant activity in accordance with HAR §11-60.1-82(g)(6).

c. The 2,000,000 gallon oil feedstock/biodiesel/fuel oil No. 2 storage tank Nos. T-0100, T-0200, T-0300, T-0400, T-0500, T-0600, T-0700, and T-0800 are considered insignificant activities pursuant to HAR §11-60.1-82(f)(7). Tank 4.0.9d printouts indicate each tank to emit 796 pounds per year (0.4 TPY) of VOC.

d. A 300,000 gallon glycerol storage tank, 100,000 gallon biodiesel bottoms tank (T-

1200), and a 150,000 gallon fuel oil No. 2 tank (T-1300) are considered insignificant activities pursuant to HAR §11-60.1-82(f)(7) due to the low vapor pressure of the products stored. For information, the material safety data sheet (MSDS) indicates a true vapor pressure for glycerol of $4.834 \times 10^{-5}$ psi at 122 $^{O}$F. As per information from AP-42, The true vapor pressure of fuel oil No. 2 is 0.016 psi at 90 $^{O}$F.

e. A 2-cell induced draft counter-flow cooling tower is considered an insignificant activity pursuant to HAR §11-60.1-82(f)(7). Maximum $PM_{10}$ emissions from the cooling tower were estimated in the application to be 0.374 TPY.

f. A tank truck load rack for fuel oil No. 2 and/or biodiesel are considered an insignificant activity pursuant to HAR §11-60.1-82(f)(7). Maximum potential VOC emissions from these operations were estimated for the application to be 1.1 TPY.

g. Marine vessel loading of biodiesel and/or fuel oil No. 2 is considered and insignificant activity pursuant to HAR §11-60.1-82(f)(7). Maximum potential VOC emissions from these operations were estimated for the application to be 1.1 TPY.

h. The propane and/or synthetic natural gas pilot lights for the combustion/control equipment are considered an insignificant activity pursuant to HAR §11-60.1-82(f)(7). As indicated by the thermal fluid heater manufacturer, the pilot lights for the thermal fluid heaters activate for 10 seconds when starting the equipment and emissions are negligible.

## 4. Alternate Operating Scenarios

4.1 The following alternate operating scenarios are allowed pursuant to 40 CFR, Part 60, NSPS, Subpart VVa:

a. The applicant may elect to comply with the allowable percentage of valves leaking of equal to or less than 2.0% in accordance with 40 CFR §60.483-1.

b. The applicant may elect to comply with one of the alternative work practices pursuant to 40 CFR, §60.483-2 for skip period leak detection and repair of valves.

c. The applicant may request a determination of equivalence of means of emission limitation as provided by 40 CFR §60.484.

4.2 The applicant may elect at a later date to use an alternative provision of 40 CFR §60.662 within which to comply with 40 CFR, Part 60, NSPS, Subpart NNN.

4.3 The applicant may elect at a later date to use an alternative provision of 40 CFR §60.702 within which to comply with 40 CFR, Part 60, NSPS, Subpart RRR.

## 5. Air Pollution Controls

5.1 A vapor recovery system consisting of two (in series) water cooled condensers will be use to control methanol vapors from process equipment and storage tanks.

5.2 The two 38 MMBtu/hr American Heating Company, Inc. thermal fluid heaters and secondary control device will be used to control methanol vapors discharged from storage tanks and process equipment. The manufacturer guarantees a 99.9% methanol reduction efficiency at above 30-40% of the burner firing rate for the thermal fluid heaters. Manufacturers of the secondary control devices being considered for the project guarantee 98% control efficiency. Emission calculations were based on a 99.5% reduction efficiency.

5.3 Each thermal fluid heater will be equipped with a low-$NO_X$ burner to control $NO_X$ emissions. The burner consists of two separate air zones providing stability throughout the burner firing range. As indicated from available literature, low-$NO_X$ burners are configured to adjust how the fuel and air are mixed in order to minimize $NO_X$ production.

5.4 Closed vent systems will be used to receive vapors discharged from tanks and process equipment.

## 6. Project Emissions

6.1 Thermal fluid heater stack emissions of $NO_X$, CO, VOC, PM, $PM_{10}$, $PM_{2.5}$, $SO_2$, $H_2SO_4$, and HAPs were evaluated. The $NO_X$, CO, and VOC emissions were based on data from manufacturer's specifications for firing biodiesel or fuel oil No. 2 with or without methanol gas. HAP emissions were estimated with emission factors from AP-42, Section 1.3 (9/98), Fuel Oil Combustion. A mass balance calculation was used to determine $SO_2$ and $H_2SO_4$ emissions. The $SO_2$ emissions were based on the maximum allowable fuel sulfur content of 0.05% by weight and a high heating value (HHV) of 17,094 Btu/lb from manufacturer's data for biodiesel as worst-case scenario. The $H_2SO_4$ emissions rate was based on the $SO_3$ emission factor from AP-42, Section 1.3, Table 1.3-1 and information from AP-42, Paragraph 1.3.3.2 that $SO_3$ readily reacts with water vapor to form sulfuric acid mist. As such, it was assumed that all $SO_3$ is converted to $H_2SO_4$. Particulate emissions were based on the particulate emission limit that is not to exceed 0.03 lb/MMBtu pursuant to 40 CFR §60.43c(e). It was assumed that 45% of the total particulate was $PM_{2.5}$ and 79% of the total particulate was $PM_{10}$ based on AP-42, Appendix B.2, Table B.2-2 (Page B.2-12) for boilers firing a mixture of fuel including petroleum. Maximum lb/hr and g/s emissions were based on simultaneous operation of two heaters at each unit's maximum capacity of 38 MMBtu/hr. A total combined heat rate input of 525,600 MMBtu/yr was applied to determine potential TPY emissions. Emissions are estimated in Enclosure (2) and summarized below.

