EMISSIONS and FUEL ECONOMY EFFECTS

of

Super FUELMAX

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PRELIMINARY ANALYSIS

October 4, 2005

1.0 Abstract

This preliminary analysis describes EPA analysis of the Super FUELMAX retrofit device under 49 U.S.C. § 32918. Testing was conducted at the National Vehicle and Fuel Emissions Laboratory (NVFEL) in Ann Arbor, Michigan at the request of the Federal Trade Commission (FTC).

The Super FUELMAX is described by the manufacturer as a set of two magnets made with "a neodymium blending". The Super FUELMAX is intended to be installed in either cars, trucks or boats; either gasoline or diesel-powered. The device is fitted around the fuel-delivery pipe to the engine. The manufacturer claims that ..."this results in more complete burn [sic], thereby saving fuel and reducing emissions." Instructions accompanying the device claim an increase of fuel-mileage up to 27%.

Two light-duty vehicles were used to evaluate the Super FUELMAX. A 2002 Chevrolet Cavalier and a 2003 Chevrolet Cavalier. Both were equipped with 2.2 liter, four-cylinder engines and automatic transmissions.

The analysis included a comprehensive inspection and maintenance identical to that performed on in-use vehicles in the Certification and Compliance Division (CCD) in-use compliance and recall program.
The Federal Test Procedure (FTP) was used throughout this analysis. Three baseline tests (FTP) were performed on each vehicle, the device was then installed and three further tests were completed on each. As suggested by the manufacturer, each vehicle was road-driven for more than 2500 kilometers following the device installation. Further testing was carried out at the conclusion of mileage-accumulation: three tests were run on each vehicle with the device still in place - followed by an additional three tests without the device (a repeat of the baseline testing.) When comparing both sets of tests independently, i.e. before and after mileage accumulation, no benefit in fuel-economy or exhaust emission performance due to the device can be found in the data generated by the two vehicles.

The EPA concludes the following from the testing conducted on these two vehicles: the Super FUELMAX device has no effect on fuel economy or exhaust emissions.

2.0 Background

Under Section 511 of Motor Vehicle Information and Cost Savings Act (MVICSA), EPA performs, in response to requests from certain sources, an evaluation of aftermarket retrofit devices and fuel additives (collectively referred to as devices) that are claimed to improve fuel economy and emissions. EPA receives information about many of these devices that are

represented by the device manufacturer as offering a potential for reductions in emissions and/or an improvement in the fuel economy of conventional automobiles. EPA's CCD is interested in evaluating such devices because of the benefits the test results and analysis have for the nation. EPA invites developers of devices to submit information on the principle of operation together with available preliminary test data. In those cases where the manufacturer's application meets certain established program criteria, and the device shows promise in preliminary screening tests at an independent laboratory, confirmatory tests may be run at EPA's National Vehicle and Fuel Emissions Laboratory (NVFEL) in Ann Arbor, Michigan at the expense of the applicant. EPA is also required to evaluate devices at the request of the Federal Trade Commission and may perform such a device evaluation at the discretion of the EPA Administrator. Section 511 of the MVICSA is codified at 40 CFR, Part 610 – Fuel Economy Retrofit Devices.

The conclusions drawn from EPA evaluation tests are necessarily of limited applicability. An all encompassing evaluation of the effectiveness of a device in achieving performance improvements on the many types of vehicles that are in actual use would require a large sample of test vehicles. This is not economically feasible in the evaluation projects conducted by EPA. Therefore, the conclusions from such device evaluation tests can be considered to be quantitatively valid only for the specific test cars used; however, it is reasonable to extrapolate the results from EPA tests to other types of vehicles in a directional manner; i.e., to suggest that similar results are likely to be achieved on other similar types of vehicles.

3.0 Introduction

This preliminary analysis describes EPA testing of the Super FUELMAX retrofit device under 49 U.S.C. § 32918. The evaluation was conducted to address claims of improved fuel-economy and tailpipe emissions due to the installation of this device. Testing was conducted due to a request by the Federal Trade Commission (FTC).

4.0 Purpose of the Test Program

The purpose of this analysis was to conduct a controlled technical evaluation of the Super FUELMAX magnetic device in a manner that would address the manufacturer's claims for significant improvement in fuel-economy, accompanied by a reduction in tailpipe emissions. All fuel-economy and tailpipe emission comparisons, with and without the device, were achieved using data generated during FTP test cycles.

Purpose of the Super FUELMAX device:

The Super FUELMAX which can be installed on cars, trucks and boats, is claimed by the manufacturer to significantly improve fuel-economy and decrease emissions. Their advertisements and information accompanying the installation instructions indicate a 27% fuel-economy improvement.

Applicability:

All gas and diesel powered cars, trucks and boats.

