**Reviewed by: CS**
November 7, 2005

**Covered Source Permit Review Nos. 0036-01-CT, 0045-02-CT, and 0522-01-C**
**Application for Minor Modification Nos. 0036-04, 0045-20, 0522-02**
**Asphalt Concrete Plants**

**Applicant:** Grace Pacific Corporation

**Equipment Description:**

There are no proposed changes to any of the equipment located on the three (3) plants listed below:

0036-01-CT - 186 tph asphalt concrete (AC) plant @ Halawa, Oahu
0045-02-CT - 334 tph AC plant @ Makakilo, Oahu
0522-01-C - 300 tph AC plant @ Kapaa Quarry, Oahu

**Responsible Official:**
Bob Creps
Senior Vice President
ph: 842-3200

**Point of Contact:**
Christopher Steele
Manager - Environmental Compliance
ph: 674-8383

**Consultant:**
Parametrix
1231 Fryar Avenue
P.O. Box 460
Sumner, Washington 98390-1516
ph: (253) 863-5128 www.parametrix.com

**Mailing Address:**
Grace Pacific Corporation
P.O. Box 78
Honolulu, Hawaii 96810

**Proposed Project:**

The Standard Industrial Classification Code (SICC) for this plant is 2951- Asphalt Paving Mixtures and Blocks.

These AC plants propose to add 'Unitek diesel' as another fuel option for the drum burners. Since this change does not significantly increase emissions or relax permitting conditions, it is considered a minor modification for all of the plants. The permittee did not propose any other changes to the permits.

This permit review is based on the applications received October 14, 2005. The application fees of three (3) x $100.00 = $300.00 for minor modifications to covered source permits will be processed and the receipts will be issued with the permits.

**Air Pollution Controls:**

No change proposed.

**Applicable Requirements:**

No change proposed.

**Insignificant Activities/Exemptions:**

No change proposed.

**Alternative Operating Scenarios:**

The permittee did not propose any alternate operating scenarios.

**Project Emissions:**

The proposed addition of using Unitek diesel at the AC plants require the determination of whether there were any increases in air pollutant emissions. Based on a previous permit review for Unitek (Application No. 0395-03 for Permit No. 0395-01-N), it was determined that the combustion of Unitek diesel will not cause any significant increase in emissions. The Unitek application included the following analysis (verbatim) in *italics*:

"*According to Unitek, the specifications for the diesel oil product (Unitek Diesel Fuel) fall between diesel no. 2 and diesel no. 4, as it is processed from the waste oil from used crankcase oils from cars and trucks. Therefore, the diesel oil product should have emissions similar to diesel fuel no. 2, but lower than waste oil. Subsequent testing of the diesel oil product and comparisons to other fuel oils have shown this to be true.*

*The existing permit required Unitek to perform an initial certification test on the diesel oil product for specification used oil constituents and also to certify the fuel to be fired in the boiler, diesel engine generator and thermal cracking unit as diesel fuel no. 2 by meeting ASTM D 975 specifications. When Unitek performed the certification tests on their diesel oil product (Unitek letter dated 8/23/05) the test results showed it was <u>below</u> the limits for specification used oil, but it did not meet the ASTM D 975 specifications for diesel fuel no. 2. (The distillation temperature and kinematic viscosity were higher than allowable). Therefore, the diesel oil product produced from the thermal cracking unit could not be considered diesel fuel no. 2 and burning it is not allowed without a permit modification. The Department of Health also later requested Unitek to analyze the diesel oil product for nitrogen content when a potential fuel buyer (Grace Pacific) requested a test burn of the diesel oil product for use in their asphalt drum mixer. The subsequent test result showed the nitrogen content to be < 200 ppm or 0.02% by weight (Unitek analysis dated 9/9/05). Test data from Tesoro Hawaii from 8/27/05 to 10/7/05 has shown the average nitrogen content of diesel fuel no. 2 and industrial fuel oil (which is similar to fuel oil no. 6), to be 63.6 ppm (0.006% by weight) and 3174 ppm (0.32% by weight), respectively. The results of these tests are shown in the table below.*

| ***Parameters*** | ***Specification Used Oil Allowable Limit*** | ***Unitek Diesel Fuel Test Results*** |
|---|---|---|
| *Arsenic* | *5 ppm maximum* | *< 0.5 ppm* |
| *Cadmium* | *2 ppm maximum* | *< 0.05 ppm* |
| *Chromium* | *10 ppm maximum* | *< 4.0 ppm* |
| *Lead* | *100 ppm maximum* | *1.8 ppm* |
| *Total halogens* | *1000 ppm maximum* | *155 ppm* |
| *Sulfur* | *2 % by weight maximum* | *0.08 %* |
| *Flash point* | *100 ° F* | *171 ° F* |
| *PCB* | *2 ppm maximum* | *< 1.0 ppm* |
| ***Parameters*** | ***Diesel Fuel No. 2 ASTM D 975 Requirements*** | ***Unitek Diesel Fuel Test Results*** |
| *Flash point, °C, min* | *52* | *73* |
| *Water and sediment % vol, max* | *0.05* | *0.05* |
| *Distillation temperature, °C, 90% vol recovered min max* | *282 338* | *391* |
| *Kinematic viscosity, 40 °C, cSt min max* | *1.9 4.1* | *6.476* |
| *Ash, % mass, max* | *0.01* | *0.003* |
| *Sulfur, % mass, max* | *0.5* | *0.098* |
| *Copper strip corrosion, 3 hr at 50° C, max rating* | *No. 3* | *1 b* |
| *Cetane number, min* | *40* | *58* |
| ***Parameter*** | | ***Unitek Diesel Fuel Test Results*** |
| *Nitrogen content* | | *< 200 ppm* |

