Biofuels: Biodiesel

What Is Biodiesel?

Biodiesel is a fuel made by chemically reacting alcohol with vegetable oils, animal fats, or greases, such as recycled restaurant grease. Most biodiesel today is made from soybean oil. Biodiesel is most often blended with petroleum diesel in ratios of two percent (B2), five percent (B5), or 20 percent (B20). It can also be used as neat (pure) biodiesel (B100). Biodiesel fuels are compatible with and can be used in unmodified diesel engines with the existing fueling infrastructure. It is one of the fastest growing transportation fuels in the U.S.

Biodiesel contains virtually no sulfur, so it can reduce sulfur levels in the nation's diesel fuel supply, even compared with today's low sulfur fuels. While removing sulfur from petroleum-based diesel results in poor lubrication, biodiesel is a superior lubricant and can reduce the friction of diesel fuel in blends of only one or two percent. This is an important characteristic because the Environmental Protection Agency now requires that sulfur levels in diesel fuel be 97 percent lower than they were prior to 2006.

Characteristics of Biodiesel

Biodiesel exceeds diesel in cetane number, resulting in superior ignition. The cetane number is the performance rating of diesel fuel. Biodiesel also has a higher flash point, or ignition temperature, making it more versatile where safety is concerned. Horsepower, acceleration, and torque are comparable to diesel. Biodiesel has the highest Btu content of any alternative fuel, though it is slightly less than that of diesel. This might have a small impact on vehicle range and fuel economy.

Distribution of Biodiesel

Biodiesel is available throughout the United States, mainly through commercial fuel distributors. There are relatively few public pumps that offer biodiesel. With only a few more than 200 biodiesel fueling stations, it is a more practical fuel for fleets with their own fueling facilities. Availability for consumers is steadily expanding as demand grows.

Economics of Biodiesel

Today, B99-B100 costs about $2.99 a gallon, but costs can vary depending on region, the base crop, purchase volume, and delivery costs. Historically, all biodiesel blends cost more than diesel. In 2005, a Biodiesel Excise Tax Credit went into effect, but these credits have expired, eliminating incentives for biodiesel use.

Because it is stored in existing infrastructure and can fuel vehicles without modification, biodiesel has emerged as a popular fuel for fleets regulated by the Energy Policy Act (EPACT). The cost difference will likely decrease in the future due to production improvements in the biodiesel industry. In addition, many states are considering legislation that will encourage greater use of biodiesel fuels to improve air quality.

Another economic consideration is the agriculture industry. The expanded use of biodiesel in the nation's fleets will require the agriculture industry to substantially increase production of soybeans and other oilseed crops that can be used as **feedstocks** for biodiesel. Farmers will have new crops and markets to support economic stability.

BIODIESEL-POWERED GARBAGE TRUCK

Image courtesy of NREL

Any vehicle that operates on diesel fuel can switch to B100 or a biodiesel blend without changes to its engine. Many state fleets and school districts have switched from diesel to biodiesel blends to reduce emissions and improve air quality.

BIODIESEL FUELING STATION

Photo courtesy of Elly Jonez via wikimedia commons

Environmental Impacts

Biodiesel is renewable, nontoxic, and biodegradable. Compared to diesel, biodiesel (B100) reduces sulfur oxide **emissions** by 100 percent, particulates by 48 percent, carbon monoxide by 47 percent, unburned hydrocarbons by 67 percent, and hydrocarbons by 68 percent. Emissions of nitrogen oxides, however, increase slightly (10 percent). Biodiesel blends generally reduce emissions in proportion to the percentage of biodiesel in the blend.