

Biodiesel Basics

Biodiesel is a domestically produced, renewable fuel that can be manufactured from new and used vegetable oils, animal fats, and recycled restaurant grease. Biodiesel's physical properties are similar to those of petroleum diesel, but it is a cleaner-burning alternative. Using biodiesel in place of petroleum diesel significantly reduces emissions of toxic air pollutants.

What is a biodiesel blend?

Biodiesel can be blended and used in many different concentrations, including B100 (pure biodiesel), B20 (20% biodiesel, 80% petroleum diesel), B5 (5% biodiesel, 95% petroleum diesel), and B2 (2% biodiesel, 98% petroleum diesel). B20 is a common biodiesel blend in the United States.

Can I use B20 in my vehicle's diesel engine?

For vehicles manufactured after 1993, biodiesel can be used in diesel engines and fuel injection equipment with little impact on operating performance. But if your vehicle is older than that, the engine could be assembled with incompatible elastomers, which can break down with repetitive high-blend biodiesel use.

Most original equipment manufacturers (OEMs) approve blends up to B5 in their vehicles. Some approve blends up to B20, and one manufacturer even approves B100 for use in certain types of its farm equipment. However, some OEMs don't recommend using



Biodiesel works well in many applications, such as this B20 transit bus at the University of Colorado at Boulder. Photo by Pat Corkery, NREL/PIX 18103

biodiesel blends above B5 in on-highway vehicles manufactured in model year 2007 and later. In these vehicles, high levels of fuel may accumulate in the engine lubricant under certain conditions. It's not known whether those high levels of biodiesel might affect lubricant performance.

Check your OEM's website or speak with a dealer to determine which biodiesel blend is right for your vehicle. You can also find general and manufacturer-specific information on the National Biodiesel Board website (www.biodiesel.org).

How can I find biodiesel?

Biodiesel is available in all 50 states. According to the U.S. Energy Information Administration, annual consumption of biodiesel in the United States totaled 316 million gallons in 2009.¹ As of June 2009, the country had an annual production capacity of more than 2.69 billion gallons.² According to the Alternative Fuels and Advanced Vehicles Data Center (AFDC) website, there are more than 600 B20 fueling sites across the country. To look up biodiesel stations in your area, use the Alternative Fueling Station Locator at www.afdc.energy.gov/stations.

Will biodiesel perform as well as diesel?

Engines operating on B20 exhibit similar fuel consumption, horsepower, and torque to engines running on conventional diesel. And biodiesel has a higher cetane number (a measure of the ignition value of diesel fuel) and higher lubricity (the ability to lubricate fuel pumps and fuel injectors) than U.S. diesel fuel. B20's energy content is between those of No. 1 and No. 2 diesel.

Will biodiesel perform well in cold weather?

The cold-flow properties of biodiesel blends vary depending on the amount of biodiesel in the blend. The smaller the percentage of biodiesel in the blend, the better it performs in cold temperatures. Regular No. 2 diesel and B5 perform about the same in cold weather. Both biodiesel and No. 2 diesel have some compounds that crystallize in very cold temperatures. In winter weather, manufacturers combat crystallization in No. 2 diesel by adding flow improvers. For best cold weather performance, drivers should use B20 made with No. 2 diesel manufactured for cold weather.



U.S. Department of Energy

1. U.S. Energy Information Administration Monthly Energy Review, Table 10.4 (www.eia.doe.gov/emeu/mer/renew.html)
2. National Biodiesel Board (www.biodiesel.org/pdf_files/fuelsheets/Production_Capacity.pdf)

For more information about cold-flow properties and biodiesel handling, download the Biodiesel Handling and Use Guide from www.nrel.gov/vehiclesandfuels/nrbf/pdfs/43672.pdf.

Will biodiesel plug my vehicle filters?

Biodiesel has a solvent effect. It cleans your vehicle's fuel system and could release deposits accumulated from previous diesel fuel use. The release of deposits may initially clog filters, so you should be proactive in checking for and replacing clogged fuel filters. Once the build-up is eliminated, return to your regular replacement schedule. This issue is less common with B20 and lower-level blends.

