

**PERMIT APPLICATION REVIEW
Minor Modification to Covered Source Permit (CSP) No. 0045-02-CT**

Application File No.: 0045-23

Applicant: Grace Pacific Corporation

Facility: 334 TPH Asphalt Plant

SIC Code: 2951 (asphalt paving mixtures & blocks)

Location: 91-920 Farrington Highway, Kapolei, Oahu

UTM Coordinates: 596,953 m East and 2,361,208 m North

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I. Background

Grace Pacific Corporation (Grace Pacific) operates three hot mix asphalt plants on Oahu, located in Makakilo, Kailua, and Halawa. Of the three, the Makakilo plant (334 tph capacity) has the greatest capacity and handles most of the large federal and state road construction projects. The Kailua plant (300 tph capacity) handles most of the projects located on the windward side of Oahu, while the Halawa plant (186 tph capacity) provides for most of the smaller projects such as private driveways and pothole repair.

Proposed Modification

Grace Pacific has submitted an application for a minor modification for all three of its plants on Oahu to allow combustion of biodiesel and grease trap oil in the facility's asphalt drum mixer. Grace Pacific also proposes the combustion of biodiesel in the permitted diesel engine generators (DEGs) located at the Makakilo and Halawa plants. The 7/31/06 application and

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12/1/06 addendum for the Makakilo plant propose a modification which is considered minor, resulting in only a small increase in DEG NOx emissions.

Site Inspection

A site visit conducted on 1/10/07 focused on the back-up DEG and fiberbed mist collector. Photos are contained in the appendix.

Back-up DEG: Although the facility has only one permitted DEG, two DEGs are permanently installed and enclosed in a 3-walled CMU housing. Per plant manager S. Komatsu, the unpermitted DEG is used as a back-up if the main DEG breaks down. The back-up DEG is run about once each month to keep it operational.

Grace Pacific informed the Department of Health (DOH) via 10/3/05 and 5/1/06 letters when it ran the back-up generator as permitted under its alternate operating scenario. However since the back-up DEG has been permanently installed at the facility and continues to be run approximately once a month, the back-up DEG will be included in the list of permitted equipment.

Fiberbed Mist Collector: Most of the fiberbed mist collector system has been installed, except for electrical connections. Blue smoke emissions from the truck loading process will be collected from two openings at the top of the loading bin, as well as from a horseshoe-shaped duct located under the bin where product is deposited into the truck.

Permit History

Table 1 shows some of the permit applications submitted for this asphalt plant. Application numbers are not consecutive because the same first four digits are used for both the Makakilo quarry and for the Makakilo asphalt plant.

Table 1: Permit History			
Applic. No.	Application Type	Description	Permit Issued
0045-02	Initial permit	Permit existing asphalt plant.	05/03/00
0045-07	Minor modification	Remove hot oil heater fired on fuel oil.	03/05/02
0045-08	Minor modification	Add RAP crushing system.	05/10/02
0045-12	Modification	Allow combustion of spec used oil in the drum mixer.	01/26/04
0045-14	Renewal	Add section on insignificant activities.	11/09/04
0045-18	Minor modification	Allow combustion of SNG in the drum mixer.	07/21/05
0045-19	Minor modification	Allow combustion of SNG in the DEG.	11/02/05
0045-20	Minor modification	Allow combustion of Unitek diesel in the drum mixer.	11/21/05
0045-22	Minor modification	Add fiberbed mist collector to control blue smoke.	08/07/06
0045-23	Minor modification	Allow combustion of biodiesel in drum mixer and DEG.	

II. Equipment Description

Table 2 lists the facility equipment with the addition of the back-up DEG.

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Table 2: Equipment					
Description	Capacity	Manuf.	Model No.	Serial No.	Date
Drum mixer	334 TPH	Astec	PDDC-835C	92-152	
Main DEG	725 kW derated to 544 KW	Caterpillar	3412	2WJ01364	<=1998
Back-up DEG	725 kW derated to 544 KW	Caterpillar	3412	2WJ00863	1996
Baghouse	58,255 CFM	Astec	RBH-58:DB	92-152437	12/92
Fiberbed Mist Collector	12,000 CFM	Astec	BSC-16-FBF	06-041	2006
Crusher	96 TPH	Telsmith	HSI-3036	232M337	
Screen	275 TPH	Telsmith	VK481	363M474	
Screen	4' x 12'1", single deck	Diester	USM-1412	579262	11/92

III. Air Pollution Controls

No changes proposed. Table 2 lists the facility's existing pollution controls.

