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WESFARMERS COAL

Evaluation of FTC Combustion Catalyst as a means of reducing diesel fuel costs in mobile mining equipment

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Prepared by:

Fuel Technology Pty Ltd
3/18 Parry St
FREMANTLE WA 6160
(PO Box 1271)

Tel: (08) 9335 6899
Fax: (08) 9430 5403
E-mail fueltech@nettrek.com.au

ACN 063 561 151

C O N T E N T S

Appendix

EXECUTIVE SUMMARY

The FTC/FPC Combustion Catalysts manufactured and marketed by Fuel Technology Pty Ltd have proven in laboratory and field trials to significantly reduce fuel consumption under comparable load conditions and to also substantially reduce carbon emissions.

Following meetings with Wesfarmers Coal Maintenance Manager, Bob Garrick, Mobile Equipment Superintendent, Barry Giblett and Workshop Supervisor, Rod Simmonds, it was agreed that a fuel efficiency study should be conducted on a Komatsu 830E and a Euclid R260 employing "Specific Fuel Consumption procedure". This trial commenced on 11th April 2001 and was due to be completed 6-8 weeks later. Due to changing haul profiles the second stage of this trial was unable to be completed and following further discussions with Wesfarmers Coal management it was agreed to conduct static tests employing the "Carbon Mass Balance" (CMB) procedure.

The net average efficiency gain (reduction in fuel consumption) measured by the CMB test methods was **7.3%**.

BACKGROUND

The FTC Combustion Catalyst is the only fuel chemical yet proven by the world's leading testing authority, Southwest Research Institute (Texas) to improve fuel efficiency in an as new 2500HP diesel engine operating at its most efficient state. SwRI also determined that FTC does not alter the physical or chemical properties of diesel fuel.

SwRI also determined, using the Caterpillar 1G2 Test (ASTM 509A) that there are no detrimental effects that could cause increased wear or deposit problems following catalyst treatment of fuel.

These findings have been verified by countless field studies in diverse applications, which have confirmed efficiency benefits for mine mobile equipment. Maintenance benefits documented include reduced wear metal profiles in lubricating oil and reduced soot. Combustion and exhaust spaces become essentially free of any hard carbon with continuous catalyst use.

FTC's action in producing fuel efficiency gains is to promote a faster fuel burn which releases the fuel's energy more efficiently. That is, a larger portion of the fuel burn occurs when the piston is closer to top dead centre.

INTRODUCTION

Equipment provided for this fuel efficiency evaluation comprised of three Euclid Detroit 4000 series powered haul trucks and two Komatsu Detroit 149 powered trucks.

Fuel Technology Pty Ltd supplied, on loan, an air operated FTC catalyst metering system which was calibrated allowing fuel to be FTC treated at time of fuel service trucks being filled.

Due to change in test circuit profile and subsequently the change in test methods plus the fact that fuel was being FTC treated prior to commencement of CMB static tests, these tests were conducted in reverse, that is FTC treated tests were conducted on the 3rd July 2001 at which time treatment of fuel ceased and return to untreated fuel tests conducted on 31st July 2001.

TEST METHOD

The Carbon Mass Balance (CMB) 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, (HC,CO,CO_2 and O_2) temperature and the gas flow rate calculated from the differential pressure and exhaust stack cross sectional area. This is an engineering standard test (AS2077-1982) and has been used by the US EPA since 1974 as the "Standard Federal Test Procedure" for fuel economy and emission testing.

Each test truck was driven to the workshop where CMB test probe was positioned in the exhausts independently. With the assistance of workshop personal the test truck engine was loaded via electrical load box to simulate operating conditions. The rpm and hp were recorded to allow these operating parameters to be repeated during the second stage of the test.

TEST RESULTS

A summary of the CMB fuel efficiency results achieved in this test program are provided in the following table.

