



# GLOSSARY

**Density**

Biodiesel has higher density than mineral diesel. The denser biodiesel will characteristically sink to the bottom of the tank and this can lower fuel consumption which is determined volumetrically; so the denser the fuel, the higher the consumption will be. Under laboratory conditions density is tested to EN ISO 12185 which is one of 27 separate tests which combine to meet EN14214. Density can be easily measured at the time of manufacture, using a simple hydrometer method. Laboratory results and the EN14214 standards report density at 15°C so it is important that the result is corrected for temperature.

**Viscosity**

Viscosity of biodiesel is higher than mineral diesel which can lead to problems in fuel delivery systems. High viscosity can lead to poor combustion which leads to coking of injector tips and engine power loss. Viscosity decreases with unsaturation but increases with the presence of mono, di or triglycerides. Lower viscosity can also indicate the presence of methanol in the biodiesel, which can be confirmed by measuring flash point (the lower the flash point, the more methanol is present). The removal of glycerides by Schroeder Biofuels systems means that purified biodiesel has increased flow capabilities which is beneficial during wintertime. Viscosity is subject to EN ISO 3104 which Schroeder Biofuels purification systems can achieve. Viscosity can be checked on-site, using a "falling ball" viscometer. This test consists of a precision tube, filled with the sample biodiesel and then a ball is timed as it falls a set distance through the fuel. The time taken is converted to viscosity. See quality control section.

**Flash Point**

Flash point is the lowest measure by which a liquid will ignite in air. The flash point with biodiesel should be low enough for it to be classified as "Non flammable" and tested to ISO 2719. Purification with MAGNESOL™ is key to residual methanol removal to ensure safer working and storage conditions to biofuel producers and users alike.

Flash point can also be checked on site, using a portable flash point tester. A sample is heated to a given temperature, in a special enclosure. The lid is then opened and a pilot light is used to ignite any flammable vapour present. The "flash" is automatically detected and provides a simple pass/fail to the EN14214 specification.

**Sulphur Content**

Sulphur emissions are harmful to human health and emissions make Sulphur Dioxide, which is indicative of acid rain. The sulphur content test BS EN ISO 20846 is difficult to pass using over used waste oils and without this part of the specification - your product will not meet EN14214.

**Carbon Residue**

The carbon residue is the material left over after combusting fuel. Residual carbon is responsible for choking fuel injectors so it is important to eliminate this. MAGNESOL™ removes residual soaps and metals which will lead to carbon residue. This is a PROVEN METHODOLOGY which will lead to your product passing IP 13.

**Cetane Number**

Cetane number is a measure of ignition quality. Fuels with low Cetane numbers show increased emissions due to incomplete combustion. Palm oil and tallow derived biodiesels have higher Cetane numbers. If you are using a feedstock which is not likely to pass EN ISO 5165 a Cetane boosting additive can be used.

**Sulphated Ash**

Similar to carbon residue sulphated ash content is tested by taking a sample of biodiesel and combusting it and then weighing the residual non-combustible mineral ash under specifications to EN ISO 3987. Production residues can be removed using Schroeder Biofuels purification systems.

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## **Water Content**

EN ISO 12937 specifies a maximum of 500 ppm (parts per million) of water in biodiesel. As FAME is hygroscopic it can pick up water in storage and because of this there can be problems meeting the specification. At around 1500 ppm the solubility limit is reached and the water becomes visible. Producers still using traditional “wet wash” systems may find this aspect of the EN specification rather troublesome to achieve. Free water promotes biological growth and adverse reaction to transesterification which undoes biodiesel back into free fatty acids, which is disastrous in a fuel delivery system. MAGNESOL™’s published performance data shows that a sample of FAME with 7000 mg/kg of water in an initial sample was reduced to 50 mg/kg which is 10% of the upper limits of EN ISO 12937 - which requires 500 mg/kg of water.

## **Total Contamination**

Because production contaminants like residues and soaps can still be present in the purification stage of making biodiesel, the use of Schroeder Biofuels final polishing makes achieving total contamination to EN12662 the best way to ensure the total removal of production residues, which means clean fuel and peace of mind.

## **Copper Strip Corrosion**

This is defined as the likelihood to cause corrosion to copper, zinc and bronze parts of an engine such as injector tips and common rail systems. Clean biodiesel gives consistently good results in this area and is unlikely to fail EN ISO 2160 due to the low sulphur content.

