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Alternative Fuels Data Center

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Ethanol Flexible Fuel Vehicle Conversion Kits

Rising gasoline prices and concerns about climate change have greatly increased public interest in ethanol use. Vehicle manufacturers currently offer ethanol flex-fuel vehicles (FFVs) in a wide variety of makes and models at little or no extra cost. In spite of the availability of new and used FFVs, many consumers are curious about the prospects for converting their existing gasoline vehicles to operate on ethanol.

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Background

The Environmental Protection Agency (EPA) implements regulations under the Clean Air Act that require certification of new vehicles as being compliant with emissions requirements (see the Code of Federal Regulations, Title 40, Parts 85 and 86). Certification is granted to the manufacturer for specific vehicle configurations operating on specific fuels according to an established test protocol. Installing or modifying a fuel system to allow a vehicle to operate on a fuel other than that for which it was originally certified is considered tampering—a violation of federal regulations that carries a significant fine. There are currently no certified aftermarket conversion systems that would allow a conventional gasoline vehicle to operate on E85.

EPA does have a process by which manufacturers of conversion systems or "kits" can obtain a Certificate of Conformity for converted vehicles. In recent years, manufacturers of natural gas and propane conversions have used this process to certify several vehicles for operation on these fuels. This process certifies the converted vehicle—not the conversion system by itself. Several ethanol conversion kit manufacturers have approached the EPA about certifying their equipment, and EPA is walking them through the process.

Regulatory Requirements

Regulations requiring aftermarket fuel converters to certify their conversions are found in 40 CFR Parts 85 and 86. Conversion kits are not considered to be a type of "device," as has been suggested by some manufacturers, which might otherwise allow converters to sell their kits without obtaining EPA certificates. This situation is sometimes the case with devices such as high-performance air filters,

free-flow mufflers and exhaust systems, and some other aftermarket accessories. Because of the complexity of certifying an ethanol FFV, including meeting EPA's on-board diagnostics (OBD) requirements, EPA works with each company interested in certifying an ethanol FFV conversion system.

Certification Process Overview

Certification of fuel conversions closely follows the process original equipment manufacturers (OEMs) use when certifying new model year vehicles. For new vehicles, EPA issues certificates for specific vehicle groupings, called an engine family or test group. A test group, designated by the OEM, contains vehicles with common design elements (such as the number of cylinders or a specific engine and transmission configuration) and similar emission components (such as a similar size catalyst and precious metal loading). There are many test groups for a particular OEM for a given model year, and there are often different test groups for what might appear to be the same kind of vehicle. For example, a pickup truck may be available with either two-wheel or four-wheel drive or with different engine and transmission combinations, each of which might require a separate series of tests and individual Certificates of Conformity.

The process for ethanol conversions takes a similar approach. Each test group of a specific vehicle type with a specific conversion system is tested and considered for certification. The tests ensure that the converted vehicle meets emission standards when operated on any blend of ethanol and gasoline, from 0 percent ethanol to 85 percent ethanol (E85), for the full useful life of the vehicle. It also ensures that the OEM's gasoline vehicle components and materials will be compatible with E85 throughout the life of the vehicle.

There is no "one size fits all" category or universal EPA certificate for a conversion kit or system that would allow it to be legally installed on any vehicle type or engine configuration. How the specific fuel and emission control systems work together determines compliance with EPA emission standards for a particular vehicle.

If a company wants to sell conversion kits in California, similar certification procedures must be followed to obtain approval from the California Air Resources Board (CARB).

Emission Standards

Emission standards are fuel neutral, which means that the same emission requirements apply no matter the fuel type. Therefore, to prove compliance with emissions standards, converted vehicles must demonstrate they meet emission standards when using the alternative fuel. For ethanol conversions, conversion companies must prove emissions compliance with exhaust standards when vehicles are operating on gasoline as well as E85.

