



EPA Motor Vehicle Aftermarket Retrofit Device Evaluation Program

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Certification and Compliance Division
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

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Introduction

The U.S. Environmental Protection Agency (EPA) conducts a program to evaluate aftermarket retrofit devices which claim to improve automobile fuel economy and/or reduce exhaust emissions. “Automobile” is defined as any four-wheeled vehicle manufactured primarily for use on public streets, roads, and highways and is rated at 6,000 pounds gross vehicle weight or less.¹ Unless ordered by the Federal Trade Commission (FTC) or the EPA Administrator (or EPA delegate), participation in the program is voluntary. The program is managed by EPA’s Office of Transportation and Air Quality at its National Vehicle and Fuel Emissions Laboratory (NVFEL) located in Ann Arbor, Michigan.

The evaluation is often identified as the “511 Program” which refers to EPA’s testing program formerly conducted under authority of Section 511 of the Motor Vehicle Information and Cost Savings Act. That authority was recodified; the current test program authority is 42 USC 7525 and 49 USC 32918. Regulations describing the program are found at 40 Code of Federal Regulations, Part 610.

“Retrofit device” or “device” means any component that is designed to be installed in or on an automobile (as an addition to, as a replacement for, or through alteration or modification of, any original component, equipment, or other device); and that any manufacturer, dealer, or distributor of the device represents will provide higher fuel economy than would have resulted with the automobile as originally equipped, as determined by EPA regulations. The term also includes fuel additives for use in an automobile. The term “retrofit device” or “device” excludes flow measuring instruments or other driving aids, and lubricants and lubricant additives.²

All fuel additives require registration with EPA’s Office of Transportation and Air Quality. It should also be noted that many of the fuel line devices and liquids sold and associated with vapor bleed devices may be considered additives for the purpose of registration.

The purpose of the program is to generate, analyze, and disseminate technical data; it does not approve or certify retrofit devices. Through engineering and/or statistical analysis of data from vehicle tests, the evaluation program determines the effects on fuel economy, exhaust emissions, durability and drive-ability of the applicable vehicles due to the installation or use of

¹ 40 CFR 610.11

² 40 CFR 610.11(i), 49 USC Sec 32918

the device. Data generated in an evaluation are public information and will be published in the *Federal Register* and elsewhere for use by the FTC and the public.³

This document is intended to assist inventors applying for an EPA evaluation of their product. It outlines the application format, describes essential independent laboratory test data submission requirements, explains test policy and basic test sequences, and describes EPA test cost estimates.

EPA will not comment on the merits, or lack of them, of any device without a formal application. Applications must contain complete independent test laboratory test reports which demonstrate a statistically significant improvement in fuel economy and/or emissions reduction (see the application discussion for details).

EPA will provide technical assistance in designing the test program to be performed at an independent laboratory. For confirmatory testing at its laboratory, EPA develops the test program in coordination with the applicant, analyzes the test results, and writes an official report summarizing the results in the *Federal Register*. Reports are available to the general public from the NVFEL Library.

General Comments

EPA recommends that device manufacturers carefully consider all the following elements when applying for evaluation:

Test Laboratory Independence

40 CFR 610.11(a)(20) of Federal regulations states that test laboratories “shall have no financial interests in the outcome of these tests other than a fee charged for each test performed,” and that “independence of the testing agent” will be considered in determining the validity of manufacturer furnished test data. Applicants must confirm that the selected laboratory has no vested financial interest in the outcome of the tests prior to the start of testing.

Acceptable Test Formats

The only acceptable test procedures are the Federal Test Procedure (FTP), which is a simulated city drive trace used for emissions testing, and the Highway Fuel Economy Test (HFET), which is a simulated highway drive test for fuel economy calculation. Inspection and Maintenance (I/M)

³ 40 CFR 610.10

test data as used in state programs or any other test formats are unacceptable and should not be included with an application.