## **Oxidation Stability**

This property relates to the overall storage stability of the fuel; the higher the degree of unsaturation (double bonds) within the FAME molecules gives a decrease in oxidative stability which means that the longer it is stored the greater the reduction in quality will be. Tests have shown that MAGNESOL™ can extend the product life of biodiesel via the removal of moisture, mono, di and triglycerides.

## **Acid Value**

Acid value is a measure of mineral acids and free fatty acids contained in a fuel sample. The fewer residual compounds, the lower the acid value of the biodiesel. For biodiesel purified with Filtertechnik filtration systems, EN14104 is consistently achievable as is EN14214. Acid number will also increase over time if the biodiesel is stored incorrectly.

Acid value can be determined rapidly using a TAN (Total Acid Number) drop test. A sample of biodiesel is added to a red colored chemical reagent and then another chemical is added until the color changes to green. The number of drops taken is easily converted to the Acid Number of the fuel. See quality control section.

## **Iodine Value**

Higher Iodine values will have better cold properties whereas lower Iodine values have poorer Oxidative stability therefore affecting storage stability over time. Iodine value is determined by testing to EN14111. Schroeder Biofuels systems remove production residues to which iodine is reactive. This is a test which is determined by upstream processes, so due diligence throughout production is key to getting good results.

## **Ester Content**

This test decides whether biodiesel is subject to the 20ppl rebate on road duties (current UK legislation). To pass EN14103 there must be a minimum ester transformation of 96.5% FFA's into Methyl Esters. This test is determined by good practice in upstream processes and ensuring a good reaction driven by heat and effective agitation.

If there is not a sufficient reaction then the levels of residuals of mono, di and triglycerides will be also out of specification suggests as they will remain untransformed and this will lead to missing EN14103 and EN14105 also. Good transformation and approved downstream purification are fundamental drivers to passing the EN specifications.

## **Methanol Content**

A high Methanol content means a lower flashpoint and dangerous storage instabilities. MAGNESOL™ is the only product that has published performance data for residual methanol recovery and that ensures conformity to EN14110 which will lead to passing EN14214.

## **Glycerides**

It is vitally important that a good transesterification reaction is achieved, as by achieving a transformation of more than 96.5% limits the amount of residual mono, di and triglyceride as per EN14105. Failing to meet the specification implies low conversion to ester and deposit formation on injectors and valves.

## **Group I Metals**

Sodium and Potassium are limited to a combined 5ppm. MAGNESOL™'s strong affinity with polar compounds enables the effective removal of residual traces of Sodium and Potassium which can lead to levels exceeding the 5mg/kg upper limit required by EN14109.

## **Group II Metals**

Production deposits like Calcium and Magnesium sulphates (not to be confused with Magnesium Silicate) produce soaps which are harmful to a fuel delivery system and will fail the test IP377. Schroeder Biofuels products can guarantee the total removal of MAGNESOL™ and other contaminants as per the Dallas Group's published performance data.

## **Phosphorous Content**

This is to test for left over phosphor used in feedstock production and refining. Removal of production residues and chemicals to pass EN14107 and also across the specification of standards which combine to meet EN14214.

## **CFPP**

Under BS EN 116 the test for Cold Filter Plugging Point requires biodiesel to pass through a filter until it can no longer do so. On average Rape Seed Oil has a CFPP of 6.8°F to 23°F (-5°C to -14°C) whereas Palm Oil has a CFPP of around 50°F (10°C). This test shows that there is some sense in having shorter production chains in biodiesel manufacture as local crops are more suitable to local weather conditions for more of the year.

Cloud point of biodiesel is also used as an indicator of cold temperature stability. The cloud point of the fuel is the temperature at which wax crystals first begin to form. Below this temperature, filters will start to become blocked and potentially starve the engine of fuel. Cloud point may be determined at the time of production using an electronic cloud point detector. A small sample (0.5 ml) of biodiesel is added to the device and the test runs automatically and unsupervised. The cloud point is reported on screen as a temperature.

## **Summary**

Due to the fact the EN14214 is made up of 27 different tests which cover several key parts of production and rely upon the acquisition of adequate quality feedstocks and good working processes the production of biodiesel cannot be accounted for by a single piece of equipment.

Due to all the variables, that only you as the producer can control, that may influence your production process, Schroeder Biofuels cannot guarantee results that will pass EN14214. We can however highlight the processes and procedures to which producers should adhere.

A simple suite of tests can be conducted at the time of manufacture to give confidence that the produced biodiesel will meet the EN14214 specification. The easily obtained results can also be used to trouble-shoot the manufacturing process, helping the purification system work to its optimum level and giving you confidence in its output.