Additives play a vital role in biodiesel production and storage, primarily for oxidation stabilisation and deposit control

Introduction to biodiesel additives

Biodiesel stability is influenced by a number of factors including feedstock, the production process used and the amount of time the product spends in the supply chain.

Virgin oils that are fresh from the crusher are likely to be low in free fatty acids and subject to the pre-treatment stages. The fatty acid profile of the feedstock will have an important effect on overall stability with feedstocks high in poly-unsaturates tending to be less stable, such as soyabean, cottonseed and jatropha.

Distilled biodiesel has fewer tocopherols (natural occurring antioxidants) retained in the product than biodiesel produced in other processes, and biodiesel produced from hydrogenated feedstocks tend to be more stable.

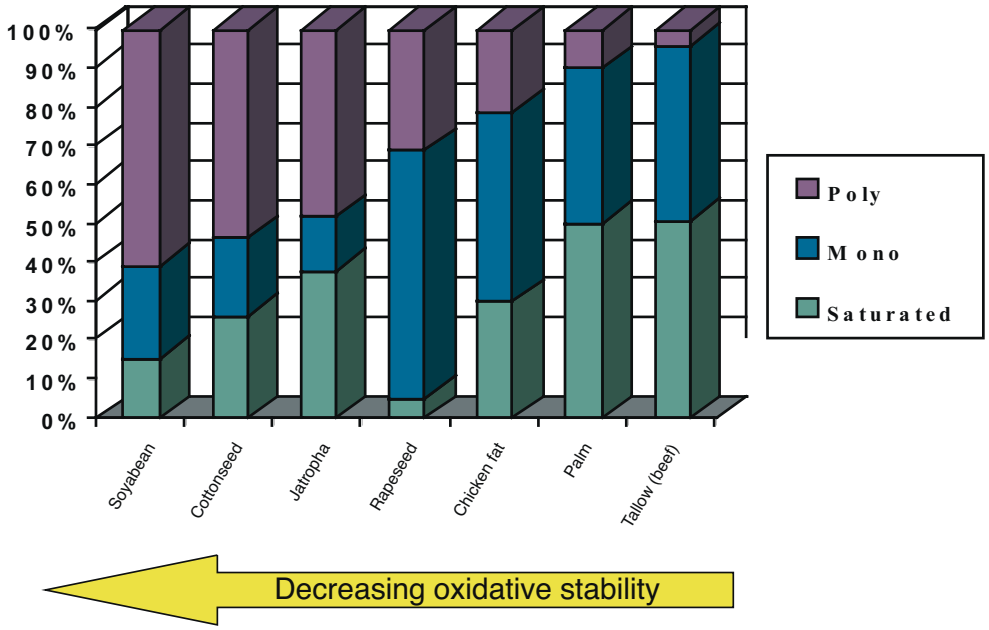
Additive supplier SBZ Corporation explains that biodiesel can degrade due to a number of factors including:

- Oxidation from contact with air
- High ambient or storage temperatures
- Contact with water or moisture
- Storage times

Metal contamination such as copper and iron will catalyse the oxidative breakdown of unsaturated methyl esters and have a major impact on the oxidative stability.

The European standard for biodiesel EN14214 specifies minimum oxidation stability of 6 hours at 110°C. This is based on the EN14112 specification or Rancimat test.

Fatty acid profile of various feedstocks



Source: Albemarle Corporation

Selecting a biodiesel stabiliser

There is a number of factors in the selection of an appropriate biodiesel stabiliser including:

- Will the stabilise work in a wide range of biodiesel types?
- Is the stabiliser approved for use in mineral diesel?
- Does the stabiliser provide straight forward handling for the producer and blender?
- Is the stabiliser cost effective?

Cold flow improvers

Mineral diesel can have problems when subjected to low ambient temperatures with start up and fuel pump problems with cloud point (CP) and cold filter plugging point (CFPP) tests defining its low temperature performance.

Generally biodiesel produced from high melting point feedstocks such as tallow and palm have poorer cold flow properties than those produced from soy and rapeseed oils.

When biodiesel is cooled to temperatures below its cloud point and crystals form in the fuel causing filters and pipe work to fail.

