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FUEL EFFICIENCY & GREENHOUSE GAS REDUCTION STUDY AT DARLOT GOLD MINE POWER GENERATION FACILITY

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C O N T E N T S

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EXECUTIVE SUMMARY

The FTC Combustion Catalysts, manufactured and marketed by Fuel Technology Pty Ltd, have proven in laboratory and field trials to reduce fuel consumption in the range 3% to 8% under comparable load conditions and to also substantially reduce carbon emissions.

Following discussions with Darlot Gold Mine Senior Maintenance Co-ordinator, Keith Backhouse, it was agreed that a fuel efficiency and greenhouse gas reduction emission study should be conducted at the power generation facility.

The International Engineering test procedure “Carbon Mass Balance” (CMB) was employed in the test program.

The average net efficiency gain (reduction in fuel consumption) measured by the CMB test procedure was **3.7%**.

INTRODUCTION

Baseline (untreated) fuel efficiency tests were conducted on four Caterpillar 3516 Generator sets, Nos 6, 7, 9 and 10 during the week commencing 26th July 2006 employing the CMB test procedure. Bosch Smoke Tests were also conducted in conjunction with CMB tests.

Darlot Gold Mine purchased and installed an FTC catalyst metering system which was calibrated and commissioned following completion of the baseline tests. This unit injected FTC-3 Catalyst into the fuel supply as fuel was pumped from bulk storage tanks to Power Generation facility day tank.

Treated tests were conducted during the week commencing 25th September, 2006 on Generator sets 7, 9 and 10 only as unit 6 was undergoing a rebuild.

Power Generation loads for treated CMB tests were significantly lower than experienced during untreated tests and calculations have been applied to allow for this factor.

TEST METHODS

The Carbon Balance Measurement (CB) is a procedure whereby the mass of carbon in the exhaust is calculated as a measure of the fuel being burned. The elements measured in this test include the exhaust gas composition, its temperature and the gas flow rate calculated from the pressure and exhaust stack cross sectional area. Whilst this is an engineering standard test (AS2077-1982) in field testing we are unable to comply with the procedure in relation to employing a chassis dynamometer. However, in the case of power generation the alternator substitutes as a mechanism to apply a constant load.

TEST RESULTS

Table below provides results achieved in the CMB test program. As the kWs produced during the treated tests were lower than that produced during untreated tests, results have been calculated as grams/second per kilowatt and shown in the following table.

Carbon Mass Balance Fuel Consumption Test Results
Grams per second flow of carbon per kW

Unit No.	Baseline 26/7/06 g/s per kW	Treated 26/9/06 g/s per kW	Variation
6	0.01951	N/A	-
7	0.01778	0.01705	-4.1%
9	0.01784	0.01704	-4.5%
10	0.01772	0.01725	-2.7%
Average g/s	**0.01778**	**0.017113**	**-3.7%**

The CB test procedure provides confirmation that addition of FTC-3 Catalyst to the fuel supply has resulted in a reduction in carbon flow (fuel consumption) of **3.7%**.
The computer printouts of results and raw data sheets are contained in the *Appendix*.

Bosch Smoke Tests

A Bosch smoke test was also undertaken during conduct of the CMB tests and the results are shown in Table 2. Smoke emissions are generally reduced by up to 30 - 40% following the introduction of FTC Combustion Catalyst.

Tests conducted at this operation resulted in a slight increase in recorded smoke emissions which we believe may be a result of the lower load recorded during treated tests and the possibility that the engines combustion spaces may still be undergoing cleaning. As FTC does not clean up combustion spaces by a solvent action but by natural attrition of hard carbon, a badly carbon contaminated engine can take longer to clean and therefore reduce smoke emissions.

TABLE 2
Bosch Smoke Measurements

Unit No.	Baseline 26/7/06	Treated 26/9/06	Variation
7	1.3	1.4	7.1%
9	0.6	0.7	14%
10	0.7	0.9	22%
Average	**0.86**	**1.00**	**14%**

The Bosch Scale reads from 0.1 (very clean) to 9.9 (very dirty).

Greenhouse Gas Reduction

A gross reduction of **3.7%** of the current estimated annual fuel consumption of 9,600 KL translates to a **956 tonnes per annum reduction in CO_2 emissions** based on the formula outlined in Worksheet 1 of the "Electricity Supply Business Greenhouse Change Workbook". Our estimate is based on the following calculations:-

	(9,600 KL x 38.6 x 69.7) ÷ 1000	=	25,828 tonnes CO_2 per annum
- 3.7%	(9,245 KL x 38.6 x 69.7) ÷ 1000	=	24,872 tonnes CO_2 per annum

CO_2 reduction by application FTC-3
25,828 – 24,872 = 956 tonnes

CONCLUSION

These carefully controlled engineering standard test procedures conducted on Caterpillar 3516 generator sets Nos 7, 9, and 10 provide clear evidence of reduced fuel consumption in the range **3.7%**.

A fuel efficiency gain of **3.7%** as measured by the Specific Fuel Consumption test method if applied to the total fuel currently consumed by the power generation plant will result in a **956 tonnes per annum reduction in CO_2 emissions**.

Additional to the fuel economy benefits measured and a reduction in greenhouse gas emissions due to a more complete combustion of the fuel, a reduction over time in engine maintenance costs will also be realised.

Appendix "C"

Carbon Balance Data Sheets