| THERMAL FLUID HEATER FUEL OIL NO. 2 OR BIODIESEL COMBUSTION | | | | |
|---|---|---|---|---|
| Pollutant | Heater Emission Rate (two heaters) | | Heater Emissions (TPY) (two heaters) | |
| | lb/hr | g/s | limited 525,600 MMBtu/yr | no fuel limit 8,760 hr/yr operation |
| $SO_2$ | 4.441 | 0.561 | 15.4 | 19.5 |
| $H_2SO_4$ | 0.066 | 0.008 | 0.2 | 0.3 |
| $NO_X$ | 10.640 | 1.343 | 36.8 | 46.6 |
| CO | 5.320 | 0.672 | 18.4 | 23.3 |
| VOC (see note a) | ------- | -------- | 2.1 | 2.7 |
| PM | ------- | ------- | 7.9 | 10.0 |
| $PM_{10}$ | 1.824 | 0.230 | 6.3 | 8.0 |
| $PM_{2.5}$ | ------- | ------- | 3.7 | 4.7 |
| HAPs (see note a) | ------- | ------- | 0.080 | 0.118 |

a: Emissions are HAPs from fuel oil No. 2/biodiesel combustion and do not include methanol from vent stream gas combustion. Thermal fluid heater VOC/HAP emissions as methanol are predicted in Paragraphs 6.3 and 6.4.

6.2 Secondary control device emissions of $NO_X$, CO, VOC, PM, $PM_{10}$, $PM_{2.5}$, $SO_2$, $H_2SO_4$, and HAPs were evaluated. Emissions were based on worst case emissions data supplied by A.H. Lundberg Associates, Inc for firing either fuel oil No. 2 or biodiesel and vent stream gas. Either a John Zink thermal oxidizer or A.H. Lundberg Associates, Inc. incineration system will be selected by the applicant to control VOCs from process equipment and storage tanks after the permit is issued. The $SO_2$ emissions were based on the maximum allowable fuel sulfur content of 0.05% by weight and a high heating value (HHV) of 17,094 Btu/lb from manufacturer's data for biodiesel as worst-case scenario. A heat rate input capacity of 12 MMBtu/hr for the John Zink thermal oxidizer was assumed as worst-case. The $H_2SO_4$ emissions rate was based on the $SO_3$ emission factor from AP-42, Section 1.3, Table 1.3-1 and information from AP-42, Paragraph 1.3.3.2 that $SO_3$ readily reacts with water vapor to form sulfuric acid mist. As such, it was assumed that all $SO_3$ is converted to $H_2SO_4$. It was assumed that 45% of the total particulate was $PM_{2.5}$ and 79% of the total particulate was $PM_{10}$ based on AP-42, Appendix B.2, Table B.2-2 (Page B.2-12) for boilers firing a mixture of fuel including petroleum. The applicant's consultant increased the lb/hr manufacturer supplied emission factors by a factor of 1.25. Emissions were also based on 2,000 hours per year operation. Worst-case secondary control device emissions are listed in the table below.

| SECONDARY CONTROL DEVICE FUEL OIL NO. 2 OR BIODIESEL COMBUSTION | | | | |
|---|---|---|---|---|
| Pollutant | Control Device Emission Rate | | Control Device Emissions (TPY) | |
| | lb/hr | g/s | limited 2,000 hr/yr | no fuel limit 8,760 hr/yr operation |
| $SO_2$ (see note a) | 0.701 | 0.089 | 0.701 | 3.1 |
| $H_2SO_4$ (see note b) | 0.001 | 0.0001 | 0.001 | 0.004 |
| $NO_X$ | 6.3 | 0.795 | 6.3 | 27.6 |
| CO | 2.5 | 0.316 | 2.5 | 11.0 |
| VOC (see note c) | 0.048 | -------- | 0.048 | 0.210 |
| PM | ------- | ------- | 0.037 | 0.162 |
| $PM_{10}$ | 0.029 | 0.230 | 0.029 | 0.127 |
| $PM_{2.5}$ | ------- | ------- | 0.017 | 0.074 |
| HAPs (see note d & e) | ------- | ------- | 0.004 | 0.017 |

a: (lb/17,094 Btu)(12 x $10^6$ Btu/hr)(0.005)(64.06 $SO_2$/32.06 S) = 0.701 lb/hr

b: Based on emission factor for $SO_3$ from AP-42, Section 1.3 (9/98), Table 1.3-1, information from Paragraph 13.2.2 that $SO_3$ readily reacts with water to form sulfuric acid mist, and mass balance calculation as follows:

(0.1 lb $SO_3$/1,000 gal)(gal/140,000 Btu)(98.07 $H_2SO_4$/80.06 $SO_3$)(12 x $10^6$ Btu/hr) = 0.001 lb/hr

c: Emissions are attributed to fuel oil No. 2 and biodiesel combustion and does not include methanol gas combustion based on AP-42, Section 1.3 (9/98), Table 1.3-1 emission factor. Secondary control device VOC/HAP emissions as methanol are predicted in Paragraphs 6.1 and 6.2. Emission is as follows:

(0.556 lb TOC/1,000 gal)(gal/140,000 Btu)(12 x $10^6$ Btu/hr) = 0.048 lb/hr

d: Based on a proportion of HAPs determined to be emitted by the thermal fluid heaters as follows:

HAPs = 0.080 TPY (24,000 MMBtu/525,600 MMBtu) = 0.004 TPY

e: Emissions are HAPs from fuel oil No. 2/biodiesel combustion and do not include methanol from vent stream gas combustion. Secondary control device VOC/HAP emissions as methanol are predicted in Paragraphs 6.3 and 6.4.

6.3 The combustion/control equipment emissions of VOCs/methanol were estimated for burning non-condensable vapors discharged from processing equipment. Emission estimates were based on a 99.5% methanol destruction efficiency. The manufacturer of the thermal fluid heaters guarantees a 99.9% VOC reduction as the primary control device. The secondary control device manufacturers guarantee a 98% VOC control efficiency. It was indicated by the applicant that methanol loading to the heaters under normal conditions could be up to 3.5 lb/min and as high as 12.6 lb/min when filling the methanol tanks. As stated by the applicant, the overall long-tem average loading of methanol gas to the combustion/control equipment is estimated, based on a wide variety engineering factors, to be 3.3 lb/min (about 200 lb/hr or 876 TPY of methanol). Also, the 3.3 lb/min methanol loading of the combustion/control devices is the average of the total methanol flow to the equipment. Estimated methanol/VOC emissions from the combustion/control equipment for firing non-condensable vapors are as follows:

| PROCESS VAPOR COMBUSTION | |
|---|---|
| noncondensable VOC as methanol prior to control | 876 TPY |
| control equipment destruction efficiency | 99.5% |
| methanol destroyed by thermal fluid heaters | 871.6 TPY |
| VOC as methanol through stack | 4.380 TPY |

6.4 Combustion/control equipment emissions of VOCs/methanol were estimated for burning vapors discharged from the methanol and catalyst storage tanks. Emission estimates were based on a 99.5% methanol destruction efficiency. The manufacturer of the thermal fluid heaters guarantees a 99.9% VOC reduction as the primary control device. The secondary control device manufacturers guarantee a 98% VOC control efficiency. Emissions were estimated using EPA's TANKS 4.0.9d program. Potential emissions from the methanol storage tanks were based on a total combined net throughput among the three tanks of 11,130,000 gallons per year which is above the maximum anticipated methanol throughput determined in Paragraph 1.7.e. Potential emissions from the sodium methylate (catalyst) tank were based on a net throughput of 2,450,000 gallons per year. Although catalyst consists of 70% methanol and 30% sodium methanolate, it was assumed that the catalyst tank stores 100% methanol as worst-case scenario because sodium methylate is not in the TANKS program. A true vapor pressure for methanol of 3.1948 was entered into the program. Estimated methanol/VOC emissions from the thermal fluid heaters for firing vapors discharged from storage tanks are as follows:

| TANK VAPOR COMBUSTION | |
|---|---|
| catalyst tank emissions (one 1000,000 gallon tank) | 3.8 TPY |
| methanol tank emissions (three 1,000,000 gallon tanks) | 33.7 TPY |
| total tank emissions | 37.5 TPY |
| heater destruction efficiency | 99.5% |
| Methanol destroyed by combustion/control unit | 35.6 TPY |
| VOC as methanol through stack | 0.188 TPY |

6.5 Fugitive VOC/methanol emissions were estimated using the EPA document Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017, November 1995, Tables 2.5 and 2-9). Leak sources included components for sodium methylate systems, methanol and sodium methylate unloading, methanol and sodium methylate storage tanks, methanol recovery tank, piping to reactors, piping to methanol surge tanks, marine unloading system, and tank truck load rack. It was indicated that no emissions will be from sample ports because ports will be capped. Also, no leaks will be from vacuum service because source emissions will be vented to an air pollution control device. Screening values of less than 500 ppm and 10,000 ppm were used to determine the applicable emission factor. The number of leak sources are based on the estimated number increased by 20%. Emissions were also based on 8,760 operating hours per year. Fugitive VOC/methanol emissions are summarized in the table below.