Certification Steps

1. The FFV conversion kit company and EPA meet to lay out the process for certifying one or more vehicle test groups.
2. EPA supplies references to guidance documents and assists the converter in obtaining an example Application for Certification from a fuel converter and the Application for Certification for the OEM test group that the converter desires to convert to an ethanol FFV. This provides both a sample of the required application, plus baseline data on the vehicle test group that's

OBD Approval Letter

A vehicle's on-board diagnostic (OBD) system performs constant checks to ensure that all emissions-related components operate correctly. The OBD system notifies drivers of any issues or problems by illuminating a malfunction indicator light on the dashboard (sometimes called the check-engine light). Meeting EPA OBD requirements is a fundamental part of the certification process, and these requirements are

being converted.
3. The conversion company initiates the appropriate emissions testing on gasoline as well as ethanol test fuels at an emissions laboratory that can perform standard EPA tests.
4. The conversion company evaluates OBD system impacts and submits a description of the OBD system and proof of compliance with EPA's OBD regulatory requirements.
5. Upon acceptance, EPA issues an OBD approval letter. This letter becomes an integral component of the Application for Certification. (See the OBD Approval Letter section for details.)
6. The conversion company submits to EPA comprehensive emissions testing data as part of the complete Application for Certification (for a Certificate of Conformity for the specific test group to be fuel converted).
7. EPA may require confirmatory emissions testing at its laboratory in Ann Arbor, Michigan.
8. EPA reviews the application to ensure that all requirements are met before issuing a Certificate of Conformity.

described in detail in EPA's certification regulations.

Obtaining an OBD approval letter from EPA is just one step in the overall certification process and is not by itself an approval from EPA for the sale of conversion kits. The approval letter only documents that EPA has reviewed the operation of the fuel-converted vehicle's OBD system, including any necessary supporting data, and finds that it meets EPA's OBD regulatory requirements.

Fuel conversions sold in California must receive an OBD approval from CARB.

As mentioned previously, a similar process is required by CARB to obtain an Executive Order (the CARB equivalent of an EPA certificate) for sales in California.

Status of Ethanol Conversion Certifications

As of the date of this bulletin, neither the EPA nor CARB have certified any ethanol FFV conversion kits. A few companies have obtained EPA OBD approval letters (one step in the process), but no certificates have been issued for aftermarket conversions to ethanol. The current certification status of ethanol fuel converters may be obtained by contacting EPA staff (see the contact information contained in the EPA presentation referenced at the end of this bulletin).

Some companies have developed ethanol conversion kits for use in other countries where emissions requirements and safety standards are different and EPA and CARB regulations do not apply. However, it is illegal to use these systems in the United States unless an EPA Certificate of Conformity and, if appropriate, a CARB Executive Order have been obtained. Some kits are offered via the Internet or other U.S. outlets. To be sure that a conversion system is legal for use in the United States, consumers should always ask the supplier for a copy of the EPA Certificate of Conformity or the CARB Executive Order that verifies compliance for use on their specific vehicles.

Resources

Some of the following documents are available as Adobe PDFs. Download Adobe Reader.

Presentations:

- Certification Process for Alternative Fuel Converters, Marty Reineman, EPA
- Vehicle Changes for E85 Conversion, Coleman Jones, General Motor

Technology Information:

- Flexible Fuel Vehicles: Providing a Renewable Fuel Choice (PDF 295 KB)

EPA Guidance:

- EPA Light-Duty Vehicle and Engine Emission Certification Home Page
- EPA Alternative Fuel Conversion (PDF 149 KB)
- EPA Approval of OBD II Systems on Aftermarket Alternative Fuel Conversions (PDF 100 KB)
- EPA Certificates of Conformity
- EPA Contact List for Fuel Converters (PDF 31 KB)
- EPA Converter General Guidance Letters
- EPA Filing Forms and Fees
- EPA Laboratory List (PDF 31 KB)

Federal Regulations:

- Code of Federal Regulations, Title 40, Parts 85 and 86