

FFA in Biofuels

Any kind of fuel is a material that stores potential chemical energy that can be released through combustion. The biological carbon fixation, the natural conversion of inorganic carbon (carbon dioxide) to organic compounds, is at the origin of this energetic potential, released during combustion as heat energy.

Biofuels are natural organic compounds that are used as fuels. When burnt, they are a natural source of heat energy and thus a natural source of power. Lower quality vegetable oils are used for biofuels.

From these oils you can produce biodiesel for transportation (in vehicles) and biofuel for cogeneration or polygeneration plants, power plants able to produce more than one kind of service (electricity, heating and cooling).

Biofuel Acidity and other Parameters

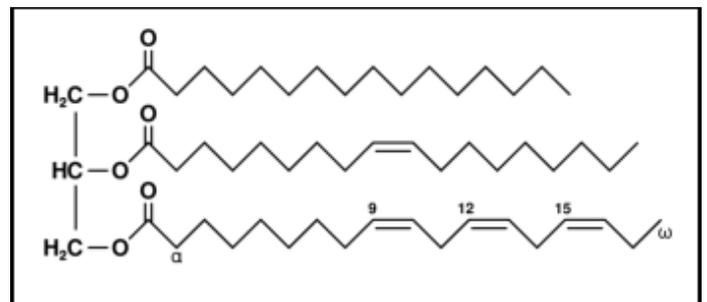
The condition of oils used as biofuels is very important. They can be identified through analysis of the free fatty acids, the phosphorus content and the presence of traces of water in the oils. The most significant aspect to analyze is the measure of acidity, the value of the free fatty acids. In both of the following cases an accurate free fatty acids test is very helpful and necessary:

- 1/ The oil used as biodiesel undergoes a transesterification process, a specific treatment that requires the monitoring of the free fatty acids of the vegetable oil treated.
- 2/ The oil used for combustion, as it will cause damage to engines or boilers if it is too acid.

Vegetable oils are tryglicerides extracted from a plant. Tryglicerides are bio-chemical compounds that occur in nature. They are formed by combining glycerol with three molecules of fatty acids. Depending on the oil source different tryglicerides are obtained.

Free Fatty Acids Test - Structures of Fatty Acids in a Triglyceride Formula

Here is an example of unsaturated fat triglyceride compound. On the left there are glycerol molecules, on the right there are three different molecules of fatty acids: in this case we have, starting from the top, palmitic acid, oleic acid and alpha-linoleic acid.



When the fatty acids are not attached to other molecules they are known as “free” fatty acids.

The measure of these broken bounds in triglyceride

compounds is the FFA parameter. The measurement is possible through the free fatty acids test.

The Acid Content in Biofuels

The acid content of fats and oils is given by the quantity of free fatty acids deriving from the hydrolytic rancidity of triglycerides. In short, FFA measures the level of degradation of the fats.

Recently the FFA parameter is used more and more to detect the conditions of vegetable oils used as biofuels that produce green power, because acidity is dangerous for engines and boilers in which the oils are used and can cause damage.

How to Determine Free Fatty Acids Parameter

The reference method to determine FFA is titration. It requires an equipped laboratory and trained analysts. An Acidometer is another method, simpler but with low sensitivity low accuracy.

More than one instrument of the FoodLab line offers an alternative: a reference method compliant FFA test that do not require a laboratory or skilled staff. The method is always the same: very easy to perform, fast (the testing time is 1 minute per test), highly sensitive and accurate, and proved by a correlation with AOCS Official Method (Ca 5a-40).



It works using a colorimetric reading at 630 nm that determines the proportional concentration of acid in the sample. Free fatty acids in the sample, at a pH value less than 7.0, react with a chromogenous compound and decrease its colour. The decreasing of the colour expresses the percentage of acid. The kind of acid depends on the kind of matrix. The most common used biofuels are low quality palm oil, rapeseed oil, sunflower oil, soybean oil, frying oil or waste oil.