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TECHNICAL NOTE TN-4

CARBONFLO FUEL CONDITIONING DEVICE

INTRODUCTION

The CARBONFLO device consists of a canister containing a compound of metals, the predominant constituent of which is tin. The canister is fitted in the fuel line of either petrol or diesel engines, and the compound of metals is continuously released into the fuel in molecular form.

The action of this compound is claimed to provide a number of benefits, including greater upper cylinder lubrication, cleaner injectors, smoother, cleaner combustion and lower exhaust emissions, and the removal of carbon deposits from the combustion chamber. These factors combine to give a claimed better engine performance and lower fuel consumption.

This report presents the results of a laboratory investigation into the performance of the CARBONFLO product. These tests were conducted by LIRO at the University of Auckland.

Figure 1 - The Lister Test Engine

TEST EQUIPMENT AND PROCEDURE

The test engine was a water cooled Petter-Lister PHW1, a single cylinder direct injection diesel which had been mounted on a test bed and connected to an engine dynamometer. The engine was instrumented for combustion air and fuel flow rates, exhaust gas and inlet air temperatures, rpm and torque. The concentrations of oxygen and carbon monoxide in the exhaust were also measured.

Baseline data without the CARBONFLO fitted were recorded at the following operating conditions:

- 1000, 1500 and 1750 rpm, 0, 1/4, 1/2, 3/4 and full load at each speed.

For each test the following data was recorded :

- exhaust oxygen and carbon monoxide concentrations
- engine speed and torque

- inlet air and exhaust temperatures, engine oil and water temperatures
- atmospheric pressure and peak cylinder pressure
- fuel and air flow rates

At each test condition three sets of data were recorded. The engine was given time to reach a stable operation at each test condition, and it was endeavoured to keep water and oil temperature constant for all tests. At the end of this testing the cylinder head was removed to examine and photograph the combustion chamber deposits.

The CARBONFLO was then fitted to the engine, and following a conditioning period of 40 hours, the same test program was repeated (including the examination of the carbon deposits). At the completion of these tests, the CARBONFLO was removed and repeat tests conducted at six operating conditions.

RESULTS

Apart from some odd behaviour at 1500 rpm tests, the fuel consumption data collected for the baseline tests proved quite repeatable. On each day of testing, several operating conditions from the day before were repeated, and the data were within $\pm 2\%$ of the previous data. At 1500 rpm two operating regimes were observed which had significantly different fuel consumptions. This anomaly has been attributed to some variability in the fuel injection equipment during these tests.

Table 1 shows the fuel consumption results from the tests. It can be seen that for most of the tests, there is little difference in the fuel consumptions with and without the CARBONFLO device (excepting the 1500 rpm tests where the engine seemed inherently variable). Of particular significance are the repeat tests, which indicate there is no significant effect of the device on the fuel itself.

Brake Specific Fuel Consumption (g/kW.hr)			
Operation	**NCF[1]**	**CF**	**NCFR**
1000 rpm, 8 Nm	390.3	379.5	-
1000 rpm, 17.5 Nm	292.1	292.7	291.1
1000 rpm, 28 Nm	262.2	263.0	265.3
1000 rpm, 38 Nm	283.4	268.9	271.4
1500 rpm, 7.5 Nm	443.8	400.5	-
1500 rpm, 18.5 Nm	283.4	263.6	268.6
1500 rpm, 28 Nm	261.3	236.1	234.6
1500 rpm, 38 Nm	278.0	236.7	235.6
1750 rpm, 9 Nm	352.0	352.5	-
1750 rpm, 19 Nm	253.1	253.1	-
1750 rpm, 30 Nm	216.0	227.5	-
1750 rpm, 39 Nm	235.1	237.3	-

Table 1 - Fuel Consumption Results

There is no doubt that the CARBONFLO was actually "bleeding" a substance into the fuel, as deposits removed from the cylinder pressure transducer passage during testing changed colour from black to brown and back to black as the CARBONFLO was fitted and removed from the engine.

The amount of carbon deposit on the cylinder head and on the piston did not appear to have been significantly affected by the 50 hours of operation with the CARBONFLO.

CONCLUSION

On this particular engine there was no significant change in fuel consumption or performance that could be directly attributed to the CARBONFLO device. The device did definitely bleed a compound into the fuel however.

A full report detailing this testing is available on request to LIRO members from the LIRO Information Centre.

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