

## **First-Generation Biofuels**

Collective term: FAME (fatty acid methyl ester) or B100, standardised in accordance with EN 14214

---The standard is specific to RME (rape methyl ester) and is not met by all types of fatty acids (soy or sunflower methyl esters represent a particular problem).

---The use of RME 100 (B100) is declining dramatically because it is no longer tax-exempt in Germany. In addition, car manufacturers have not authorised the use of RME in vehicles fitted with a diesel particulate filter.

---RME is currently added to all diesel fuels at a concentration of up to 5% (B5). This B5 must fulfil the specification for diesel fuel in accordance with EN 590. There is pressure from the EU to raise the portion of biofuel to B10. This is being resisted by the car industry, which is currently carrying out large-scale field trials. The preferred option of the car industry is the addition of B5 (first generation) +5 (second generation).

---The high content of fuel ash (containing the catalyst poisons phosphorous, potassium, sodium, etc.) permitted in accordance with EN 14214 compromises the long-term stability of the catalyst.

---The standard EN 14214 is currently being tightened. The large oil companies use a B100 input specification for the addition of biofuel, which corresponds to a greatly tightened standard EN14214. However the addition of the remaining types of low-grade B100 by medium-sized oil companies still represents a risk.

---Generally the addition of FAME to mineral oils is a big step backwards with regard to the purity of the fuels and makes it more difficult to meet future emission standards: "Clean engines need clean fuels."

---Operators of commercial vehicles are still backing unesterified plant oil (high ash content) as the currently less expensive solution. This trend must be halted quickly since the exhaust gases of plant oil engines have distinctively mutagenic properties and are not compatible with catalysts, which will be required for Euro IV vehicles.

---Hope comes with the introduction of

## **Second-Generation Biofuels (BTL: biomass-to-liquids):**

---A precursor of these fuels is produced by the hydrogenation of plant oil (NEx-BTL). It will be available in small quantities from 2010. "hydrogenation instead of esterification" is the best method of turning plant oil into pure diesel fuel. Both processes have the same CO<sub>2</sub> balance. An additional advantage of this fuel is that there is no formation of unwanted by-products like e.g. glycerine.

---BTL from the gasification of biomass followed by Fischer-Tropsch synthesis also produces a very high-quality fuel (no traceable sulphur and ash content).

Unfortunately, this is not expected to become widely available before 2015. The use of these pure fuels will dramatically improve the durability of catalysts.

---The use of BTL will reduce the emissions (NO<sub>x</sub>, particulates) of the entire vehicle population by 20-40%.

### **Biofuels for spark-ignition engines**

---The main fuel used in this area is ethanol, which is not very popular because of its high vapour pressure (it does not meet the volatility requirements of EN 228). The car industry's preferred solution is etherification to produce ethyl t-butyl ether, which improves the octane number.

---All bio components for the liquid fuels for spark-ignition engines are ash-free substances that do not compromise the catalyst.