Minimum Test Requirements

Although some devices may require more complex test plans, the minimum for fuel economy effect requires two vehicles with triplicate test sequences in each configuration for each vehicle. The vehicles should be selected from different manufacturers and should be representative of the largest selling engine/transmission combinations in the United States. Each vehicle must be set to its manufacturer's tune-up specifications for baseline tests. Baseline emissions and fuel economy should be near the levels at which the vehicles were certified.

Test sequences are conducted in "back-to-back" fashion. Minimum testing requirements are as follows:

(a) If device installation does not involve adjustment of original vehicle manufacturer specifications (e.g., timing, fuel-air mixture, choke or idle speed, etc.), then conduct triplicate tests with the vehicle in baseline condition, and triplicate tests with the device installed with no vehicle adjustments between tests.

(b) If installation of the device also involves adjustments (e.g., timing, fuel-air mixture, choke or idle speed, etc.), then conduct triplicate tests with the vehicle in baseline condition, triplicate tests with the adjustments and the device installed, and then conduct triplicate tests with only these adjustments. If mileage accumulation is necessary to realize the full benefit, or to determine whether the vehicle meets emission standards, the same number of miles that were accumulated before the tests with the device must also be accumulated before baseline tests without the device. In addition, the method of mileage accumulation should be kept constant. In all test sequences three more baseline series must be performed after the device has been removed to confirm there are no post-use negative effects on performance.

Confirmatory tests performed by EPA will include the complete FTP (40 CFR Part 86). This is the only valid test used to evaluate devices for emission effects. The HFET will be included whenever fuel economy improvements are claimed. As a final requirement, the personnel of the independent laboratory selected for screening tests should perform every element of the applicant's test plan including preparation of the test vehicle, adjustment of parameters, and installation of the device.

Submission of Data

Section 610.16(b)(5) of Federal regulations requires all test data obtained from the independent laboratories in support of the application be submitted to EPA including any results declared void

or invalid by the laboratory. We also ask that, prior to the screening tests, applicants provide EPA with the name of the laboratory, test date schedule, and tests to be conducted. Applicants should allow EPA to contact the laboratory during testing, and allow them to directly answer any EPA questions about the test program.

Complete test reports from the independent test laboratory must be included with any application. All test vehicle information must be furnished; this includes the manufacturer name, model year, car line, vehicle identification number (VIN), engine family code, and evaporative family code. The inertia weight, road load horsepower with corresponding dynamometer setting, fuel used, method for loading the evaporative canister, any special test requirements from the original vehicle certification (e.g., auxiliary cooling), and the vehicle prep information must also be included in the report.

Test Costs

Minimum testing at EPA's laboratory requires three tests in baseline configuration, three with the device and three baseline configuration tests after removal of the device. The minimum cost for two different vehicles in this test format is \$27,000. Additions to the minimum test plan, such as providing test vehicles, mileage accumulation, parameter adjustment, or additional testing, etc. will increase cost. EPA will provide a specific cost based on the test requirements for individual device evaluations. EPA, however, does not charge applicants for consultation or report writing time.

Test Results

EPA confirmatory tests will only be performed on devices which have demonstrated statistically significant fuel economy and/or emissions benefits based on the independent laboratory test report. From our experience, most of the products in this program are designed to improve fuel economy. For a minimum test plan to evaluate the impact on fuel economy, a fleet of two cars should be tested in triplicate. If a minimum five percent difference in average fuel economy is shown, one may usually conclude with reasonable confidence that a real improvement exists. (Analysis by EPA for potential fuel economy effects will be based on actual test results and test variability, not these guidelines.)

If the device is primarily intended to reduce one or more of the EPA regulated exhaust emissions (e.g., carbon monoxide, oxides of nitrogen and hydrocarbons), then the number of tests needed to prove a reduction is heavily dependent on the amount of the reduction and other factors. The test variations for these compounds are usually greater than those for carbon dioxide which is the primary constituent in the fuel economy calculation. In such cases, EPA will work with the applicant on a per situation basis to develop an appropriate test plan.

Submitted data and information labeled confidential or proprietary must be justified on a case-by-case basis by the applicant. EPA cannot treat test results, including those conducted by independent or other laboratories, as confidential since applicable laws (42 USC 7525 and 49 USC 32918) require disclosure of such information. (EPA may not perform an evaluation of a device if it judges it cannot develop a technically sound final report because an applicant declares information is confidential.)

