

Biodiesel

Biodiesel is a renewable fuel produced from agricultural resources such as vegetable oils. In the United States, most biodiesel is made from soybean oil; however canola oil, sunflower oil, recycled cooking oils, and animal fats are also used.

How It's Made

To make biodiesel, the base oil is put through a process called “esterification.” This refining method uses an industrial alcohol (ethanol or methanol) and a catalyst (substance that enables a chemical reaction) to convert the oil into a fatty-acid methyl-ester fuel (biodiesel).

Biodiesel in its pure form is known as “neat biodiesel” or B100, but it can also be blended with conventional diesel, most commonly as B5 (5 percent biodiesel and 95 percent diesel) and B20 (20 percent biodiesel and 80 percent diesel). Biodiesel is registered with the U.S. Environmental Protection Agency (EPA) and is legal for use at any blend level in both highway and nonroad diesel vehicles.

Most diesel engines can run on biodiesel without needing any special equipment. If you are interested in using biodiesel in your vehicle or equipment, check with the manufacturer for any recommendations and information regarding engine warranties. In addition, once you have determined the proper blend for your vehicle, make sure to purchase your fuel from a reputable dealer selling commercial grade biodiesel.

Biodiesel -vs- Vegetable Oil

In 1895, Dr. Rudolf Diesel invented the diesel engine with the intention of running it on a variety of fuels, including vegetable oil. In fact, when he demonstrated his engine at the World Exhibition in Paris in 1900, he fueled the vehicle with peanut oil. However, biodiesel and vegetable oil are very different.

Raw vegetable oil or recycled greases (also called waste cooking oil) that have not

been processed into esters are not biodiesel, and are not registered by EPA for legal use in vehicles. In addition, vehicles converted to use these oils would likely need to be certified by the EPA; to date EPA has not certified any conversions. These conversions may also violate the terms of the vehicle warranty. For more information on the certification process, please visit EPA's Web site at: www.epa.gov/otaq/cert/dearmfr/cisd0602.pdf .

EPA has published guidance that explains and clarifies EPA's regulatory requirements for biodiesel producers and biodiesel blenders/users. This document is available at: www.epa.gov/otaq/renewablefuels/420b07019.pdf

Performance

Vehicles have similar horsepower and torque as conventional diesel when running on biodiesel. Chemically speaking, biodiesel has a higher cetane number, but slightly lower energy content than diesel. To the average driver, this means better engine performance and lubrication, but a small decrease in fuel economy (2-8 percent). Biodiesel vehicles can also have problems starting at very cold temperatures, but this is more of an issue for higher percentage blends such as B100 and easily solved the same way as with conventionally fueled vehicles -by using engine block or fuel filter heaters or storing the vehicles in a building.

Availability

In 2006, 250 million gallons of B100 were sold. By 2008, that number had nearly tripled to 700 million gallons. Today, approximately 600 fleets nationwide use biodiesel blends in their diesel engines, and biodiesel is available in its various blends at approximately 700 locations across the United States. A station locator is available at www.afdc.energy.gov/locator/stations/.

Affordability

The price of biodiesel blends varies depending on geographic area, base material (corn, soybeans, etc.), and supplier. Although biodiesel can cost more than petrodiesel, diesel drivers can transition to biodiesel without purchasing new vehicles. In the case of fleets, managers can transition to biodiesel without acquiring new spare parts inventories or rebuilding refueling stations.

Maintenance

Generally, the use of biodiesel does not cause many maintenance issues. However, when used for the first time, biodiesel can release deposits accumulated on tank walls and pipes from previous diesel fuel, initially causing fuel filter clogs. As a result, vehicle owners should change the fuel filter after their first tank of biodiesel. Also, biodiesel can degrade rubber fuel system components, such as hoses and pump seals. This is especially true with higher-percentage blends, and older vehicles. Many newer vehicles have biodiesel-compatible components, but it is best to consult your owner's manual or contact your vehicle manufacturers for specific information.

Benefits

Biodiesel has a number of important benefits. As an alternative to diesel, it can help reduce U.S. dependence on foreign oil. Biodiesel can also provide greenhouse gas (GHG) emission reductions.

In addition, biodiesel offers several criteria emissions benefits for the existing vehicle fleet. It reduces emissions of carbon monoxide, particulate matter (PM), and sulfates, as well as hydrocarbon and air toxics emissions.

EPA analysis of existing data shows that the nitrogen oxide (NO_x) emission impacts of biodiesel are dependent on engine load, and thus vary by test cycle or application. On average, though, NO_x emissions are expected to increase by about 2% for B20 blends. A number of test programs have also been recently to examine effects of B20 blends on modern aftertreatment devices (such as particulate filters, and NO_x storage and reduction devices), and none to date has shown biodiesel to degrade or impair the devices performance.