| FUGITIVE EQUIPMENT LEAK EMISSIONS | | | | | | |
|---|---|---|---|---|---|---|
| Leak Source | Service | | Source Number | Weight % Methanol | Factor (kg/hr-source) | TPY Emission VOC/Methanol[a] |
| transfer valves | light liquid | pressure | 157 | 100 | 0.000165 | 0.250 |
| transfer connectors | light liquid | pressure | 17 | 100 | 0.000081 | 0.013 |
| transfer relief valves | light liquid | pressure | 2 | 100 | 0.003182 | 0.061 |
| transfer pumps | light liquid | pressure | 6 | 100 | 0.001870 | 0.108 |
| transfer valves | vapor | ambient | 5 | 24 | 0.000131 | 0.001 |
| transfer connectors | vapor | ambient | 52 | 24 | 0.000081 | 0.010 |
| transfer relief valves | vapor | ambient | 13 | 24 | 0.000425 | 0.053 |
| reactor agitator shafts | heavy liquid | pressure | 2 | 15 | 0.002100 | 0.006 |
| reactor valves | heavy liquid | pressure | 90 | 15 | 0.000230 | 0.030 |
| reactor connectors | heavy liquid | pressure | 84 | 15 | 0.000081 | 0.010 |
| reactor relief valves | heavy liquid | pressure | 4 | 15 | 0.003182 | 0.018 |
| reactor pumps | heavy liquid | pressure | 1 | 15 | 0.002100 | 0.0003 |
| reactor valves | vapor | pressure | 6 | 5 | 0.000131 | 0.0003 |
| reactor connectors | vapor | pressure | 18 | 5 | 0.000081 | 0.0007 |
| reactor relief valves | vapor | pressure | 5 | 5 | 0.044700 | 0.108 |
| recovery valves | heavy liquid | pressure | 205 | 24 | 0.000230 | 0.109 |
| recovery connectors | vapor | pressure | 100 | 24 | 0.000081 | 0.019 |
| recovery system pumps | heavy liquid | pressure | 7 | 24 | 0.002100 | 0.034 |
| methanol reboiler valves | heavy liquid | pressure | 35 | 100 | 0.000230 | 0.078 |
| methanol reboiler connectors | heavy liquid | pressure | 16 | 100 | 0.000081 | 0.012 |
| methanol reboiler pumps | heavy liquid | pressure | 2 | 100 | 0.002100 | 0.040 |
| methanol reboiler valves | vapor | pressure | 14 | 100 | 0.000131 | 0.018 |
| methanol reboiler connectors | vapor | pressure | 32 | 100 | 0.000081 | 0.025 |
| methanol reboiler relief valves | vapor | pressure | 2 | 100 | 0.044700 | 0.861 |
| methanol reboiler pumps | vapor | pressure | 4 | 100 | 0.001870 | 0.072 |
| antioxidant transfer system valves | light liquid | pressure | 10 | 30 | 0.000165 | 0.005 |
| antioxidant transfer system connectors | light liquid | pressure | 14 | 30 | 0.000081 | 0.003 |
| antioxidant transfer system relief valve | light liquid | pressure | 2 | 30 | 0.003182 | 0.018 |
| antioxidant transfer system pumps | light liquid | pressure | 2 | 30 | 0.001870 | 0.011 |
| antioxidant tank relief valve | vapor | ambient | 1 | 30 | 0.000425 | 0.001 |

| | |
|---|---|
| Total ---------- -> | 1.957 |

a: TPY emission = (#sources)(8,760 hr/yr)(%methanol)(factor in kg/hr-source)(2.2lb/kg)(ton/2000 lb).

6.6 Potential emissions from permitted equipment at the biodiesel facility are listed below as follows:

| TOTAL FACILITY EMISSIONS | | | | | |
|---|---|---|---|---|---|
| Pollutant | Potential Emissions (TPY) | | | | TPY Emissions (8,760 hr/yr with controls and without limits) |
| | Thermal Fluid Heaters | Secondary Control Device | Equipment Leaks | Entire Facility (with limits and controls) | |
| $SO_2$ | 15.4 | 0.7 | --------- | 16.1 | 19.5 |
| $H_2SO_4$ | 0.2 | 0.001 | --------- | 0.2 | 0.3 |
| $NO_X$ | 36.8 | 6.3 | --------- | 43.1 | 46.6 |
| CO | 18.4 | 2.5 | --------- | 20.9 | 23.3 |
| VOC | 2.1– biodiesel/F.O. #2 combustion<br>4.6 – vent stream methanol release | | 2.0 | 8.7/12.0 (see note a) | > 12 |
| PM | 7.9 | 0.037 | --------- | 7.9 | 10.0 |
| $PM_{10}$ | 6.3 | 0.029 | --------- | 6.3 | 9.0 |
| $PM_{2.5}$ | 3.7 | 0.017 | --------- | 3.7 | 4.7 |
| Methanol | 4.568 – vent stream methanol release | | 1.957 | 6.525/9.9 (see note a) | >10 |
| Total HAPs | 0.1– biodiesel/F.O. #2 combustion<br>4.6– vent stream methanol release | | 2.0 | 6.7/10.0 (see note a) | >10 |

a: The lower TPY emission rate was estimated based on anticipated operation of the plant. The higher emission rate is based on limit to prevent the facility from exceeding the major source threshold for any single hazardous air pollutant of 10 TPY.