EPA will request further information for incomplete applications. If confirmation tests are required, EPA will advise applicants of costs and provide applicants with the opportunity to review the test plan. Once testing is completed, an evaluation report will be written on the basis of independent test data submitted, EPA test data, and EPA engineering analysis.

EPA does not acknowledge the receipt of applications but attempts to respond with full comments to the applicant within 30 days. The EPA confirmatory test program requires very precise scheduling, and is dependent on the applicant's prompt response to requests for further information. Failure to respond in a timely manner will delay the process. Furthermore, scheduling device evaluation tests may be delayed due to higher priority test programs at certain times of the calendar year (e.g., certification of new model year vehicles, etc.).

If the applicant does not complete requested independent lab tests and submit data to EPA, or does not respond to requests for further information within a six month period (180 days) after EPA develops the test program, it will be considered a withdrawal from the program.

EPA will schedule testing once a test plan has been signed by the applicant and the receipt of test cost funds have been confirmed. Completion of all testing and the issuance of the final report may take up to twelve months.

In October 1994, EPA issued a final rule setting interim and final standards for detergent use in gasoline. To maintain the integrity of the rule, EPA requires that applicants for aftermarket fuel additive evaluation must provide information demonstrating that the additive has no adverse effect on the deposit control properties of gasoline. EPA will not accept applications for fuel additive evaluation program without this information.

EPA cautions applicants that the installation of an aftermarket retrofit device, or use of a fuel additive (applicants should contact EPA's Office of Transportation and Air Quality at 202-564-9755 to register fuel additives), raises the issue of tampering liability and the potential for civil fines of up to \$25,000. In the past, one approach for a device or additive manufacturer to address the tampering issue was to demonstrate by durability, aging, and FTP tests that the device did not increase vehicle emissions over its useful life. However, beginning with 1994 models, vehicle manufacturers must provide an onboard emission diagnostic capability for their vehicles. As a consequence, applicants must ensure that, besides not adversely affecting vehicle emissions, their device or additive must not render inoperative, degrade, or defeat the operation of vehicle onboard diagnostic systems.

EPA trusts that this information will aid in the preparation of an acceptable application for evaluation of a device. The Device Evaluation Team will be the contact in the application process and any subsequent EPA evaluation. The contact information is:

Device Evaluation Program
U.S. EPA
Office of Transportation and Air Quality
2000 Traverwood Drive
Ann Arbor, Michigan 48105
Telephone: (734) 214-4925
Internet: banush.russell@epa.gov

Device Evaluation Application Format

Applications for EPA evaluation of retrofit and aftermarket fuel additives devices should use the following format (there is no application form as such):

1. Title:

Application for Evaluation of (Name of Product) in the EPA Motor Vehicle Aftermarket Retrofit Device Evaluation Program.

2. Identification Information:

a. Marketing Identification:

Trade name, marketing name, trade mark, or other methods which are (or will be) used to identify the product. Include model numbers and/or other designations where appropriate.

b. Inventor and Patent Protection:

- (1) Name and address of the inventor.
- (2) One complete copy of the patent or patent application.

c. Applicant:

- (1) Name and address of the individual or corporation applying for this evaluation.
- (2) Principal officers and/or owners of this organization.
- (3) The person(s) who are authorized to represent the organization in communications with the EPA. Include name, mailing address, FAX, e-mail address, and telephone number.

d. Manufacturer:

- (1) Name and address of the individual or corporation who is (or will be) manufacturing the product.
- (2) Principal officers and/or owners of this organization.

3. Description:

a. Purpose:

Purpose and/or objective of the product.

b. Applicability:

(1) Provide a statement indicating which types or groups of vehicles for which the product is, or is not, applicable. The statement should include make, model and year, engine size, ignition type, fuel delivery, and transmission type. If the product is (or will be) marketed in different sizes and/or calibrations, identify which models correspond to which type of vehicle.