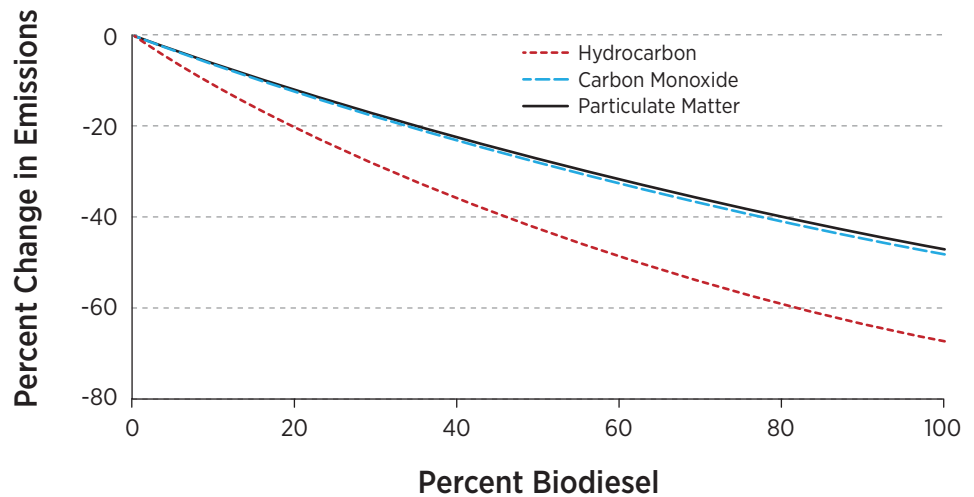
Will long-term biodiesel use affect my engine?

Studies of B20 and lower-level blends in approved engines have not demonstrated negative long-term effects. Higher-level blends (above B20) can impact fuel system components (primarily fuel hoses and fuel pump seals) that contain elastomer compounds incompatible with biodiesel. The effects are lessened as the biodiesel blend level decreases. For more information, visit www.biodiesel.org.

Does biodiesel need to meet any standards?

Biodiesel used in blends should meet specification D6751, a quality standard set by ASTM International. Biodiesel that meets this standard is legally registered as a fuel blendstock or additive with the U.S. Environmental Protection Agency. Biodiesel blends containing 5% or less biodiesel are required to meet the same fuel-quality specifications as conventional diesel fuel, according to ASTM D975. Biodiesel

Figure 1. Average Emission Impacts of Biodiesel for Heavy-Duty Highway Engines



Environmental Protection Agency. Draft Technical Report, *A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions*, EPA420-P-02-001, 2002.

blends containing 6% to 20% biodiesel must meet the requirements of ASTM D7467.

Is biodiesel cleaner-burning than diesel?

The use of biodiesel in conventional diesel engines substantially reduces emissions of pollutants that impact air quality, including unburned hydrocarbons (HCs), carbon monoxide (CO), sulfates, polycyclic aromatic HCs, nitrated polycyclic aromatic HCs, and particulate matter (PM). B100 provides the greatest emissions reductions, but lower-level blends also provide benefits. B20 has been shown to reduce PM emissions by 10%, CO by 11%, and unburned HCs by 21% (see Figure 1). Studies of oxides of nitrogen emissions have provided contradictory results, and additional testing and analysis is ongoing.

Biodiesel use also reduces greenhouse gas emissions. The carbon dioxide released in biodiesel combustion is

offset by the carbon dioxide sequestered while growing the feedstock from which biodiesel is produced. B100 use reduces carbon dioxide emissions by more than 75% compared to petroleum diesel. Using B20 reduces carbon dioxide emissions by 15%.

Can I use vegetable oil in my diesel engine?

Straight vegetable oil is not a legal motor fuel and doesn't meet biodiesel fuel specifications or quality standards. For more information, download the fact sheet, "Straight Vegetable Oil as a Diesel Fuel," from the AFDC website at www.afdc.energy.gov/afdc/pdfs/47414.pdf.

Where can I read more?

For more information on biodiesel, including production, distribution, and fueling station locations, visit the biodiesel section of the AFDC at www.afdc.energy.gov/afdc/fuels/biodiesel.html.