## 7. Air Quality Assessment

7.1 An ambient air quality impact analysis (AAQIA) was performed. Sources evaluated include the thermal fluid heaters, secondary control device, emergency engine generator, firewater pump engine, cooling tower, and fugitive equipment leaks. For information, incorporating the emergency engine generator, firewater pump engine, and cooling tower into the AAQIA is conservative. An AAQIA is not typically performed for the aforementioned equipment because the units are insignificant activities. Fugitive leak emissions were evaluated to determine methanol impacts. Methanol impacts will be from both fugitive leaks and the combustion/control equipment. Fugitive emissions were represented as point sources with low exit velocities and lower than ambient temperatures. The Department re-ran the model for fugitive emissions represented as area sources. The EPA's AERMOD (Version 07026) was used for the analysis. Assumptions for the model are listed below.

a. Elevated terrain was used for the AERMOD model. A USGS digital elevation map (DEM) file from the Ewa topographic quadrangle was used for executing AERMAP in the model.
b. Rural dispersion parameters were used for the model.
c. Structures at the facility (e.g., tanks and buildings) were imported into the model. The EPA building profile input program prime (BPIPPRIME) was used to evaluate the effects of downwash from structures at the facility.
d. Receptors used by the applicant were imported into the model. A 9,500 meter x 9,500 meter coarse receptor grid with 250 meter grid spacing was used to determine impacts around the facility. A finer 2,300 meter x 2,300 meter receptor grid with 100 meter grid spacing was placed around the facility within the course receptor grid. Receptors of less

than 25 meter spacing were also used to determine impacts along the facility's fence-line that defines the property boundary.

e. Meteorological data was used for the AERMOD model to create the surface (*.SFC") and profile (*.PEL") files. The meteorological data included:

1) 1992/1993 AES meteorological tower data;
2) 1992/1993 Honolulu International Airport data;
3) 1992/1993 Lihue and Hilo upper air sounding data; and
4) Land Use/Land Cover data.

7.2 The following background concentrations were used for the AAQIA:

a. $PM_{10}$ – collected in 2006 from the West Beach air quality monitoring station (air monitoring station closest to Barbers Point with $PM_{10}$ data).

b. $NO_X$ - collected in 2006 from the West Beach air quality monitoring station (air monitoring station closest to Barbers Point with $NO_X$ data).

c. CO – collected in 2006 from the Kapolei air quality monitoring station (air monitoring station that is closest to Barbers Point with CO data).

d. $SO_2$ – collected in 2006 from the West Beach air quality monitoring station (air monitoring station that is closest to Barbers point with $SO_2$ data).

7.3 The table below lists the emission rates and stack parameters used in the AAQIA. The maximum gram per second emission rates for the thermal fluid heaters are shown in Enclosure (1). The maximum gram per second emission rates for the secondary control device are shown in Paragraph 6.2. The stack parameters for the secondary control device are worst case among those for either a thermal oxidizer or incinerator system. The maximum gram per second emission rates for the emergency engine generator, firewater pump engine, and cooling tower are shown in Enclosure (3).

| SOURCE | STACK | MAXIMUM EMISSION RATES (g/s) | | | | STACK PARAMETERS | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $NO_X$ | $SO_2$ | CO | $PM_{10}$ | Height (ft) | Temp. °K (°F) | Dia. (ft) | Flow Rate ($ft^3$/min) |
| thermal fluid heaters (units 1 & 2) | 1 | 1.343 | 0.561 | 0.672 | 0.230 | 50 | 578 (580) | 5.2 | 61,617 |
| secondary control device | 2 | 0.795 | 0.089 | 0.316 | 0.230 | 30 | 810 (1,000) | 5 | 13,800 |
| 250 kW emergency engine generator | 3 | 0.171 | 0.011 | 0.146 | 0.008 | 11.5 | 755(899) | 0.5 | 1,229 |
| 250 hp firewater pump engine | 4 | 0.581 | 0.014 | 0.181 | 0.031 | 12 | 722(840) | 0.5 | 1,356 |
| cooling tower | 5 | ------ | ------- | ------- | | 18 | ambient | 12.3 | 100,922 |
| equipment leaks (methanol catalyst storage area) | 6 | ------ | ------ | ------ | ------ | 26 | ambient | 1.0 | area source |
| equipment leaks (reactor area) | 7 | ------ | ------ | ------ | ------ | 25 | ambient | 1.0 | area source |

7.4 The table below lists the parameters to determine impacts from fugitive methanol emissions represented as area sources.

| SOURCE | MAXIMUM EMISSION RATE (g/s-$m^2$) | Release Height (ft) |
|---|---|---|
| | Methanol | |
| equipment leaks (methanol/catalyst storage area) | $5.5 \times 10^{-6}$ (see note a) | 26 |
| equipment leaks (reactor area) | $2.4 \times 10^{-5}$ (see note b) | 3.3 |

a: Based on information from application that there are 328 lb/3,288 lb of fugitive leaks from the methanol-catalyst storage (10% of the total fugitive leaks). Therefore, based on the fugitive emission calculations that were revised on July 30, 2007, the fugitive leak emissions from the area are:

(0.1)(1.957 ton/yr) = 0.1957 ton/yr methanol

(0.1957 ton/yr)(yr/8,760 hr)(hr/3,600 s)(2,000 lb/ton)(kg/2.2 lb)(1,000 g/kg) = $5.6 \times 10^{-3}$ g/s methanol

The methanol tank storage area is 62.8 meters long x 16.1 meters wide = 1,011 $m^2$

The emission rate = ($5.6 \times 10^{-3}$ g/s)(1/1,011 $m^2$) = $5.5 \times 10^{-6}$ g/s-$m^2$

b: Based on information from application that there are 2,960 lb/3,288 lb of fugitive leaks from the reactor area (90% of the total fugitive leaks). Therefore, based on the fugitive emission calculations that were revised on July 30, 2007, the fugitive leak emissions from the area are:

(0.9)(1.957 ton/yr) = 1.7613 ton/yr methanol

(1.7613 ton/yr)(yr/8,760 hr)(hr/3,600 s)(2,000 lb/ton)(kg/2.2 lb)(1,000 g/kg) = $5.1 \times 10^{-2}$ g/s methanol

The methanol tank storage area is 76.5 meters long x 28.1 meters wide = 2,150 $m^2$

The emission rate = (5.1 x $10^{-2}$ g/s)(1/1,011 $m^2$) = 2.4 x $10^{-5}$ g/s-$m^2$

7.5 The gram per second emission rates for various averaging times and pollutants are listed in below for the thermal fluid heaters, secondary control device, 250 kW emergency engine generator, 250 hp firewater pump engine, and cooling tower. It was assumed that the firewater pump engine and emergency engine generator will only operate 2 hours during the 8 hour day shift. Therefore, the total day shift hours are 2,920 hours per year (8 hours/day x 365 hr/yr = 2,920 hr/yr). It was also assumed that the firewater pump engine and emergency engine generator will not run more than 150 hours per year. As such, the adjustment factors for emission rates for the 3-hour, 8-hour and 24-hour, and annual averaging times are 2/3, 2/8, and 150/2,920, respectively. For the 38 MMBtu/hr thermal fluid heater annual averaging periods, emission rates were reduced by 525,600/665,760 to account for a total combined 525,600 MMBtu/yr firing rate limit. For the secondary control device annual averaging periods, emission rates were reduced by 2,000/8,760 to account for an operation limit of 2,000 hours per year. Maximum emissions from the 75 gallon per minute two cell cooling tower were reduced by 60/75 to account for its annual average 60 gallon per minute capacity. Stack parameters are listed in Paragraph 7.3.

| **EMISSION RATES (g/s)** | | | | |
|---|---|---|---|---|
| Source | $NO_X$ | $SO_2$ | CO | $PM_{10}$ |
| 250 kW emergency engine generator | 8.8 x $10^{-3}$ (annual) | 7.3 x $10^{-3}$ (3-hour)<br>2.8 x $10^{-3}$ (24-hour)<br>5.7 x $10^{-4}$ (annual) | 0.0365 (8-hour) | 2.0 x $10^{-3}$ (24-hour)<br>4.1 x $10^{-4}$ (annual) |
| 250 hp firewater pump engine | 0.030 (annual) | 9.3 x $10^{-3}$ (3-hour)<br>3.5 x $10^{-3}$ (24-hour)<br>7.2 x $10^{-4}$ (annual) | 0.0451 (8-hour) | 7.8 x $10^{-3}$ (24-hour)<br>1.6 x $10^{-3}$ (annual) |
| thermal fluid heaters (units 1 & 2) | 1.060 (annual) | 0.443 (annual) | ---------- | 0.182 (annual) |
| secondary control device | 0.182 (annual) | 0.020 (annual) | ---------- | 0.053 (annual) |
| cooling tower | ---------- | ---------- | ---------- | 0.0055 (24-hour north cell)<br>0.0055 (24-hour south cell)<br>0.0044 (annual north cell)<br>0.0044 (annual south cell) |

7.6 The gram per second emission rates of additional pollutants evaluated are listed in the table below. Stack parameters are listed in Paragraph 7.3

| **EMISSION RATES (g/s)** | | |
|---|---|---|
| Source | Methanol | $H_2SO_4$ |
| process + tank vapor combustion | 1.909 (8-hour and 24-hour)[a]<br>0.284 (annual)[b] | thermal fluid heaters<br>0.008 (24-hour)<br>0.006 (annual)<br>secondary control device<br>0.001 (24-hour)<br>2.3 x $10^{-4}$ (annual) |
| 250 kW emergency engine generator | ---------- | 0.001 (24-hour)[c]<br>2.1 x $10^{-4}$ (annual)[d] |
| 250 hp firewater pump engine | ---------- | 0.001 (24-hour)[c]<br>2.1 x $10^{-4}$ (annual)[d] |

a: Based on the applicant's estimation that maximum methanol loading to the VOC control equipment is 12.6 lb/min from process equipment and filling methanol into tank(s) at the maximum loading rate. A 98% methanol destruction efficiency was assumed for the VOC control equipment as worst-case. The maximum 8-hour and 24-hour emission rate was determined as follows:

(12.6 lb/min)(min/60 s)(kg/2.2 lb)(1,000 g/kg)(1-0.98) = 1.909 g/s methanol

b: Maximum short-term emission rater was reduced by a factor of 9.9/16.6 to determine annual emission rate to account for the limit on any single HAP as methanol. A 98% methanol destruction efficiency for the thermal fluid heaters was also assumed. The annual emission rate was determined as follows:

(12.6 lb/min)(60 min/hr)(8,760 hr/yr)(ton/2,000 lb)(1-0.98) = 66.2 TPY methanol

(1.909 g/s)(9.9/66.2) = 0.285 g/s methanol

c: The adjustment factor for the 24-hour emission rate is 2/8 pursuant to information from Paragraph 7.4.

d: The adjustment factor for the annual emission rate is 150/2,920 pursuant to information from Paragraph 7.4.

