
ALTERNATIVE FUELS IN THE FUTURE

Biodiesel Fueled Vehicles

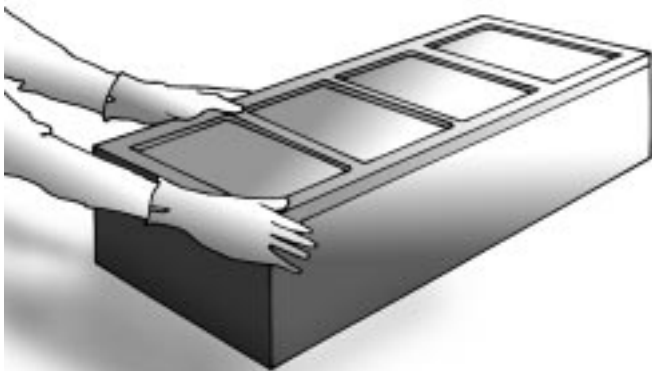
Biodiesel (mono alkyl esters) is a cleaner-burning diesel fuel made from natural, renewable sources such as vegetable oils. Soybean oil is currently the main source of biodiesel, but considerable interest has been shown in rapeseed oil. Just like petroleum diesel, biodiesel and biodiesel blends operate in combustion-ignition engines. Essentially no engine modifications are required, and biodiesel maintains the payload capacity and range of diesel.

Biodiesel has physical properties very similar to conventional diesel. Emission properties, however, are better for biodiesel than for conventional diesel. It is made from domestic renewable resources. It is biodegradable, requires minimal engine modification when used either as a blending component or as is, and is potentially cleaner burning than the diesel it replaces. Most biodiesel is 20% bio and 80% diesel.

Biodiesel is relatively new but is gaining widespread commercial use. As its price becomes more competitive, experts predict it will make a significant market impact.

Vehicles Powered by Fuel Cells

A fuel cell converts the chemical energy of a fuel into usable electricity and heat without combustion as an intermediate step.



A fuel cell is very much like a battery that can be recharged while you are drawing power from it. The above fuel cell stack could power an automobile.

A vehicle powered by a fuel cell can be highly efficient and can reduce emissions significantly. Because hydrogen reacts with oxygen to produce electricity and emits only water vapor and heat, it is the optimal fuel for powering fuel cells.

Fuel cell vehicles are being developed to meet the performance expectations of today's consumers. They are expected to be extremely quiet and have very little vibration because there are few moving parts.

Currently few fuel cell vehicles are available for sale in the United States. The goal is to develop these vehicles with levels of safety, comfort, and cost comparable to those of a conventional vehicle. Meeting consumers' cost expectations, especially when the vehicles are first introduced, will be difficult. But incentives, rebates, and possible auto manufacturer price adjustments will help to reduce the purchase price of these unique vehicles.

Alternative fuels provide three distinct advantages over conventional fuels:

1. Using domestically produced transportation fuels can reduce U.S. dependence on imported crude oil.
2. Alternative fuels can reduce the amount of airborne pollution.
3. Cleaner-burning alternative fuels mean less frequent engine maintenance and extended engine life, resulting in economical efficiency.

Hydrogen as a Fuel

Though some automakers are testing hydrogen-burning cars, they are not currently feasible or economical. Research shows that the greatest potential use for hydrogen as a transportation fuel is in a fuel cell. Electricity to power a vehicle is produced when hydrogen and oxygen are combined. A fuel cell is two to three times more efficient than an internal combustion engine.

Hydrogen is the most abundant element in the universe, but is rarely found in its uncombined form on the earth. When combusted (oxidized) it creates only water vapor and heat as by-products. When burned in an internal combustion engine, however, combustion also produces small amounts of nitrogen oxides and small amounts of unburned hydrocarbons and carbon monoxide because of engine lubricants. The exhaust is free from carbon dioxide.

While no transportation distribution system currently exists for hydrogen transportation use, the ability to create the fuel from a variety of resources, including natural gas, and its clean-burning properties make it a desirable alternative fuel and worthy of consideration.