(2) Provide a statement describing other conditions for which the product is, or is not, applicable. The statement should address weather conditions, types of driving, topographical differences, etc.

c. Theory of Operation:

Provide a detailed description of the theory and principles of operation for the product in sufficient detail to permit technical personnel at EPA to understand the theory of operation.

d. Construction and Operation:

A detailed description of the product itself, including drawings and/or schematics, should be included.

e. Specific Claims:

Specific claims made in advertising, sales literature, packaging and installation instructions as they relate to improvements in fuel economy, emissions, drive-ability, etc., should be provided. Test data to support these claims must be included with the application.

f. Cost and Marketing:

Provide suggested retail price and methods used to market the product. This discussion should also identify the stage of the development of the product or state that it is in production or is ready for production.

4. Installation:

a. Equipment:

Provide installation instructions for the product to include those for general and special applications. Indicate tools, equipment and skills required. Advise adjustments required to the vehicle or the product upon installation.

b. Operation:

Furnish a copy of the consumer's operating instructions with details on maintenance procedures, service intervals, and basic diagnostics.

c. Safety:

Provide all available information regarding use of the product which could result in unsafe conditions for the vehicle, its occupants, or persons or property in close proximity. This information should also address situations where the product is not in use or has malfunctioned in some way.

d. Maintenance:

Include maintenance procedures and scheduled maintenance required to ensure the correct operation of the product. List tools, equipment, and skills required to perform maintenance. Also, describe how the use of the product will affect the normal maintenance schedule for the vehicle.

5. Effects on Emissions and Fuel Economy:

a. Regulated Emissions and Fuel Economy:

Furnish all information related to the product and its effects on regulated emissions and fuel economy⁴ obtained through screening tests at an independent laboratory which conforms with applicable regulations for emissions and fuel economy testing. Regulated exhaust emissions include unburned hydrocarbons, carbon monoxide, oxides of nitrogen, and particulate (diesel vehicles only). Unburned hydrocarbons in the form of evaporative emissions are also regulated and may be measured in the test program as required.

b. Unregulated Emissions:

Provide all information related to the effect of the product on types of pollutants other than those regulated by EPA.

6. Testing

The actual test plans required to properly evaluate the worth of a product vary widely although the basic premise of any plan is that it is able to accurately define benefits due solely to the product. In some cases, this requires only duplicate tests on two vehicles with and

⁴ The FTP (40 CFR Part 86) is the primary test for vehicle emissions. The FTP and the Highway Fuel Economy Test (HFET, 40 CFR Part 600) are the only tests recognized by EPA for evaluating fuel economy of light-duty vehicles. Data which have been collected in accordance with other standardized procedures may be used to supplement results from the FTP and HFET and will be considered in EPA's evaluation of the product.

without the product. For products which require adjustments of engine parameters, such as timing or mixture, a third set of tests with only these adjustments is also required. In any case, an acceptable test plan can be developed in consultation with EPA before or after the remainder of this application is submitted.

Supplemental Information

Potential Tampering Liability Associated with Fuel Economy Retrofit Devices

The federal tampering prohibition is contained in section 203(a)(3) of the Clean Air Act (Act), 42 U.S.C. 7522(a)(3). Section 203(a)(3)(A) of the Act prohibits any person from removing or rendering inoperative any device or element of design installed on or in any motor vehicle in compliance with regulations under Title II of the Act (i.e., regulations requiring certification that vehicles meet federal emissions standards). The maximum civil penalty for a violation of this section by a manufacturer or dealer is \$25,000; for any other person, \$2,500.

Section 203(a)(3)(B) of the Act prohibits any person from manufacturing or selling, or offering to sell, or installing, any part or component intended for use with, or as part of, any motor vehicle or motor vehicle engine where a principal effect of the part or component is to bypass, defeat, or render inoperative any device or element of design installed on or in a motor vehicle or motor vehicle engine, and where the person knows or should know that such part or component is being offered for sale or is being installed for such use. The maximum civil penalty for a violation of this section is \$2,500.

