Program for Advanced Vehicle Evaluation

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Report on

SAE J1321 (TMC RP-1102) Type II Fuel Consumption Test

Conducted for

World NCI
312 West Fourth Street
Carson City, NV 89703

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ABSTRACT

The purpose of the testing program described herein was to evaluate the impact on fuel economy resulting from the addition of a Fuel and Air Saver Technology (FAST) aftermarket closed crankcase breathing system to a 2004 Detroit Diesel 435 BHP Series 60 14L engine after running thousands of conditioning miles (in this case, over 8,500). The device under evaluation was a modified version of the FAST unit previously tested by the PAVE Research Institute in December of 2006 and February of 2007. Retesting became necessary when the installation procedure was modified in order to eliminate positive crankcase pressures in excess of the engine manufacturer's recommendations, which caused oil seal seepage on the PAVE test vehicle back in 2007.

Testing was conducted by the PAVE Research Institute between the dates of April 30 and May 20, 2008 on the 1.7-mile closed loop oval NCAT Pavement Test Track. The TMC/SAE Type II test procedure was used, incorporating the SAE 40-mile minimum test run. The following change in fuel economy was observed after 8,715 miles:

- 2.3% improvement in fuel economy (reference tire change effects below)

Two 2004 Freightliner C120 Columbia Series tractors each pulling heavy triple trailer trains served as the treatment and control vehicles, both powered with identical drive trains. The triple trailers utilized for this test were production units loaded with metal sheets intended to optimize damage on experimental pavements, producing an average GCW of approximately 155,000 pounds. Cruise control was used during testing to target speeds of between 45 and 50 mph. At these speeds, trucks are driven in direct gear (1:1) producing an engine speed of approximately 1,533 RPM. Demand wheel horsepower is approximately 200 to 300 WHP depending on location on the test oval.

During testing, fuel consumption was measured in 50-gallon portable weigh tanks. The weight of fuel consumed after each test run was measured on an Ohaus Champ II Model CH300R digital scale with a 650 pound capacity. Scale calibration was checked before and after each stage of testing. Test fuel was ULS diesel #2 with a measured specific gravity of 0.848 @ 60 degrees Fahrenheit. The same drivers remained with both the control vehicle and the treatment vehicle for the duration of testing.

The baseline segment of this test was run using two untreated vehicles, and the treatment segment was run with the FAST unit installed on the test truck after 8,715 conditioning miles. It should be noted that a combined total of 12 tires (9 on the test vehicle and 3 on the control vehicle) were changed between baseline and treatment testing; consequently, it is impossible to know how much of the 2.3 percent improvement resulted from the effect of the experimental treatment and how much resulted from any change in rolling resistance that could have been caused by the necessary tire changes. The potential impact of tire changes on fuel economy is fully explained in RP 1111 (page 6).

The revised FAST installation evaluated in this test utilized two receiving canisters plumbed between the crankcase blow-by tube and the turbo inlet in parallel. Additionally, both collection canisters were equipped with bottom-fed drain tubes that ran via gravity to a larger collection reservoir mounted on the back side of the front bumper. An oily residue was first noted in the bumper-mounted collection canister on May 19th, the day before high mileage fuel economy data was collected. An oily coating was observed on the turbo compressor wheel on May 5th after running approximately 2,000 miles. The unit was inspected weekly thereafter, with the understanding that testing would be stopped if the condition worsened. No additional buildup was noted and the condition of the turbo compressor wheel was documented with dated photographs provided in the full report. Crankcase pressure rose from a maximum of 0.9 inches of H_20 immediately after installation to a maximum of 1.1 inches after completion of the conditioning miles (neither value exceeding the engine manufacturer's design limit).