7.7 The applicant's consultant performed a risk assessment that compared 24-hour methanol impacts from the thermal fluid heaters and fugitive leaks to various reference threshold concentrations that included Washington State Acceptable Source Impact level (WA ASIL), California Environmental Protection Agency (Cal/EPA) reference exposure level, National Institute of Occupational Health and Safety's recommended exposure limit (NIOSH REL), Occupational Safety and Health Administration's permissible exposure limit (OSHA PEL), NIOSH's immediately dangerous to life or health concentration, and the American Industrial Hygiene Association (AIHA) mean odor detection threshold. As noted in the risk assessment, methanol is not a carcinogen. Based on comparison between the 24-hour methanol impact and the aforementioned reference thresholds, it was concluded that methanol emissions from the biodiesel facility will not represent a health risk. Included in the impact analysis were uncontrolled emissions from methanol and catalyst tanks during a two week plant shutdown period, however, uncontrolled tank emissions are not applicable because the applicant will control all tank vapors in accordance with NSPS, Subpart Kb requirements.

7.8 The table below shows impacts from operating the thermal fluid heaters with the firewater pump engine and emergency engine generator based on the assumptions provided by the applicant. Results from the AAQIA indicate compliance with the ambient air quality standards.

**PREDICTED AMBIENT AIR QUALITY IMPACTS**

| AIR POLLUTANT | AVERAGING TIME | IMPACT (ug/m$^3$) | BACKGROUND (ug/m$^3$) | TOTAL IMPACT (ug/m$^3$) | AIR STANDARD | PERCENT STANDARD |
|---|---|---|---|---|---|---|
| $SO_2$ | 3 –Hour<br>24 – Hour<br>Annual | 42<br>31<br>7 | 24<br>7<br>2 | 66<br>38<br>9 | 1,300<br>365<br>80 | 5<br>10<br>11 |
| $NO_2$ | Annual | 24 | 6 | 30 | 70 | 43 |
| CO | 1 – Hour<br>8 – Hour | 802<br>151 | 2,736<br>1,183 | 3,538<br>1,334 | 10,000<br>5,000 | 35<br>27 |
| $PM_{10}$ | 24 – Hour<br>Annual | 18<br>3 | 33<br>12 | 51<br>15 | 150<br>50 | 34<br>30 |

7.9 The table below shows the methanol impact from operating the thermal fluid heaters and secondary control device combined with emissions from equipment leaks. The predicted impact is below the significant ambient air concentration for non-carcinogenic HAPs, as defined in HAR, Subchapter 9, for the 8-hour averaging period.

| COMPARISON OF 1/100 TLV-TWA TO 8-HOUR METHANOL IMPACT | | | | |
|---|---|---|---|---|
| Pollutant | TLV-TWA ($ug/m^3$) | 8-hour Impact ($ug/m^3$) | 1/100 TLV-TWA ($ug/m^3$) | Percent Standard |
| Methanol | 262,000 | 639 | 2,620 | 24 |

7.10 The table below shows the methanol impact from operating the thermal fluid heaters and secondary control device combined with emissions from equipment leaks. Maximum impact is based on the assumption that all the methanol vapors from process equipment and storage tanks are treated by either the thermal fluid heaters or secondary control device. The predicted impact is below the significant ambient air concentration for non-carcinogenic HAPs, as defined in HAR, Subchapter 9, for the annual averaging period.

| COMPARISON OF 1/420 TLV-TWA TO ANNUAL METHANOL IMPACT | | | | |
|---|---|---|---|---|
| Pollutant | TLV-TWA ($ug/m^3$) | Annual Impact ($ug/m^3$) | 1/420 TLV-TWA ($ug/m^3$) | Percent Standard |
| Methanol | 262,000 | 82 | 624 | 13 |

7.11 Sulfuric acid mist impacts were evaluated for operation of the combustion/control equipment combined with operation of the firewater pump engine and emergency engine generator. The 24-hour California Ambient Air Quality Standard (CAAQS) for sulfates of 25 $ug/m^3$ was used to evaluate short-term $H_2SO_4$ impacts. For evaluating the annual impacts, the inhalation reference exposure level of 1 $ug/m^3$ for sulfuric acid, that is a "present all the time" threshold, was used. Results listed in the tables below show that the impacts do not exceed air thresholds provided by the Hazardous Evaluation Emergency Response Branch toxicologist for $H_2SO_4$.

| Pollutant | 24-hour Standard ($ug/m^3$) | 24-hour Impact ($ug/m^3$) | Percent Standard |
|---|---|---|---|
| $H_2SO_4$ | 25 | 1.2 | 5 |

| Pollutant | Annual Standard ($ug/m^3$) | Annual Impact ($ug/m^3$) | Percent Standard |
|---|---|---|---|
| $H_2SO_4$ | 1 | 0.1 | 10 |

## 8. Significant Permit Conditions

8.1 The combustion equipment shall only be fired on one or a combination of the following fuels:

1) Fuel oil No. 2 with a maximum sulfur content not to exceed 0.05% by weight;

2) Biodiesel meeting American Society for Testing and Materials (ASTM) D6751 with a

maximum sulfur content not to exceed 0.05% by weight; and

3) VOC/methanol gas vented from vapor recovery system and storage tanks.