Table 3: Air Pollution Controls			
Emission Source	Control Measure	Control Efficiency	Control Efficiency Reference
Drum mixer	Baghouse	99%	AP-42, App. B, Table B.2-3, 1/95.
Silos & Truck load-out	Fiberbed mist collector	95% for PM	CECO filter manufacturer
Aggregate piles & roads	Water spray	70% for PM	AP-42 §11.19.1.2, par. 3, 11/95.

IV. Applicable Requirements

1. Hawaii Administrative Rules (HAR), Title 11
 - Chapter 59, Ambient Air Quality Standards
 - 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
 - 11-60.1-33 Fugitive Dust
 - 11-60.1-38 Sulfur Oxides from Fuel Combustion
 - 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
 - 11-60.1-115 Basis of Annual Fees for Covered Sources
 - Subchapter 8 - Standards of Performance for Stationary Sources
 - 11-60.1-161 New Source Performance Standards

Subchapter 10 - Field Citations

2. PSD Requirements

PSD requirements do not apply because this facility is not considered a major stationary source and is not proposing any modifications to trigger a major modification as defined in 40 CFR 52.21 and HAR Title 11, Chapter 60.1, Subchapter 7.

3. NSPS Requirements

The following subparts of 40 CFR 60 - Standards of Performance for New Stationary Sources (NSPS) apply to this facility:

Subpart A - General Provisions

Subpart I - Standards of Performance for Hot Mix Asphalt Facilities

The two DEGs are not subject to Subpart III, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines because each was manufactured before April 1, 2006 and was not modified or reconstructed after July 11, 2005.

4. NESHAP Requirements

These requirements do not apply because no standard covering the facility's operation or equipment has been promulgated under 40 CFR 61.

5. MACT Requirements

These requirements do not apply because this facility is not a major source of hazardous air pollutants and does not belong to a source category or subcategory for which a standard has been promulgated under 40 CFR 63.

6. BACT Requirements

A BACT review is required for new or modified sources which generate a net emissions increase that is "significant," as defined in HAR §11-60.1-1. Since the emissions increase shown in Table 4 is below the significant level, a BACT review is not required.

Table 4: Emissions & Triggering Levels (tpy)						
Pollutant	Current Emissions	Past Emissions	Net Increase	Significant Level	CERR Type B	DOH Level
CO	42.04	42.04	0.0	100	1000	250
NOx	41.94	38.41	3.5	40	100	25
PM	27.01	27.00	0.0	25	N/A	25
PM-10	12.16	12.16	0.0	15	100	25
PM-2.5	6.06	6.06	0.0	-	100	-
SOx	28.70	28.70	0.0	40	100	25
VOC	13.65	13.65	0.0	40	100	25
Lead	4.05E-03	4.05E-03	0.0	0.6	5	5

7. CAM Requirements (40 CFR 64)

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

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Code of Federal Regulations, 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 100% of the major source level; and (5) not otherwise be exempt from CAM. Since this facility is not a major source and does not meet all five criteria, CAM does not apply.

8. CER Requirements

Consolidated Emissions Reporting (CER) requirements apply if emissions from the facility equal or exceed levels provided in 40 CFR 51, Subpart A, Appendix A shown in Table 4. CER requirements do not apply because the facility's emissions are below the CER threshold levels.

The Department of Health (DOH) requires emissions reporting if total facility emissions of a particular pollutant exceed the DOH levels shown in Table 4. Emissions reporting is required because facility-wide emissions of NO_x and SO₂ exceed DOH levels.

9. Major Source Determination

A major source, as defined in HAR 11-60.1-1, emits or has the potential to emit any hazardous air pollutant in the aggregate of 10 tpy, 25 tpy or more of any combination of HAPs, or 100 tpy of any pollutant. This facility is not a major source since potential emissions, considering operating limits and pollution controls, are below these levels.

10. Synthetic Minor Determination

A synthetic minor is a facility that is potentially major (as defined in HAR §11-60.1-1) but is made non-major through federally enforceable permit conditions. The facility is a synthetic minor of CO, NO_x, PM, and SO₂ because without operational limits, emissions of these pollutants would equal or exceed 100 tpy. (Reference: Review of Application 0045-14, 6/3/04).

