THE UNIVERSITY OF WESTERN AUSTRALIA

Engineering Design and Consultancy Centre

School of Mechanical Engineering

Further tests on the G-cylinder fuel-saving device

for

Itochu Australia Ltd.

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Introduction.

The School of Mechanical Engineering at UWA was asked to carry out a second set of tests on a "G-cylinder" fuel saving device on behalf of Itochu Ltd. The G-cylinder is a device that wraps around the fuel line of a diesel of petrol engine, and is claimed to condition the fuel to give better combustion, and hence reduced fuel consumption. A series of tests was carried out by Dr. Angus Tavner and Mr. Malcolm Stafford of UWA on the morning of December 10th 2004. The tests were attended by Mr. Ichiro Matsuura of Itochu Ltd, and Mrs. Harumi Suzuki of B.Tec Ltd.

Testing method.

As before, tests were carried out on a Holden 161 "red" engine, a six-cylinder in-line engine with a cubic capacity of 161 cubic inches or 2.64 litres. The engine was manufactured in 1966, and has been run for approximately 465 hours since the last major overhaul. It is well maintained and in a good state of tune. Fuel is supplied to the engine by a single Stromberg carburetor mounted on a marine inlet manifold (which is more suited to a static engine installation). The engine drives a Froude-style water-brake dynamometer.

Six tests were carried out:

1. ¼ throttle, 2500rpm, no G-cylinder. Testing time 15 mins.
2. Full throttle, 2500rpm, no G-cylinder. Testing time 15 mins.
3. ¼ throttle, 2500rpm, G-cylinder attached. Testing time 15mins.
4. Full throttle, 2500rpm, G-cylinder attached. Testing time 15 mins.
5. Full throttle, 2500rpm, no G-cylinder. Testing time 15 mins.
6. ¼ throttle, 2500 rpm, no G-cylinder. Testing time 15 mins.

Each test was preceded by a brief period to allow the engine to stabilize, giving a total engine running time of 2 hours 30 minutes.

Between tests 2 and 3, two G-cylinder devices were installed by Mrs. Suzuki on a plastic section of the fuel line between the mechanical fuel-pump and the carburetor. The two devices were earthed directly to the battery. Following the installation of the G-cylinders, the engine was left to run for at a fast idle (1500rpm, no load) for 30 minutes, on the advice of the inventor. The G-cylinders were removed after test 4, and the engine was again run at a fast idle for 30 minutes. Tests 5 and 6 were to check for any residual effect. Engine speed and load, cooling-water inlet and outlet temperatures, exhaust and inlet-air temperatures, air-flow meter pressures, and fuel consumption were recorded during each test at intervals of 5 minutes. The fuel used was standard unleaded, and the specific gravity was measured by hydrometer as 714kg/m^3.

Results.

Results recorded during the six tests were used to calculate average values of specific fuel consumption in kg/kWh for each test. Specific fuel consumption takes into account small variations in engine speed, throttle position, and load for different tests, and is therefore the most robust way of comparing results.

Test 1: 0.482 kg/kWh	¼ throttle, no G-cylinder
Test 2: 0.362 kg/kWh	full throttle, no G-cylinder
Test 3: 0.366 kg/kWh	full throttle, with G-cylinder
Test 4: 0.456 kg/kWh	¼ throttle, with G-cylinder
Test 5: 0.549 kg/kWh	¼ throttle, no G-cylinder
Test 6: 0.371 kg/kWh	full throttle, no G-cylinder

Errors and accuracy.

Times for fuel delivery were recorded manually, and are therefore accurate to within +/- 0.25s over a time of approximately 45s, which represents a possible error of approximately 1%. Load recorded on the dynamometer could be read to within 0.25lbs for a load of approximately 24lbs, which represents an error of approximately 1%. RPM was measured with a hand-held tachometer, accurate to within 20rpm at 3000rpm, an error of less than 0.7%. Variations in laboratory temperature were small, the maximum difference being from 26^{o}C at the start of test 1 to 28^{o}C at the end of test 6. Atmospheric pressure was constant at 1013 mb for all tests. The calculated results of specific fuel consumption should therefore be accurate to within 3%, and inaccuracies will to some extent be mitigated by the use of an average of several readings taken for each test, although in this instance the testing times were rather shorter than the author would have wished.

Discussion.

There are no significant changes to the fuel consumption in the three full-throttle tests. However, the ¼ throttle tests with the G-cylinder show a noticeable decrease in specific fuel consumption. The results from test 4, ¼ throttle with the G cylinder attached, give a 5% reduction in fuel consumption compared with test 1, and a 17% reduction compared with test 5. This variability demonstrates the problems that can emerge when running relatively short tests. The absence of an improvement at full throttle could be due to the engine being tuned rather rich at this throttle setting; this is to protect the engine.

It should be noted that these tests were of a limited nature, and run for a short time. The engine was run at a constant speed at high load or partial load, which is not representative of driving a vehicle in an urban environment.

Conclusions.

In the set of tests carried out for this investigation, the presence of the G-cylinder made an improvement to the specific fuel consumption when running at ¼ throttle. The G-cylinder made no measurable difference to the specific fuel consumption when running at full throttle. The very brief nature of this test, and the variable nature of the results suggest that a longer and more complete set of tests should be used to fully evaluate the G-cylinder.

Dr. Angus Tavner

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