Construction and Theory of Operation:

The Super FUELMAX is described by the manufacturer as a set of two magnets made with "a neodymium blending". Neodymium is a rare-earth element, a metal with an atomic weight of 60 which carries the symbol Nd . Usually, commercially available magnets which contain neodymium are blended with iron and boron. The Super FUELMAX is intended to be installed in either cars, trucks or boats; either gasoline or diesel-powered. The device is fitted around the fuel-delivery pipe to the engine. The manufacturer claims that, "After going past the FUELMAX device, the hydrocarbon chains are fractured into smaller pieces by resonance, and now positively charged the fuel molecularly attracts the air for better oxidation."

According to EPA regulations, devices evaluated are organized into categories for the purpose of evaluation criteria and test procedures (40 CFR 610.21 (c)). This device fits into the "Other miscellaneous" category and does not effect vehicle functional characteristics.

Device integrity was evaluated to the extent possible during this preliminary analysis. Since this evaluation was initiated via a FTC request, EPA only received the device provided by FTC, no drawings, specifications or other fabrication and quality assurance controls were provided by FTC or the device manufacturer. No deterioration or malfunction was noted during the testing of this device. There was no manufacturer–furnished test-data to evaluate.

Because there are no operator interaction effects, the device was not evaluated with respect to the operator.

Specific Claims:

Decrease in tailpipe emissions and increase in fuel-economy by as much as 27%

5.0 Test Plan

This report describes EPA testing of the Super FUELMAX retrofit device under 49 U.S.C. §

32918. This testing was conducted at the National Vehicle and Fuel Emissions Laboratory (NVFEL) in Ann Arbor, Michigan at the request of the Federal Trade Commission.

Two light-duty vehicles were used to evaluate the Super FUELMAX. A 2002 Chevrolet Cavalier and a 2003 Chevrolet Cavalier. Both were equipped with 2.2 liter, four-cylinder engines and automatic transmissions. One vehicle, 0001, started testing at odometer 37,349 miles. Vehicle 0002 started testing at odometer 17,124 miles.

The test plan included a comprehensive inspection and maintenance identical to that performed on in-use vehicles in the CCD recall program.

EPA received no manufacturer-furnished test data for analysis.

Prior to any testing, both vehicles were drained of commercial fuel and filled with Phase II test-fuel. One pint of commercially-available fuel-injection cleaner was added to the fuel-tanks (as recommended by the manufacturer) and each car was driven two hundred miles to stabilize any combustion-chamber deposits. Immediately prior to the testing, both vehicles were operated on the US06, high-speed cycle to minimize any sulfur-buildup in the catalytic converters.

The FTP was used throughout this test-program. The FTP is used by manufacturers and EPA to certify that new cars and trucks produced for sale in the U.S. meet applicable emission and fuel-economy standards. Three baseline tests (FTP) were performed on each vehicle, the device was then installed per manufacturer's instructions and three further tests were conducted. No adjustment was made to any engine-components between tests. As suggested by the manufacturer, each vehicle was put on the road for more than 2500 kilometers..."for removal effects of carbon and varnish buildup in the engine" following the device installation and testing. Further testing was carried out at the conclusion of mileage-accumulation: three tests were run on each vehicle with the device still in place - followed by an additional three tests w/o the device (a repeat of baseline testing.)

6.0 Results

An examination of the two paired-data groups - baseline vs. with-device, before and after mileage accumulation, indicate no statistically significant changes in either fuel-economy value (city and highway). One vehicle showed a slight increase in fuel-economy with the device before and after mileage accumulation; the other a slight decrease. A statistical evaluation indicates no fuel-economy benefit due to the device. (See appendix for data presentation.)

Carbon monoxide (CO) was the only emission significantly greater in a statistical t-test comparison without the device vs. with the device. This significant result occurred for vehicle 002 after mileage accumulation, in which the mean CO was 0.7113 with the device compared to

1.406 without the device. No similar pattern was observed from vehicle 001, in which CO was measured at 0.7877 with the device and 0.5027 without the device. None of the other nine comparisons of emissions or fuel economy after mileage accumulation was significant.

Examination of data with the device installed- separated only by mileage accumulation- appears to indicate an improvement in fuel-economy due to the device. However, the baseline retests after mileage accumulation (immediately after removing the device) indicated that any improvement in the fuel-economy value was not due to effects of the device. Had the device any effect at all, it would have been observed if baseline retests after mileage accumulation matched the original baseline tests. This was not the case.

There is no cost savings realized from device ownership from fuel economy effects since EPA testing demonstrated no statistical fuel economy benefits.

7.0 Conclusions

The EPA concludes that the Super FUELMAX provides no fuel-economy or tailpipe emission benefit in either of the vehicles tested. One emission result for CO was found to be significantly larger without the device, but the result was not confirmed by tests run on vehicle 001.

Because this preliminary analysis shows no significant beneficial effect on fuel economy, EPA has decided not to further test this device.

APPENDIX