V. Insignificant Activities / Exemptions

Table 5 lists the activities designated as *insignificant activities* and the corresponding HAR paragraph reference upon which this determination is based.

Table 5: Insignificant Activities		
Quantity	Description	HAR Section Reference
1	1.5 MMBtu/hr hot oil heater, Heatec HC-120	11-60.1-82(f)(7)
1	Specification used oil tank < 10,000 gallons	11-60.1-82(f)(1)
3	Fuel oil storage tanks - 3,000, 4,000, & 10,000 gallons	11-60.1-82(f)(1)
2	Liquid asphalt cement storage tanks - 30,000 gallons	11-60.1-82(f)(1)
1	Cold mix tank - 6,000 gallons	11-60.1-82(f)(1)

VI. Alternate Operating Scenario

No new alternate scenario proposed.

VII. Project Emissions

Comparison of Biodiesel to Fuel Oil No. 2

Grace Pacific proposes to fire biodiesel and/or grease trap oil in its asphalt drum mixer and to fire biodiesel in either of the two DEGs. Biodiesel is a renewable fuel made by a chemical reaction of alcohol, vegetable oils, animal oils, fats, and/or greases. A transesterification process removes the undesirable glycerin by-product so that biodiesel can operate like petroleum diesel oil in conventional compression-ignition engines.

When compared to diesel oil combustion, biodiesel has lower CO, PM, SO₂, and VOC emissions. NO_x is the only pollutant that increases when biodiesel is used instead of diesel oil in internal combustion engines. Studies have found that NO_x emissions from the internal combustion of biodiesel can be as much as 15% higher than that of diesel oil.¹ Since facility emissions are calculated using the worst-case scenario, a 15% increase in previously calculated NO_x emissions from diesel oil combustion is assumed to account for biodiesel combustion in the DEG.

A study comparing NO_x emissions from external combustion of diesel oil and biodiesel found that NO_x emissions are lower when firing biodiesel.² Based on this study conducted on boilers, it is assumed that combustion of biodiesel in the asphalt drum mixer does not increase emissions.

References:

1. *A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions - Draft Technical Report*, U.S. Environmental Protection Agency, October 2002.
2. *Biodiesel Blends in Space Heating Equipment*, C.R. Krishna, prepared for the National Renewable Energy Laboratory, U.S. Department of Energy, December 2001.

Grease Trap Oil used in Asphalt Drum Mixer

Grease trap oil is unprocessed waste oil collected from restaurants. Emissions from grease trap oil are assumed to be similar to those of cooking oil which is already a permitted fuel. Table 6 shows some properties of the oil, as provided by Pacific Biodiesel, Inc. Per W. Mohlman of Pacific Biodiesel, Inc., no visible emissions are expected from the external combustion of grease trap oil.

Table 6: Grease Trap Oil Properties	
Supplier	Pacific Biodiesel
Density at 250° C	0.894 g/cm ³
Heat of Combustion (gross)	122,390 BTU/gal
Heat of Combustion (net)	130,640 BTU/gal
Viscosity at 40°C	27.1 cst
Ref:	
1. Addendum to Application No. 0036-06, 12/1/06 cover letter.	
2. Appendix A of 12/1/06 Addendum.	

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DEG Potential Emissions

Grace Pacific's back-up DEG will be added to the facility's permitted equipment list. The two DEGs are identical models and both have been de-rated to 544 kW, according to facility personnel. Only one DEG will be operated at any time.

The DEGs will be fired on the following fuels:

- 1) fuel oil no. 2
- 2) biodiesel
- 3) synthetic natural gas (SNG) or liquefied petroleum gas (LPG)

Table 7 shows worst-case potential DEG emission rates, based on combustion of fuel oil no. 2 for pollutants other than NOx, and from combustion of biodiesel for NOx. The biodiesel NOx emission rate was determined by multiplying the NOx emission rate for fuel oil no. 2 combustion by 1.15. SNG and LPG are considered relatively clean fuels.

