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Extended Definition:

Biodiesel

**Introduction**

Biodiesel is a renewable resource created from animal fats, waste vegetable oil, plant oils, and even algae. Biodiesel has many advantages over petroleum-based diesel, including it is biodegradable and free from aromatics (fragrances). Individuals with diesel engines and a high demand for fuel or with excess vegetable oil commonly produce biodiesel. This occurs most often on farms when there is a demand for diesel in tractors. Biodiesel can sometime be confused with ethanol and raw vegetable oil, however, there are some differences.

**Production of Biodiesel**

According to the Biodiesel Handling and Use Guide, the process to make biodiesel is referred to as transesterification. This process involves converting oils and fats into methyl esters, also known as biodiesel. Figure 1 is a simplified diagram of the process. To produce 100 pounds of biodiesel, 100 pounds of oil or fat are reacted with 10 pounds of an alcohol, usually methanol, in the presence of a catalyst, usually potassium hydroxide. About 10 pounds of glycerin, another product of the process, is also produced. Glycerin can then be used to make soap, therefore all of the products can be used (National Renewable, 2009).

Ethanol, another alternative fuel, is produced from sugars for use in gasoline type engines as opposed to diesel engines. Raw vegetable oil does not meet the biodiesel fuel specifications. Biodiesel can be interchangeable with petroleum-based diesel because they have similar viscosity, whereas vegetable oil has a much higher viscosities and will not work in standard diesel engines without major modifications. Some small modifications may be required to run biodiesel in engines containing rubber because it is incompatible with some rubbers (National Biodiesel, 2009).



Figure1: Basic Transesterification Process1

**Biodiesel Advantages**

There are several advantages to using and producing biodiesel, a few of them are listed below.

* According to biodiesel.org, biodiesel is the only alternative fuel to have fully completed the health effects testing requirements of the Clean Air Act.
* There are almost no sulfur oxides or sulfates in biodiesel emissions.
* Biodiesel has almost fifty percent less smog forming potential from its hydrocarbon exhaust emissions compared to diesel fuel.
* Biodiesel is the best greenhouse gas improvement strategy for medium and heavy-duty vehicles.
* The storage and handling methods of biodiesel are the same as petroleum based diesel.
* Biodiesel blends of up to twenty percent biodiesel can be used in normal diesel engines without any modifications, and only slight modifications are necessary for blends of more than twenty percent biodiesel.
* Biodiesel is a diversified fuel because it is produced from several renewable resources including waste vegetable oil, plant oils, and animal fat.
* It is less toxic than table salt and biodegrades as fast as sugar.
* For every unit of fossil energy it takes to create biodiesel, 3.5 units of energy are gained.
* Biodiesel can be produced from renewable resources available in the United States, decreasing our dependence on foreign oil (National Biodiesel, 2009).

**Biodiesel Disadvantages**

Despite the numerous advantages of using biodiesel, there are some drawbacks.

* The National Biodiesel Board says that nitrogen oxides emissions of biodiesel engines could be slightly increased compared to diesel engines depending on the duty cycle of the engine and the testing methods used.
* Biodiesel has a higher gel temperature than standard petroleum based diesel. This means that straight biodiesel should not be used at low temperatures, but twenty percent blends can be treated as regular diesel in low temperature situations (National Biodiesel, 2009).
* Biodiesel releases deposits from the tank walls during the initial uses, which can cause filter clogging. Because of this, great caution should be used when converting over vehicles with over 80,000 miles (Summit, 2007).

**Conclusion**

Biodiesel is a great biofuel whose popularity is on the rise. America has become a nation filled with fast food restaurants and citizens addicted to fried foods, which has lead to large amounts of waste vegetable oil (WVO), about 4.5 billion gallons per year (Frequently, 2006). Four and half billion gallons of waste vegetable oil equals 4.5 billion gallons of biodiesel per year if companies began using proper disposal techniques and sold or donated their WVO to biodiesel producers instead of dumping it in landfills. Biodiesel’s popularity is growing in every direction from the small-scale productions by home brewers to school organizations to large-scale incorporated companies producing biodiesel for profit.

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