



## **ELECTRIC WHEEL HAUL TRUCK, FUEL CONSUMPTION TEST PROCEDURE**

### ***Introduction***

In marketing FTC Combustion Catalysts to clients with mobile mine equipment Fuel Technology have recognized the need to provide a means to demonstrate the expected benefits of FTC in the clients own mining fleet. The main difficulty in running any trial is controlling the variables of normal operation, which can influence the results of a trial other than the effects as a result of FTC addition to the fuel.

Whilst various methods have been used in the past, namely a method derived from AS2077-1982 Carbon Balance and the statistical analysis of daily operational data, in some instances these methods have not been suitable to evaluate FTC under the prevailing site conditions.

Fuel Technology has developed a dynamic field test in conjunction with a major mining contractor, where the fuel consumed by the haul truck can be measured against work done to provide a fuel efficiency measure for comparison of untreated and treated tests. This test requires specialized test equipment including a vehicle fitted with a load monitor.

To demonstrate the fuel efficiency benefits of FTC to clients with electric wheel haul trucks not fitted with a load monitor, a derivation to the dynamic test has been used to provide an alternative basis for measuring fuel consumption but still be representative of normal operating conditions.

This technical bulletin provides an overview of the test procedure, equipment required and the reporting of results for clients wishing to undertake a trial of FTC using the Electric Wheel Haul Truck Fuel Consumption Test Procedure.

### ***Equipment***

To enable a controlled test to be conducted the engine load and fuel consumed needs to be measured.

Previous tests have been conducted by using an electrical analyser equipped to measure load (kW/HP) and RPM (Provided by site)

Two (2) calibrated flow transducers fitted with pulse output coupled to a Minitrol Totaliser to measure fuel flow. Photographs 1 and 2 show the flow transducers and Minitrol in operation. (Provided by FTPL)

Fuel Temperature/Density to be monitored.

- A) A calibrated hydrometer and thermometer measure density. Corrections for variations in fuel temperature and density are made in accordance with Institute of Petroleum Density Correction Tables 53B.
- B) Fuel Operating Temperatures are measured by thermocouple probes fitted in each flow transducer and a Fluke 51 K/J digital thermometer with dual temperature readouts.

A quartz crystal digital stopwatch is employed for timing each run.

### ***Method***

The Flow transducers will be connected to the truck's fuel tank inlet and outlet pipework and electrically connected to the Minitrol unit. Time involvement to install the equipment is approximately 20 minutes. The electrical analyzer is also fitted.

Prior to the first run a sample of fuel will be drawn from the truck's tank and density assessed and corrected to 15°C.

Engine load can be achieved by connecting to an external load box or through the resistor bank of the truck.

The trial crew will generally involve: -

- 1) The truck driver
- 2) Fuel Technology engineer
- 3) Customer engineer

### ***Procedure***

Using the electrical analyzer the truck will first be checked at full load and RPM and adjusted to meet specification.

The truck is then run up to predetermined load settings. A series of measurements will be made of fuel in and return from the engine to determine net fuel in litres consumed at the fixed load. To avoid resistor bank overheating it is anticipated to take 4-6 readings of 2-minute intervals each. The test is repeated over the load range of the truck at the designated load settings that relate to the duty cycle advised by the client.

The test data is entered on to a data sheet for later evaluation and includes:

Load (kW/ Hp)

RMP

Fuel In

Fuel Return

Fuel Temperature In

Fuel Temperature Return

Ambient Air Temperature (Start/ Finish)

Ambient Pressure

### ***Reporting***

At the conclusion of the trial the fuel consumed by the truck for each run will be calculated by: -

- 1) Calculating the mass (kilograms) of the fuel measured by each flow transducer for each run at the observed temperature.
- 2) The outlet mass of fuel from the engine is subtracted from the inlet mass of fuel to the engine to calculate the net mass of fuel consumed by the truck over the run.

Net mass of fuel consumed is plotted against load and RPM. This will be used to determine fuel consumption characteristics over the load range tested.

The trial is based on a back to back untreated and treated tests with approximately a 300 hour treatment period. On completion of a successful trial a full report will be submitted detailing the results and test methods supported by all raw data.

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