Table 7: Worst Case DEG Emission Rates for Diesel Oil & Biodiesel Combustion							
Pollutant	AP-42	EF	Emission Factors (EF) EF Units	Diesel Oil		Biodiesel	
	Table	Date		Lb/hr	G/sec	Lb/hr	G/sec
CO	3.4-1	10/96	0.850 lb/MMBTU	4.635	0.584		
NOx	3.4-1	10/96	3.200 lb/MMBTU	17.450	2.199	20.07	2.53
PM	3.4-1	10/96	0.100 lb/MMBTU	0.545	0.069		
PM-10	B.2-2	9/90	0.096 lb/MMBTU	0.523	0.066		
PM-2.5	B.2-2	9/90	0.090 lb/MMBTU	0.491	0.062		
SO2	-	-	Refer to Note 6.	2.803	0.353		
VOC	3.4-1	10/96	0.090 lb/MMBTU	0.491	0.062		

Notes:

1. Reference: AP-42, Section 3.4 Large Stationary Diesel & All Stationary Dual-fuel Engines, 10/96.
2. Maximum fuel feed rate = 39.8 gph per 6/3/04 review of Application 0045-14.
3. Diesel fuel heating value = 0.137 MMBTU/gal.
4. MMBTU/hr = (39.8gal/hr) * (0.137 MMBTU/gal) = 5.453 MMBTU/hr.
5. PM-10 and PM-2.5 emission factors obtained from particle size distribution data in AP-42, Appendix B.2.
6. The biodiesel NOx emission factor was set equal to the diesel oil NOx emission factor multiplied by 1.15.
7. Since the SOx EF from Table 3.3-1 doesn't account for fuel sulfur content, use the molecular weight ratios of S and SO2. Assume 100% conversion for mass balance eqn S + O2 -> SO2.
EF (SO2) = (7.05 lb/gal)*(fuel gal/hr)*(lb S / lb fuel)*(64.06 wt of SO2 / 32.06 wt of S)
8. Values in bold used in the air quality assessment.

DEG Operating Limits

Emissions are also based on an original operating limit of 107,460 gallons per year. In the last permit renewal issued on 11/9/04, DEG fuel usage was limited to 107,460 gallons of fuel oil no. 2 per rolling 12-month period. This equates to an hourly limit of 2,700 hr/yr, based on a fuel feed rate of 39.8 gal/hr (107,460 gal/yr divided by 39.8 gal/hr = 2,700 hr/yr).

When DEG combustion of synthetic natural gas (SNG) and liquid petroleum gas (LPG) was also allowed in the amendment issued on 11/2/05, the 107,460 gallon limit was converted to a heat input limit of 14,922 MMBTU per rolling 12-month period since SNG is measured in scfm (rather than gallons) and billed in terms of therms. The heat input limit was based on a fuel oil no. 2 heat input value of 0.137 MMBTU/hr (107,460 gal/yr * 0.137 BTU/gal = 14,722 MMBTU/yr).

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Table 8 shows total facility emissions. Except for the 15% increase in DEG NOx emissions, amounting to an increase of 3.5 tpy, facility emissions remain the same as those determined in the previous application review.

Table 8: Facility Emissions (tpy)								
Pollutant	Drum Mixer	RAP System	Material Conveying	DEG	Agg Handling, Paved Roads	Load-Out	Silo-Filling	Total
CO	35.10			6.26		0.36	0.32	42.04
NOx	14.85			27.09				41.94
PM	8.91	1.75	3.50	0.74	12.09	0.01	0.01	27.01
PM-10	6.21	0.84	1.67	0.42	3.00	0.01	0.01	12.16
PM-2.5	0.78	0.61	1.23	0.42	3.00	0.01	0.01	6.06
SO2	24.92			3.78				28.70
VOC/TOC	8.64			0.66		1.06	3.29	13.65
Lead	4.05E-03							4.05E-03
Total HAPs	2.40			0.03		0.02	0.05	2.50

Notes:

1. Emissions other than those for Load-Out & Silo-Filling are based on Review of Application No. 0045-14, 6/3/04, page 12, Table 2, Facility Emissions Summary.
2. Load-Out & Silo-Filling emissions based on Review of Application No. 0045-22, 6/28/06, page 7, Table 5, Facility Emissions.
3. DEG NOx emissions increased by 15% (23.56 to 27.09) to account for biodiesel combustion.

VIII. Air Quality Assessment

An Ambient Air Quality Impact Assessment (assessment) is generally performed for new or modified sources. Since DEG combustion of biodiesel increases NOx emissions, an assessment was performed on the DEG based on the following assumptions:

- Screen3 model.
- Operating limits of 20 hr/day and 2,700 hr/yr (107,460 gpy / 39.8 gph = 2,700 hr/yr).
- Stack parameters as shown in Table 9.
- Flat terrain.
- Rural area.
- Default meteorology.
- Critical building for downwash is the DEG housing (26'L 12'W, 12'H).
- Ambient temperature of 298 K (76 F).
- 1 gm/sec of pollutant.
- Regulatory default cavity.
- EPA scaling factors of 0.9, 0.7, 0.4, and state scaling factor of 0.2 for the 3-hr, 8-hr, 24-hr, and annual concentrations, respectively.

