

1989 E350 Diesel Delivery Van

Emission Test - FTP 505

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Final Report on Testing of
a Ford E-350 Diesel Truck

Performed for
Combustion Technologies, LLC

August 16, 2002

Automotive Testing and Development Services, Inc.

400 South Etiwanda Avenue Ontario, CA 91761
Tel (909) 390-1100 Fax (909) 390-9056

AUTOMOTIVE TESTING AND DEVELOPMENT SERVICES, INC.

August 16, 2002

Mr. Robert Pond
Combustion Technologies, LLC
5115 Via del Fierro
Yorba Linda, CA 92887

Dear Mr. Pond:

Automotive Testing and Development Services, Inc. (ATDS) is pleased to present the attached Final Report on the testing performed for Combustion Technologies, LLC, on a 1989 Ford E-350 Diesel truck. All testing was performed in accordance with the requirements of 40CFR86, EPA and CARB regulations, and was subjected to an in-house quality review prior to release.

ATDS has been providing certification and emissions testing support to the automotive Industry for 13 years; individual members of our staff have over 25 years experience Each in engineering and automotive design and testing. We have provided support for After market parts Executive Orders and tests of fuels and fuel additives. Our Combination of both past and very recent experience is perhaps unique among Independent engineering service providers and provides our customers a high level of Confidence in our ability to get the job done.

We look forward to working with Combustion Technologies in future efforts to bring
Dipetane treated fuel to the California diesel fuel Market.

Sincerely,

Signature on file

Linwood E. Farmer Jr.
Division Vice-president

Enclosures: (1) Final Report on Testing of a Ford E-350 Diesel Truck

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Executive Summary

On behalf of Combustion Technologies LLC, ATDS tested the effect of Dipetane treated diesel fuel on exhaust emissions and fuel economy of a 1989 Ford E-350 diesel powered truck utilizing California standard diesel fuel. Before and after Hot 505 chassis dynamometer emissions tests were performed to demonstrate the effect of Dipetane on exhaust emissions of a diesel engine. The actual treatment of the vehicle and the mileage accumulation was conducted by Combustion Technologies and was not under the supervision or oversight of ATDS. Combustion Technologies has provided written statement to ATDS stating that: "No changes were made to the test vehicle other than normal maintenance."

The results of the tests conducted do show a substantial decrease in NOx emissions of about 20% between the initial baseline tests and the tests conducted after mileage accumulation. HC emissions were reduced by 44% and Particulate Emissions (PM-10) were reduced 25%. There was a small increase in test to test Carbon Monoxide (CO) emissions but this may be in the range of test to test variability. There was also an increase in Fuel economy of approximately 4% measured by the carbon balance method between the before and after test sequences.

The report below includes an Overview, Project Scope and Tabulated Results.



Project Overview for Combustion Technologies treated diesel fuel

This project consisted of Hot 505 emissions testing of a diesel powered truck to determine the effect of the Combustion Technologies Dipetane treated diesel fuel on exhaust emissions of a diesel truck. The truck tested was a 1989 Ford E-350 truck with the 7.3L Diesel Engine, with over 44,377 miles on the odometer (Due to age and apparent condition of the truck it is assumed that this is a roll-over to an actual mileage of at least 144,377). This truck was chosen to represent a typical average-mileage diesel truck in the California market.

A baseline Hot 505 emissions test with standard commercially available California diesel fuel was run at the beginning. Combustion Technologies then took the vehicle away for mileage accumulation with the Dipetane added to standard diesel fuel. After approximately 8,000 miles the vehicle was brought back to the ATDS laboratory for a three Hot 505 test sequence. The fuel used was the tank fuel in the truck upon receipt, presumably California diesel with Dipetane. The test vehicle was run in a chassis dynamometer using Hot 505 test procedure (third phase of an FTP-75 emissions test) to determine the exhaust emissions during the test cycle. Particulate Matter (PM), Total Hydrocarbons (HC), Oxides of Nitrogen (NOx) and Carbon Monoxide (CO) emissions were measured during the test along with Carbon Dioxide (CO₂). The software calculates the fuel economy (MPG) of the vehicle based upon the carbon-balance in the exhaust emissions as compared to the total Carbon content of the fuel.

Project Scope

ATDS provided the following services:

- Conducted a baseline test sequence on the chassis dynamometer using the Hot Start 505 second driving cycle using commercially available California diesel fuel.
- Conducted three Hot Start 50-5 tests after the completion of 8,000 miles of mileage accumulation.
- Generated a final report of effects of the treated diesel fuel on exhaust emissions.



Test Result Summary

The table below tabulates the test results for the vehicle.

Ford E-350 with the 7.3 L Diesel Engine

Vehicle:	1989 Ford E-350	Test Weight (ETW)	(ETW)	8,250
Engine:		Test HP (AHP)		19.2
Odo:	44377 (Probably roll-over 144,377)			

Test	Test type	Date	Test ID	ODO	HC	CO	NOx	CO2	FE	PM
Baseline	Hot 505	7/10/2002	N2C00711	44377	0.475	1.085	6.984	810.809	12.501	0.217
With Dipetane										
#1	Hot 505	8/13/2002	N2C00741	52427	0.289	1.251	5.440	784.813	12.918	0.166
#2	Hot 505	8/13/2002	N2C00742	52442	0.280	1.221	5.551	779.475	13.008	0.158
#3	Hot 505	8/13/2002	N2C00743	52446	0.233	1.218	5.770	777.449	13.044	0.166
Miles Accumulated				8050						
Test Variability										
Max					0.289	1.251	5.770	784.813	13.044	0.166
Min					0.233	1.218	5.440	777.449	12.918	0.158
Average					0.267	1.230	5.587	780.579	12.990	0.163
Change from Baseline					-44%	13%	-20%	-4%	4%	-25%

Product Evaluation

As can be seen from the above table, the results for the gaseous emissions exhibit a significant improvement in the HC, NOx and PM for the 1989 E-350 diesel vehicle between the baseline test and the test conducted after mileage accumulation. The slight increase in CO may be test to test variability unrelated to changes in the test vehicle. The increase in fuel economy is significant for a vehicle of this age and type.

Signature on file

Linwood E. Farmer Jr.
Division Vice-President

DIPETANE Emissions Reductions

1989 Ford E350 Diesel Delivery Van

