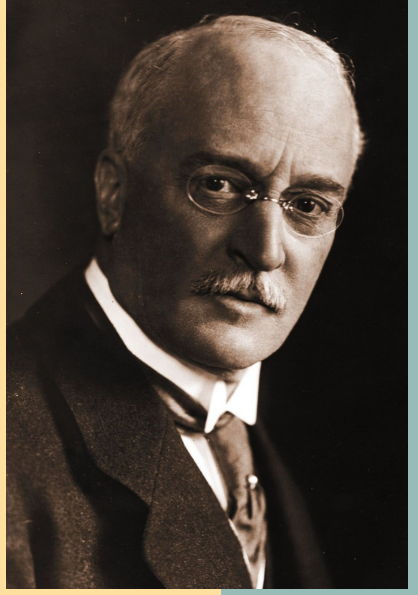

BIODIESEL PRODUCTION

Brief History of Biodiesel



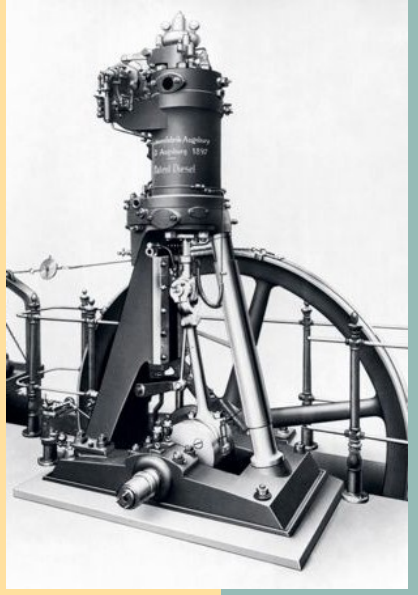
Rudolf Diesel
1858-1913

“For sake of completeness it needs to mentioned that already in the year 1900 plant oils were used successfully in a diesel engine. During the Paris Exposition in 1900, a small diesel engine was operated on arachide (peanut) oil by the French Otto company. It worked so well that only a few insiders knew about this inconspicuous circumstance. The engine was built for petroleum and was used for the plant oil without any change. In this case also, the consumption experiments resulted in heat utilization identical to petroleum.”

Diesel addresses the use of vegetable oils as a fuel on his book "*Die Entstehung des Dieselmotors*" in 1913.

HISTO

Brief History of Biodiesel



Diesel's third test engine used in the successful 1897 acceptance test.
1 cylinder, four-stroke, water-cooled, air injection of fuel
Output: 14.7 kW (20 hp)
Efficiency: 26.2%

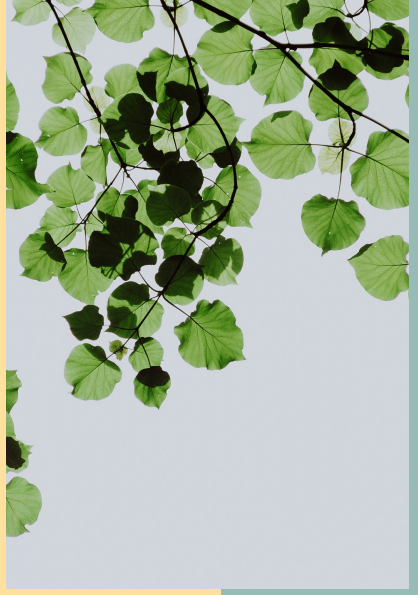
Source: dieselnet.com

HISTO

Rudolf Diesel invented the diesel engine in the 1890s. From the beginning, this engine could run on a variety of fuels, including vegetable oil. In 1900, one of the new diesel engines featured at the Paris Exposition was powered by peanut oil. However, because cheap petroleum fuels were easily available, few people were interested in alternatives (Pahl, 2005, pp. 18-22).

As early as the 1930s, there was interest in splitting the fatty acids from the glycerin in vegetable oil in order to create a thinner product similar to petroleum diesel. In 1937, G. Chavanne was granted a Belgian patent for an ethyl ester of palm oil (which today we would call biodiesel). In 1938, a passenger bus fueled with palm oil ethyl ester plied the route between Brussels and Louvain (Knothe, 2005, p. 10).