Table 9 shows DEG stack parameters.

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Table 9: Stack Parameters & Emission Rates			
Height	13.75 ft = 4.2 m	CO emission rate (g/sec)	0.584
Diameter	10" = .25 m	NOx emission rate (g/sec)	2.528
Exhaust velocity (m/sec)	29.71 m/s	PM-10 emission rate (g/sec)	0.066
Exhaust temperature (K)	785.13 K	SO2 emission rate (g/sec)	0.353

Note: Velocity and temperature per 8/12/97 submittal for initial CSP.

Results shown in Table 10 indicate compliance with federal and state air quality standards.

Table 10: Ambient Air Quality Assessment Results											
Pol.	Avg. Time	Emis-sions (g/sec)	Time Factor	Oper. Limit Factor	Pred. Conc. (ug/m3)	NOX Tier 3 OLM	Bkgrd. Conc. (ug/m3)	Total Impact (ug/m3)	SAAQS (ug/m3)	NAAQS (ug/m3)	Percent SAAQS
CO	1 hr	0.584	1.0	1.00	815		1710	2525	10000	40000	25%
CO	8 hr	0.584	0.7	1.00	570		1055	1625	5000	10000	33%
NO2	annual	2.528	0.2	0.31	217	54.3	9	63	70	100	90%
PM10	24 hr	0.066	0.4	0.83	31		53	84	150	150	56%
PM10	annual	0.066	0.2	0.31	6		15	21	50	50	41%
SO2	3 hr	0.353	0.9	1.00	443		64	507	1300	-	39%
SO2	24 hr	0.353	0.4	0.83	164		21	185	365	365	51%
SO2	annual	0.353	0.2	0.31	30		2	32	80	80	40%

Notes:

1. The Screen3 maximum predicted concentration is 1395 ug/m3 located 19 meters from the source.
2. The annual concentration is adjusted by an operating limit factor = 2700 / 8760 hrs = 0.31 for the 2700 hr/yr limit.
3. The 24-hr concentration is adjusted by an operating limit factor = 20/24 hrs = 0.83 to account for the 20 hr/day limit.
4. NOx concentration, based on Tier 3 OLM = 0.1 * 217 + 46/48*34 = 21.7 + 32.6 = 54.3.
5. Background concentration levels for the pollutants are the highest recorded levels of the 2005 Kapolei station data.

IX. Significant Permit Conditions

1. The drum mixer shall only be fired on fuel oil no. 2, spec used oil, cooking oil, aviation fuels, Unitek diesel, biodiesel, or any combination thereof.

Purpose: Emission calculations based on use of the above fuels, as proposed by the applicant.

2. The DEG shall only be fired on fuel oil no. 2, biodiesel, synthetic or liquefied petroleum gas, or any combination thereof.

Purpose: Emission calculations based on use of the above fuels, as proposed by the applicant.

3. Biodiesel shall only be obtained from Pacific Biodiesel unless the permittee requests and obtains approval from the Department of Health to use a different vendor.

Purpose: Biodiesel specification sheets were submitted for fuel provided by Pacific Biodiesel.

4. The back-up DEG shall be added to the list of permitted equipment.

Purpose: The back-up DEG is permanently installed at the facility and operated approximately once per month.

5. The two DEGs shall not operate simultaneously.

Purpose: Air quality assessment based on this assumption.

6. The total combined hours for the two DEGs shall not exceed 20 hours per day.

Purpose: Air quality assessment based on this assumption.

X. Conclusion

Grace Pacific has proposed use of biodiesel and or grease trap oil in the asphalt drum mixer and use of biodiesel in the DEG. Facility emissions should be less than indicated in this review because although different fuels will be used, emissions are calculated based on the worst-case emissions of the various fuels. Also, the worst-case rather than average increase in NOx emissions was assumed for biodiesel combustion in the DEG, as compared to fuel oil no. 2.

Issuance of an amended covered source permit is recommended based on review of information provided by the applicant and subject to significant permit conditions and EPA review.

April Matsumura
January 31, 2007