



BRIEF SUMMARY OF THE AECC HEAVY-DUTY EURO VI TEST PROGRAMME

In February 2007 AECC completed a Heavy-duty Euro VI test programme demonstrating the emissions potential of an integrated emissions control system combining Diesel Particulate Filtration with Selective Catalytic Reduction of NO_x, applied to a commercially-available low-NO_x engine designed to meet the US2007 emissions requirements. The emissions system was over-aged for 200 hours using standard industry procedures. This work provided a follow-up to AECC's previous Heavy-duty demonstration programme using a Euro III engine, which achieved emissions half the Euro V limits after 1000 hours test-bed ageing (equivalent to 250 000km) when fitted with a similar system. Both programmes were run at an independent laboratory by experts in heavy-duty engines.

The results obtained from the new AECC Heavy-duty Euro VI programme showed NO_x emissions of 0.150g/kWh over the European Transient Cycle (ETC), particulate mass below 0.005g/kWh, and three orders of magnitude reduction in particle numbers. The system efficiencies on the ETC test were 86% for NO_x reduction, over 99.5% for PM and over 99.9% for particle number.

The AECC Euro VI test programme was intended to confirm the efficiency of the emissions control system when applied to a low-NO_x engine. In addition it was thought useful to provide data on the use of the PMP methodologies developed by a UN-ECE working group for determination of particle numbers and for improved accuracy of particulate mass measurement. These methods are currently being subjected to round-robin testing in a programme co-ordinated by DG-JRC.

An engine meeting specifically the US2007 emissions requirements, but described to AECC as a 'world engine', was selected as the base for this test programme as no European low-NO_x engines were available to us. It has to be recognised that this engine had higher fuel consumption that would be considered normal for a European engine; nevertheless, it is a commercially-available engine which meets the US2007 emissions regulations. We understand that further developments in engine technology are to be expected before Euro VI comes into force.

Further optimisation of the system, including the sizing of the emissions control units, would be expected as part of the development process for a production application. In particular:

- The US2007 engine calibration was unchanged and hence was not optimised for either emissions or fuel economy over the European or other test cycles.
- The engine as supplied was provided with an original-equipment particulate filter, which was replaced by the AECC system. The calibration for filter regeneration, designed to meet US2007 commercial and legislative requirements, was not changed.
- A low-dose urea-injection system was fitted as part of the AECC system. It was calibrated only over the European Steady-state and Transient cycles (ESC and ETC) and the World-harmonised Heavy-duty Transient Cycle (WHTC). Emissions measurements were made over other cycles, including the US cycle, but with no further optimisation of the urea dosing system.
- Although thermal management would be expected to have improved NO_x performance over cold-start cycles, the timing of the programme did not allow this to be included.
- The test work included a limited number of tests on a 30% biodiesel fuel. Unfortunately the power loss on this fuel, without any change in engine calibration, was such that it was not possible to run transient tests.

The purpose of the AECC programme was to provide a demonstration of state-of-the-art emissions control technologies with a low-NO_x engine. AECC has not made any proposals as to future limit values. AECC recognises that the system used in the programme was not fully optimised and further optimisation of the emissions controls and developments in engine technology are to be anticipated before the implementation of Euro VI.