During World War II (1939 to 1945), when petroleum fuel supplies were interrupted, vegetable oil was used as fuel by several countries, including Brazil, Argentina, China, India and Japan. However, when the war ended and petroleum supplies were again cheap and plentiful, vegetable oil fuel was forgotten.[1]



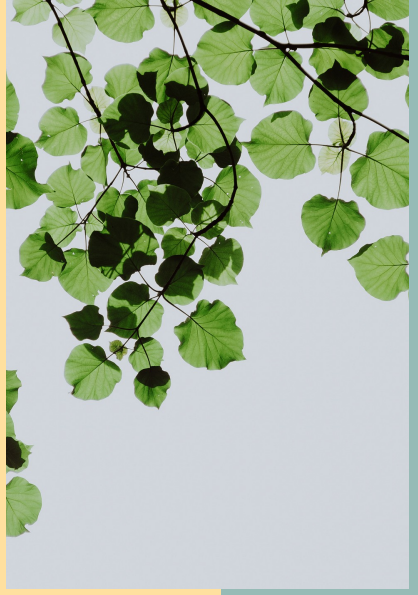
Brief History of Biodiesel

Photo: eia.gov

Modern Interest in Biodiesel

In the 1970s, the petroleum oil embargo caused many countries to look to vegetable oil as a possible fuel. Scientists in Austria, the United States, South Africa, and many other countries rediscovered that straight vegetable oil could be used to run diesel engines; however, eventually the poor quality of the fuel spray caused by the thickness (viscosity) of the vegetable oil caused damage to the engines. Scientists then conducted experiments to convert the vegetable oil into biodiesel. The word “biodiesel” was probably first used in about 1984 (Van Gerpen et al., 2005, p. 4).

HISTO



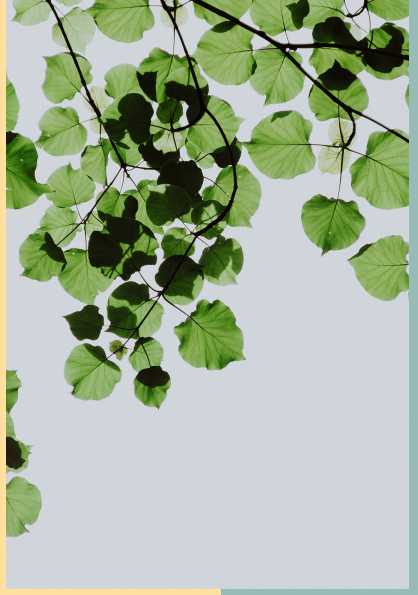
Brief History of Biodiesel

A Boeing 747, one of four engines powered by a 50-percent biokerosene mix.

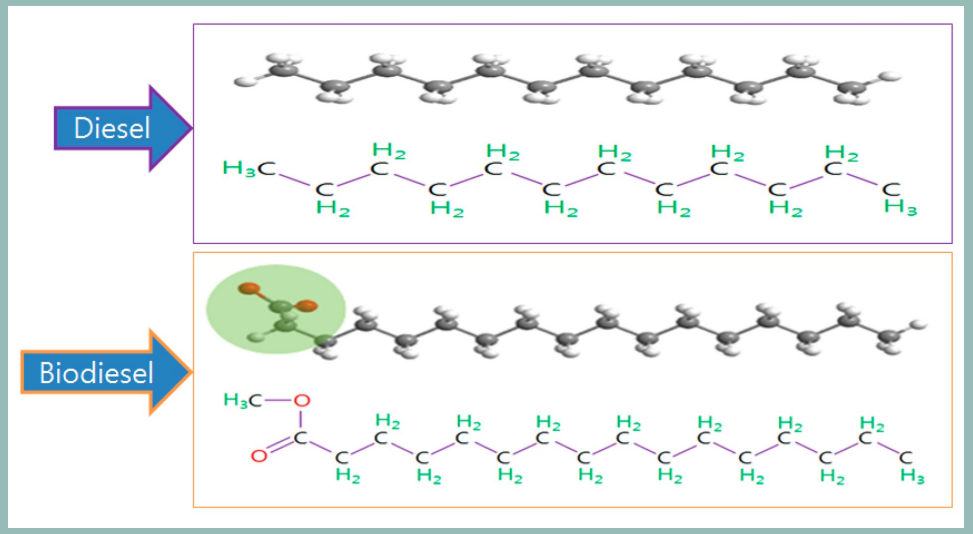
Source: phys.org

The first biodiesel manufacturing plant specifically designed to produce fuel was started in 1985 at an agricultural college in Austria. Since 1992, biodiesel has been commercially manufactured across Europe, with Germany being the largest producer. In the United States, biodiesel was first manufactured commercially in 1991 in Kansas City, Missouri. In 1995, the University of Idaho provided biodiesel to Yellowstone National Park, which used the fuel in a truck that has been driven several hundred thousand miles without damage to the engine and is still in use. As a result, other national parks began using biodiesel in their vehicles (Pahl, 2005, pp. 40-41, 83, 156)[1]

HISTO



What is Biodiesel?