Reason for 8.1: This condition was incorporated based on what was proposed in the application for operating the combustion equipment. The fuel sulfur limits for the thermal fluid heaters, that is the same as that for the secondary control device, are more restrictive than that specified for fuel in NSPS, Subpart Dc. The ambient air modeling assessment was also based the types of fuels proposed for the combustion equipment to predict maximum air impacts.

8.2 The total combined thermal fluid heater firing rate shall not exceed 525,600 MMBtu in any rolling twelve-month (12-month) period based on each fuel's HHV in Btu/lb and pounds of each fuel fired.

Reason for 8.2: This condition was proposed by the applicant to prevent the facility from exceeding the BACT threshold for $NO_X$ as worst-case scenario for the thermal fluid heaters.

8.3 The total combined methanol emissions from the combustion/control equipment shall not cause the facility to exceed 9.9 tons per year of any single hazardous air pollutant (HAP) in any rolling twelve-month (12-month) period. Methanol emissions from the thermal fluid heaters shall be based on the total combined methanol loading to the units in tons and each unit's methanol reduction efficiency identified by the most recent performance test.

8.4 The total combined methanol emissions from fugitive equipment leaks shall not cause the facility to exceed 9.9 tons per year of any single HAP in any rolling twelve-month (12-month) period. Methanol emissions shall be based on the total combined number of leak sources and the applicable leak detection limits.

Reason for 8.3 and 8.4: These conditions were required to prevent the facility from exceeding the major source threshold of any single HAP of 10 TPY for methanol worst-case.

8.5 The total organic compound (TOC) emission rate (less methane and ethane) from each vent stream routed to the combustion equipment shall be reduced by at least 98% by weight, or to a TOC concentration not to exceed 20 ppmv on a dry basis corrected to 3 percent oxygen, whichever is less stringent.

Reason for 8.5: This limit is considered most restrictive among the federal regulations for VOC and TOC control. The limit is specified in NSPS, Subparts NNN and RRR. For the VOC requirements specified in NSPS, Subpart kb requirements, the manufacturer of the thermal fluid heaters guarantees a 99.9% reduction efficiency for methanol at above 30-40% burner firing rate. The manufacturers of secondary control devices being considered for the project guarantee 98% VOC reduction.

8.6 At least one combustion unit shall be fully functional and operational at all times for controlling TOC emissions from process equipment and storage tanks.

Reason for 8.6: This limit is required to ensure that emissions from process equipment and storage tanks are controlled at all times including periods of plant shutdown. Although, there are no emissions from processing equipment during facility shutdowns, there will be VOC emissions due to standing losses from methanol and catalyst storage tanks that must be

controlled in accordance with NSPS, Subpart Kb.

8.7 The thermal fluid heaters shall not discharge into the atmosphere any gases that contain particulate matter (PM) in excess of 0.03 lb/MMBtu heat input.

8.8 The permittee shall not cause the discharge into the atmosphere, emissions from the thermal fluid heaters that exhibit greater than twenty (20) percent opacity (six (6)-minute average), except for one six (6)-minute period per hour of not more than twenty seven (27) percent opacity.

Reason for 8.7 and 8.8: These conditions are required by NSPS, Subpart Dc. Performance testing, though, is not required to determine compliance with these permit conditions due to the low sulfur content of the fuels proposed for the equipment. Also, fuel sulfur content will be verified by the applicant based on fuel supplier certifications and from fuel analysis.

8.9 Incorporate requirement to monitor the minimum combustion temperature of the combustion/control equipment.

Reason for 8.9: This condition was incorporated to ensure proper combustion efficiency for the combustion equipment for VOC control. Requirement to monitor the control device combustion temperature is specified in NSPS, Subparts NNN and RRR. The established temperature is 900 $^{O}$F for the thermal fluid heaters prior to the initial performance test. The established temperature for the John Zinc thermal oxidizer is 1,400 $^{O}$F prior to the initial performance test. For the A.H. Lundberg Associates, Inc. incineration system, the established temperature prior to initial performance testing is 1,600 $^{O}$F.

8.10 Incorporate NSPS, Subparts DC, Kb, VVa, NNN, and RRR requirements.

Reason for 8.10: Incorporate pursuant to Paragraphs 2.2, 2.4, 2.5, 2.6, and 2.7, respectively.

## 9. Conclusion and Recommendation:

9.1 Maximum potential emissions were based on worst-case conditions (combustion equipment operating simultaneously at maximum capacity on a continuous basis). Actual capacity of the units will vary depending on operating load. The facility will use a vapor recovery system to recover methanol from process equipment. Noncondensable vapors passing through the vapor recovery system will be routed to combustion equipment for additional control. The combustion equipment will also control VOC emissions from the methanol and catalyst storage tanks. The fugitive methanol emission estimate is considered conservative because the number of leak sources was increased by 20% to determine maximum potential methanol emissions. The permit also incorporates procedures from Subpart VV to inspect and repair equipment leaks. The air modeling assessment, based on the facility operating at maximum capacity, predicts compliance with state and federal air quality standards. Permit limits restrict methanol emissions below the major source threshold for any single HAP. Recommend issuance of the covered source permit subject to the significant permit conditions, a public hearing, the thirty day public comment period, and forty-five day EPA review period.

December 12, 2007

**PROPOSED**

Dave Wong
Mike Madsen