TABLE 1
Carbon Balance Fuel Consumption Test Results

Unit No.	Untreated 31/7/01 Carbon flow g/s	Treated 3/7/01 Carbon flow g/s	Variation
1131 Front Exhaust	48.044	45.217	
1131 Rear Exhaust	51.750	49.170	
TOTAL g/s	**99.175**	**94.387**	**-4.8%**
1132 Front Exhaust	43.692	41.245	
1132 Rear Exhaust	33.778	31.596	
TOTAL g/s	**77.470**	**72.841**	**-6.0%**
1137 Right Exhaust	49.361	46.721	
1137 Left Exhaust	47.511	43.241	
TOTAL g/s	**96.872**	**89.962**	**-7.1%**
1139 Right Exhaust	51.814	20.665	
1139 Left Exhaust	49.387	22.194	
TOTAL g/s	**101.201**	**42.859**	**-57.6%**
1140 Right Exhaust	44.678	39.858	
1140 Left Exhaust	49.564	43.813	
TOTAL g/s	**94.242**	**83.671**	**-11.2%**
AVERAGE EXCLUDING # 1139	**367.759**	**340.861**	**- 7.3%**

The CMB test procedure provides confirmation that addition of the Catalyst to the fuel supply has resulted in a reduction in carbon flow (fuel consumption) of **7.3%** excluding truck 1139. Tests conducted on truck 1139 indicate that during CMB treated test the truck may not have been producing the hp as measured. The computer printouts of results and raw data sheets are contained in the *Appendix*.

Following are photographs showing CMB measurements and Bosch smoke sampling in process.

BOSCH SMOKE MEASUREMENTS

A Bosch smoke test is also undertaken during conduct of the CMB test and the results are shown in the following table. Significant reductions in smoke particulates are not generally measured after only one month's running on FTC/FPC treated fuel or in this case only 3 weeks return to untreated fuel. Smoke patches in *Appendix*.

TABLE 2
Bosch Smoke Results

Unit No.	Untreated 31/7/01	Treated 3/7/01	Variation
1131 Front	0.6	0.4	
1131 Rear	0.6	0.3	
AVERAGE	**0.6**	**0.35**	**- 41%**
1132 Front	0.2	0.4	
1132 Rear	0.2	0.1	
AVERAGE	**0.2**	**0.25**	**+ 25 %**
1137 Right	0.5	0.6	
1137 Left	0.5	0.4	
AVERAGE	**0.5**	**0.5**	**N/C**
1139 Right	2.2	0.6	
1139 Left	0.7	0.7	
AVERAGE	**1.45**	**0.65**	**- 55 %**
1140 Right	0.6	0.6	
1140 Left	0.5	0.5	
AVERAGE	**0.55**	**0.55**	**N/C**
Average Excluding # 1139	**1.85**	**1.65**	**-10.8 %**

GREENHOUSE GAS REDUCTION

A gross reduction of **7.3%** of the current estimated annual fuel consumption of 18,000 KL translates to a **3,799 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:-

(18,000 KL x 38.6 x 74.9) ÷ 1000 = 52,041 tonnes CO_2 per annum

- 7.3% (16,686 KL x 38.6 x 74.9) ÷ 1000 = 48,242 tonnes CO_2 per annum

CO_2 reduction by application FPC Catalyst
52,041 – 48,242 = 3,799 tonnes

CONCLUSION

These carefully controlled engineering standard test procedures conducted on a selection of Wesfarmers Coal fleet provide clear evidence of average reduced fuel consumption of **7.3%**.

A fuel efficiency gain of **7.3%** as measured by the Australian Standards (AS2077) CMB test method, if applied to the total fuel currently consumed by Wesfarmers Coal will result in a **net** saving of in excess of **$550,000 per annum.**

Additional to the fuel economy benefits measured, is a reduction in greenhouse gas emissions of 3,799 tonnes per annum due to more complete combustion of the fuel. Further, the more complete combustion will translate to significant reduction over time in engine maintenance costs. FTC/FPC also acts as an effective biocide.

Appendix "D"

Fuel Technology Measurements using Carbon Balance Techniques