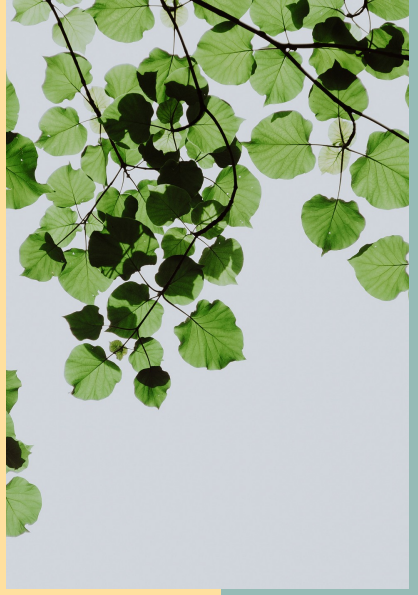


The chemical composition difference between petrodiesel and biodiesel.[3]

Biodiesel is a renewable fuel made from biomass. Biodiesel is mostly produced from vegetable oils, animal fats and used cooking oil. Biodiesel can be used in the same equipment as diesel fuel made from petroleum.

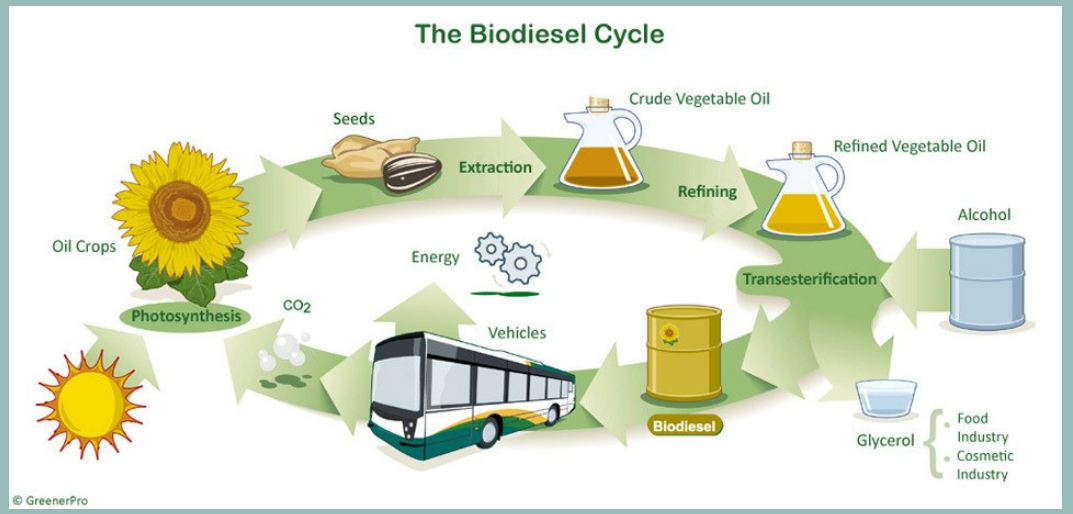
Biodiesel is most often blended with petroleum diesel in ratios of 2% (referred to as B2), 5% (B5), or 20% (B20). Biodiesel can also be used as pure biodiesel (B100). Biodiesel fuels can be used in regular diesel engines without making any changes to the engines. Biodiesel blends are also used as heating oil. Biodiesel can be stored and transported using petroleum diesel fuel tanks and equipment.[2]

DEFINI



PROS &

Advantages of Biodiesel



Source:metaefficient.com

- Renewable fuel, obtained from vegetable oils or animal fats.
- Low toxicity, in comparison with diesel fuel.
- Degrades more rapidly than diesel fuel, minimizing the environmental consequences of biofuel spills.
- Lower emissions of contaminants: carbon monoxide, particulate matter, polycyclic aromatic hydrocarbons, aldehydes.
- Lower health risk, due to reduced emissions of carcinogenic substances.
- No sulfur dioxide (SO2) emissions.
- Higher flash point (100C minimum).

REFERENCES

1https://articles.extension.org/pages/27135/history-of-biodiesel

2https://www.eia.gov/energyexplained/index.php?page=biofuel_biodiesel_home

3- Ge, J.C.; Yoon, S.K.; Choi, N.J. Using Canola Oil Biodiesel as an Alternative Fuel in Diesel Engines: A Review. Appl. Sci. 2017, 7, 881.

4- Romano, S. D. and Sorichetti, P. A. Dielectric Spectroscopy in Biodiesel Production and Characterization, Green Energy and Technology, 2011, Springer.

5- UFOP Report on Global Market Supply 2017/2018

6Marchetti J.M.; Miguel V.U.; Errazu A.F. Possible methods for biodiesel production. Renewable and Sustainable Energy Rewievs. 2005.

7Gebremariam, S.N.; Marchetti, J.M. Biodiesel production technologies: review. AIMS Energy. 2017.

8https://www.sebiodiesel.com/2017/11/06/biodiesel-synthesis-simplified/

9Motta, Justin & S Parnas, Richard. (2015). Creating Renewable Energy from the Effective Management of Fats, Oils, and Grease (FOG).