Installing any device, system or part(s) which affect the fuel delivery rate or the combustion process would be expected to affect elements of design of the emissions control system. Accordingly, any change from the original certified configuration of a vehicle such as adding a system or parts that affect the fuel delivery rate or the combustion process, or the manufacture, sale of, or installation of, aftermarket parts or systems which are not equivalent to the original equipment could be considered violations of section 203(a)(3) of the Act. However, EPA has established an enforcement policy, Mobile Source Enforcement Memorandum No. 1A (Memorandum 1A), to provide guidance to the public to reduce the uncertainty regarding potential liability under section 203(a)(3) of the Act for using or selling aftermarket parts or systems, or making adjustments or alterations to parts or system parameters.

Basically, Memorandum 1A states that EPA will not consider any modification to a certified emissions control configuration to be a violation of the tampering prohibition if there is a reasonable basis for knowing that emissions are not adversely affected. In many cases, durability aging and emissions testing according to the FTP would be necessary to make this determination.

There are two different methods for establishing a reasonable basis for knowing that emissions are not adversely affected by the installation of a retrofit device: 1) the installer knows of, or the

manufacturer of the device represents in writing, that FTP emission tests have been performed as prescribed in 40 CFR 86 showing that the device does not cause similar vehicles to fail to meet applicable emission standards for their useful life; or 2) a federal, state or local environmental control agency expressly represents that a reasonable basis exists. Such an agency determination is limited to the geographic area over which that agency has jurisdiction. Some states, such as California, have additional requirements.

If the results of EPA emission testing of a retrofit device show that any of the regulated emissions increase (even though other regulated emissions may have decreased), EPA will publish a *Federal Register* Notice (Notice) explaining the legal implications of those findings on persons engaged in the business of servicing, repairing, selling, leasing, or trading motor vehicles, fleet operators, new car dealers and individuals. The Notice will alert the regulated parties that the installation of such a device by them may be deemed to be a violation of section 203(a)(3) of the Act.

EPA does not have a mandatory, formal program to evaluate and make determinations of compliance of aftermarket parts with Memorandum 1A. Although EPA has informally evaluated compliance information in the past, because of current budget cuts and resource constraints we are not routinely reviewing information showing compliance with Memorandum 1A. While compliance with Memorandum 1A is required, submission of the information to us is not required unless we request the information to verify compliance. We emphasize, however, that our lack of review of the information does not relieve any one from responsibility to comply with Memorandum 1A or liability for violations of section 203(a)(3) and Memorandum 1A.

The results of an FTP test are valid only for similar vehicles. Therefore, the test fleet should be diverse and large enough to provide an adequate data base from which conclusions can be drawn with reasonable confidence. When appropriate, however, analyses based upon engineering judgment can be used to determine the applicability of FTP test results to other vehicles and the devices' effect on the durability of the emission control systems.

The EPA's NVFEL does not make decisions as to whether the installation of a particular retrofit device constitutes tampering with the emission control system of a vehicle. Questions regarding tampering or requests for copies of Memorandum 1A are handled by Steve Albrink in Washington, DC, at 202-564-8997.

Miscellaneous

Evaluations conducted in the EPA test program are for the purpose of demonstrating the effectiveness of developed devices and are not to be construed as development testing. All development work must precede EPA evaluation. The applicant will not be permitted to make adjustments to the test vehicle or to the device except to repair malfunctions. Such repairs will be permitted at the discretion of the EPA test engineer.

EPA engineering staff will prepare a draft report on the evaluation of the device for applicant review to ensure accuracy of the information describing the device. The developer should transmit comments to EPA promptly. Final test reports are distributed upon request to technical personnel in federal and state governments, private industry, universities and are also available to the general public from the NVFEL Library at:

U.S. EPA
NVFEL Library
2000 Traverwood Drive
Ann Arbor, MI 48105
(734) 214-4311

Applicants may cite final EPA reports (but not draft reports) to indicate the exhaust emission and fuel economy levels attained with the device, but the developer may not claim that the EPA report constitutes approval, certification, endorsement or registration. Cases of misrepresentation of EPA evaluation reports will be referred to the Department of Justice and/or the Federal Trade Commission, as appropriate.