*Although the nitrogen content of the diesel oil product is slightly higher than the nitrogen content of diesel fuel no. 2, based on AP-42, $NO_x$ emissions when burning diesel fuel no. 2 should be similar to $NO_x$ emissions when burning the diesel oil product since essentially all*

*$NO_x$ formed is thermal $NO_x$. Please see the excerpts from AP-42 below.*

*AP-42 (9/98), Section 1.3.3.3 (Fuel Oil Combustion - Nitrogen Oxides Emissions)*
*Fuel nitrogen conversion is the more important $NO_x$ forming mechanism in residual oil boilers. It can account for 50 percent of the total $NO_x$ emissions from residual oil firing. The percent conversion of fuel nitrogen to $NO_x$ varies greatly, however; typically from 20 to 90 percent of nitrogen in oil is converted to $NO_x$. Except in certain large units having unusually high peak flame temperatures, or in units firing a low nitrogen content residual oil, fuel $NO_x$ generally accounts for over 50 percent of the total $NO_x$ generated. Thermal fixation, on the other hand, is the dominant $NO_x$ forming mechanism in units firing distillate oils, primarily because of the negligible nitrogen content in these lighter oils. Because distillate oil-fired boilers are usually smaller and have lower heat release rates, the quantity of thermal $NO_x$ formed in them is less than that of larger units which typically burn residual oil.*

*AP-42 (10/96), Section 3.4.3.1 (Large Stationary Diesel and All Stationary Dual-fuel Engines - Nitrogen Oxides)*
*Nitrogen oxide formation occurs by two fundamentally different mechanisms. The predominant mechanism with internal combustion engines is thermal $NO_x$ which arises from the thermal dissociation and subsequent reaction of nitrogen ($N_2$) and oxygen ($O_2$) molecules in the combustion air. Most thermal $NO_x$ is formed in the high-temperature region of the flame from dissociated molecular nitrogen in the combustion air. Some $NO_x$, called prompt $NO_x$, is formed in the early part of the flame from reaction of nitrogen intermediary species, and HC radicals in the flame. The second mechanism, fuel $NO_x$, stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Gasoline, and most distillate oils, have no chemically-bound $N_2$ and essentially all $NO_x$ formed is thermal $NO_x$.*

*In addition, the AP-42 $NO_x$ emission factors for small boilers are very similar, 20 lb/1000 gal and 19 lb/1000 gal, respectively, when comparing distillate oil burning to waste oil burning (AP-42 Tables 1.3-1 and 1.11-2). Based on these assumptions, the emissions for the boiler, diesel engine generator and thermal cracking unit should remain the same when comparing the burning of the diesel oil product (Unitek Diesel Fuel) to diesel fuel no. 2. The emissions from the fuel-fired equipment are shown in the table below."*

To be consistent, the data from the Unitek permit review was used instead (no significant increase). Furthermore, there is no increase in lead emissions since specification (spec) used oil were previously permitted for these AC plants (allowable lead concentration in the spec used oil is greater than the average lead concentration found in the Unitek diesel. Finally, it should also be noted that Unitek's permit require that only spec used oil to be processed at the waste oil recycling facility. Therefore, the Unitek diesel should be no less refined than spec used oil.

For information only, the following is a conservative determination made by the permittee which would still deem the modifications as 'minor'.

**Reviewed by: CS**
November 7, 2005

The permittee's consultant (Parametrix) calculations showed slight potential increases in lead and nitrogen dioxide (27.4 lb/yr and 3,820 lb/yr respectively) for the Kapaa Quarry plant. The nitrogen increase is conservative because Unitek diesel is assumed to have the minimum detectable amount of 200 ppm. This plant has the largest increase of the three (3) plants and would still be insignificant since 3,820 lb/yr x 1 ton/2,000 lb = 1.91 ton/yr. Pursuant to HAR 11-60.1-81, a 'Minor Modification' includes potential increases of less than 2 ton/yr. See page B-1 of the application for calculations.

**Ambient Air Quality Analysis (AAQA):**

New AAQA are not required for the permit modifications since there are no significant increase in emissions. Therefore, there are no additional ambient air impacts from these AC plants.

**Other Issues:**

None.

**New Permit Conditions:**

Add Unitek diesel for consumption by the drum burners of the AC plants.

**Conclusion and Recommendation:**

In conclusion, these facilities comply with all State and Federal laws, rules, regulations, and standards with regards to air pollution. Therefore, issuance of Minor Modifications to Covered Source Permits to Grace Pacific Corporation subject to the above permit condition is recommended. The issuance of these permits are subject to a 45-day EPA review period.