Biodiesel
By Joseph M. Perez Sr., PhD, Professor Emeritus at Pennsylvania State University

What is biodiesel?

By definition (USEPA/ASTM): “Biodiesel is a fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100, and meeting the requirements of American Society of Testing Material (ASTM) specification D6751.”

It is a domestic, renewable fuel for diesel engines and can be used in any concentration with petroleum-based diesel fuel in existing diesel engines with little or no modification.

It is not:

- Green diesel
- Renewable diesel
- Vegetable oil, animal fat
- Waste cooking oils
- Used motor oil diluted into petro-diesel

These are often referred to in the literature as biodiesel. Green and Renewable diesel are based on commercial processing technology by Shell and Conoco-Phillips Oil companies. The chemical composition is different.

The chemical process used to produce biodiesel is known as transesterification. Vegetable oil and alcohol are reacted, producing esters, or biodiesel, and a byproduct, glycerol. The process to produce green or renewable diesel involves hydrogenation or hydrocracking and no glycerol is produced.

Vegetable oil can be used as a fuel but requires modification of the fuel system. In some systems, the engine starts and runs on regular diesel fuel until the system is hot enough to reduce the viscosity of the vegetable oil. On shutdown, the system must be converted to regular diesel again as the system cools down.

The economics of producing bio-diesel and the quality of the biodiesel are affected by the feedstocks. Cost of the feedstock is over 75% of the production cost. The degree of refinement of the byproduct of the transesterification, glycerol, is also a major factor.

In the US, soybean oil is the major feedstock. Waste cooking oils are in high demand as feedstocks for making biodiesel. An ideal food – biodiesel cycle is to produce the crop, use the oil for cooking, take the waste cooking oil, convert it to biodiesel for use in tractors to plant the crop.

Source: STLE Lubrication Fundamentals Technical eNewsletter
©Society of Tribologists and Lubrication Engineers