

# BIODIESEL and RENEWABLE DIESEL

Biodiesel and renewable diesel are  
fuels for diesel engines produced from  
renewable resources

## Biodiesel

Making biodiesel is a relatively simple process where the feedstock is blended with an alcohol and catalyst mixture causing a chemical reaction, called transesterification. The reaction causes the feedstock to yield an ester, which is used for fuel, and glycerol, which can be used for many chemical processes and animal feed.

For every gallon of vegetable oil used in the process, about one gallon of biodiesel is produced.

## Renewable Diesel

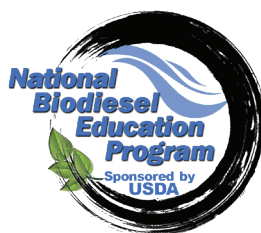
Renewable diesel is a broad term used to describe a variety of fuels made from widely different chemical processes from bio-based feedstocks. Most renewable diesel processes use hydrogenation where hydrogen mainly replaces oxygen but also other atoms such as sulfur and nitrogen using heat and pressure with the assistance of catalysts. The process produces renewable diesel and other co-products such as propane, depending on the processes. Although there are markets for propane, glycerol is a more versatile commodity.

For every gallon of vegetable oil used, about 0.9 gallons of renewable diesel is produced. The yield of renewable jet fuel is typically much lower at 0.4 gallons due to the additional processing steps needed.

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Biodiesel  
VS.  
Renewable Diesel

# BIODIESEL VS RENEWABLE DIESEL

Biodiesel and renewable diesel are fuels made from vegetable oils and animal fats that are used to run compression-ignition (diesel) engines. Both fuels have environmental, economic and social benefits as compared to petroleum diesel fuel. Greenhouse gas emissions are lower since the oils and fats used to make these fuels result in a carbon

cycle while petroleum diesel releases long-stored carbon. Both biodiesel and renewable diesel create financial and agronomic opportunities for farmers and markets for waste cooking oils and animal fats. Although both fuels are made from biomass, they are two distinctly different fuels.

## Biodiesel

Biodiesel can be used in pure form or blended with diesel at any level without any engine modifications. It's excellent lubricating properties eliminate the need for lubricating additives required by petroleum diesel. Use of biodiesel significantly reduces harmful emission in older diesel engines and does not have the almost unbearable smell and black smoke of petroleum diesel. However, with exhaust emissions control technologies now installed on new engines, this advantage will decrease and lose significance with time. Because biodiesel contains oxygen, which improves combustion and reduces emissions, biodiesel does have a slightly lower BTU value. It is safer since it is less combustible and more biodegradable than petroleum diesel but petroleum diesel does have better cold-flow properties. Biodiesel fuel suppliers in cold climates deal with cold-flow properties with additives in the same way as petroleum diesel suppliers.

Although biodiesel can be blended at any level with petroleum diesel, a 20% blend of biodiesel with 80% petroleum diesel, or "B20", is generally considered the best blend for normal use in diesel engines. Biodiesel is cost competitive with petroleum diesel to the fuel wholesaler but unlike petroleum diesel, the fuel wholesaler must have separate storage and mix biodiesel with petroleum diesel. This adds a cost to the fuel wholesaler in addition to having to deal with two different fuel suppliers.

## Renewable Biodiesel

Most renewable diesel is produced from hydrogenation which produces long chain paraffin molecules that have poor low temperature properties, poor lubricity, and can only be used in low level blends with petroleum diesel where these undesirable properties are diluted. Since the EPA waived the rigorous emission testing of renewable diesel that has been required by all other biofuels for fuel certification, emissions from this renewable fuel have not been verified by third-party sources. It is expected, however, that the low level blend would have no appreciable impact on the petroleum diesel emissions.

The processing of renewable diesel is well suited for widely different feedstocks like slaughterhouse waste, tallow, and yellow grease. Due to the processing complexity and cost, in addition to difficulties of providing hydrogen and the need for a propane market, renewable diesel is usually made in petroleum refineries. At refineries renewable diesel can be processed with dedicated equipment or co-processed with crude petroleum. Because renewable diesel is mostly made in refineries using existing equipment, it does not represent new capacity for the refineries. The low number of refineries producing renewable diesel also suggests it is not cost competitive with petroleum diesel.

Some in the industry, particularly those seeking to provide jet fuel for the aviation market, have proposed further processing of the renewable diesel fuel by using

other refinery processes such as catalytic cracking, deoxygenation, and isomerization. Petroleum refineries are skilled at using these processes to convert one hydrocarbon into another for a more desirable product. These processes can provide fuel products that match the composition and improve properties of any commercially available fuel including jet fuel and gasoline. However, these processes add cost and lower the yield of the desired product. Each step requires energy and produces lower value by-products that must be marketed properly.

The disturbing aspect of renewable diesel is that the EPA, who is charged with regulating fuels, broadly categorizes fuels as renewable diesel regardless of their composition. This has resulted in claims of its desirable properties without any means to verify the claims. It is common for renewable diesel advocates to present data for emissions, life cycle analysis, cost and properties without identifying the specific process used to produce the fuel. Without clearly defining the composition of the fuel, it is difficult to interpret any statements made about it.

**Both biodiesel and renewable diesel have environmental, economic and social benefits as compared to petroleum diesel fuel.**

