Biodiesel Fuel

A Renewable, Clean Burning Alternative

ENERGY EFFICIENCY AND RENEWABLE ENERGY

OFFICE OF TRANSPORTATION TECHNOLOGIES

Transportation

FOR THE 21ST CENTURY

Background

Biodiesel is a clean, renewable, domestically produced fuel that can be burned in diesel vehicles without modifications while using the existing fueling infrastructure. The use of biodiesel decreases our dependence on imported petroleum while creating new markets for domestic agricultural products. Most biodiesel produced in the United States is made from soybeans and yellow grease. The U.S. Department of Energy (DOE) National Renewable Energy Laboratory (NREL) is the cornerstone for biofuels research that continues to develop and facilitate the commercialization of biodiesel.

The Technology

Biodiesel is produced by chemically reacting any natural oil or fat with an alcohol (usually methanol). Typically, biodiesel is distributed as a 20% blend with Number 1 or 2 diesel fuel. When burned, biodiesel releases up to 78% less carbon dioxide (CO_2) than conventional diesel fuel because the crops used to produce biodiesel absorb large amounts of CO_2 as they grow. Biodiesel also reduces small lung-burning particulates endemic to diesel exhaust by 68%. It reduces sulfur dioxide (SO_2) by 100%, polycyclic aromatic hydrocarbons (potential cancer causing compounds) by 75%, carbon monoxide (CO) by 50%, and hydrocarbons (HC) by 37% over various engine families. Biodiesel is the first alternative fuel to have a complete evaluation of emission results and potential health effects submitted to the U.S. Environmental Protection Agency under the Clean Air Act.

Commercialization

Through various partnerships, NREL's bench-scale pretreatment laboratory and highly instrumented equipment have enabled biodiesel companies to scale up processes and improve the economics of biodiesel, leading to commercial production in the mid-1990s. U.S. farmers have always promoted soy-based industrial products, and now there are six midwestern states that offer a biodiesel fuel option at the pump. Farm co-ops in 11 locations offer farmers the opportunity to commercially purchase biodiesel for use in diesel engines.

Federally regulated fleets under EPACT can now use B20, a blend of 20% biodiesel and 80% diesel fuel to qualify for EPACT credits under certain conditions. One AFV credit is provided for each 450 gallons of pure biodiesel used in blends of at least 20% in a vehicle weighing 8,500 lbs or more gross weight, in a year. B20 credits cannot exceed 50% of the fleet's AFV requirements. B20 can be used in off-road and on-road vehicles to qualify.

Currently, 30 million gallons of biodiesel are produced annually in the United States. According to the American Biofuels Association, with government incentives comparable to those provided for ethanol, biodiesel production from recycled greases could reach about 1 billion gallons per year, which is equivalent to near-term potential of 5 billion gallons of biodiesel blend B20.

Benefits

- **Reduces emissions of:**

  CO by 50%
  HC by 37%
  SO_2 by 100%
  Particulates by 68%

- **Seventy-eight percent reduction in CO_2 emissions over lifecycle**
- **Non-toxic and biodegradable**
- **Suitable for conventional diesel engines without retrofit**

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