The effectiveness of cold flow improvers on biodiesel will vary depending on the feedstock, manufacturing process and the blend ratio. Producers and blenders should discuss their objectives with their additive supplier and will need to undertake a programme of laboratory testing to identify the best combination of additives to use.

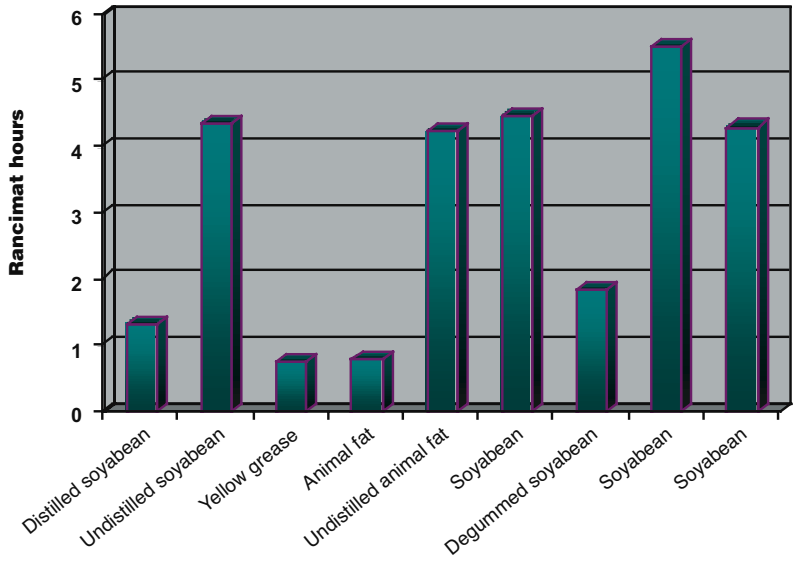
Cetane improvers

The cetane number of biodiesel can be correlated to the feedstocks used to produce it, with higher percentages of saturated fatty esters producing higher cetane numbers, although there are variations in cetane numbers within biodiesel produced from the same feedstock due to climatic and farming methods.

In the US biodiesel which meets ASTM D6751 has a cetane number of a minimum 47 compared to the minimum of 40 for mineral diesel fuel.

The European specification EN 590 for diesel fuel contains a requirement for the cetane number with a minimum of 51 specified. It follows therefore that biodiesel may require a cetane improver additive to reach the minimum specification especially if the biodiesel is to be exported from the US to Europe.

High variability across feedstocks



(Each feedstock is from different producers)

Source: Albemarle Corporation

Selection of the optimum cetane improver will result in the following key performance benefits:

- Cost-effective increase in cetane number
- Elimination of biodiesel NOx debit
- Improved low temperature start ability
- Reduced noise and vibration

Biocides

Biodiesel that has not been dried adequately in the manufacturing process will contain excess water which can lead to corrosion and provides an ideal environment for microorganisms. Anaerobic colonies, usually sulphur reducing, can be active in sediments on tank surfaces and cause corrosion. Biodiesel that is stored in free-breathing tankage in high humidity environments will absorb moisture.

Biodiesel will have a number of intermediate transfers between the production plant and the final customer tank including railcar, road car and ship transfers, all of which increase the possibility of moisture and bacteria contamination.

A biocide additive is recommended for all biodiesel fuel at a low dosing rate to minimise the potential for biological growth in the fuel. SBZ Corporation recommends a 10ppm treat rate in the final blend. A dosing regime will avoid the need for shock treatments with high dosage rates, blocked filters, off specification product and system contamination that is extremely difficult to eliminate.

When biological contamination has been identified in a tank all free water and sediment contamination should be removed since the bacteria is usually grown at the fuel-water interface.

Anti foaming

An under-reported problem with biodiesel both as B100 and in mineral diesel blends is foaming at the fuel pump. This slows the filling of road vehicles and can significantly increase refuelling times and the likelihood of forecourt spillages, in the case of road fleet refuelling operations.

SBZ recommends the use of its premium multifunctional diesel/biodiesel fuel additive package, which includes an extremely effective defoamant. ●

For more information:
This article was written by SBZ Corporation, www.sbzcorporation.com