

# **Union for Promoting Oil and Protein Plants**

## **(www.ufop.de)**

### **Status report regarding the granting of approval for operation with biodiesel as a fuel**

#### **1. Cars**

the granting of a production release for diesel cars of the VW, Audi, Seat, and Skoda brands has expired with the introduction of the EURO-4 engines – but the stock of “old vehicles” (Euro 2 and Euro 3) with release at present 2-2.5 m cars

Retro-fitting of vehicles with a warranty for biodiesel with particle filters approved for biodiesel is possible since September 2006. Two project plans funded by UFOP and VDB had the result, that the companies TwinTec and HJS give a warranty for biodiesel for all particle filter systems.

The Institute of Technology and Biosystems Technology of the Federal Institute for Agriculture (FAL), Brunswick, developed the “biodiesel sensor” in 2004, with support coming from VW, FNR, UFOP and AGQM. The particle/NO<sub>x</sub> problem (trade-off) has been solved by means of the fuel sensor and appropriate adjustment of the software in the motor management system.

Use of biodiesel in EURO-4 cars with self-regenerating particle filter system is not possible – reason: the post-injection of biodiesel leads, in contrast to diesel fuel, to accelerated engine oil dilution (distillation characteristics of biodiesel). This is why the biodiesel sensor was no longer used in this generation of engines.

#### **2. Commercial vehicles**

Mercedes Benz and MAN give approval for EURO-4 and even for EURO-5 engines. The use of biodiesel in modern exhaust after-treatment systems (see below) has no negative effects – so long as the biodiesel complies with the European Biodiesel Standard DIN EN 14214.

With approval for EURO-5 engines biodiesel can, even as of today, comply with the exhaust gas requirements that will come into legal force at the end of 2008. As regards the clean fuel sales in the transport industry, from an engine-engineering viewpoint there is a sales prospect of at least 10 years.

Moreover, Mercedes Benz is offering an optional extra: a larger oil sump (no reduction of the intervals between oil changes), separate fuel supply for the auxiliary heating system.

### **3. Agricultural vehicles**

Nearly all manufactures have given their approval, especially for the latest models.

Current status: successful completion of a project carried out by DEUTZ AG to relieve engines of exhaust gas Tier 3.

The question whether the use of the biodiesel sensor leads to a further reduction of NO<sub>x</sub>/particles leads is under discussion.

All approvals at: [www.ufop.de](http://www.ufop.de)

### **Common project of the Federal Institute of Agriculture and ARGILLON GmbH**

In cooperation with the commercial vehicle manufacturer IVECO and the manufacturer of SCR exhaust gas purification system, ARGILLON GmbH, a 1,000-hour endurance trial was undertaken using a EURO-4 commercial vehicle engine with SCR exhaust gas purification.

SCR stands for "selective catalytic reduction". With the aid of urea as a reduction medium, the nitrous oxide emissions (NO<sub>x</sub>) are converted into non-harmful nitrogen (N<sub>2</sub>).

For the 1000-hour trial, only rapeseed oil methyl ester was used and the following results obtained:

1. The RME proportion in the engine oil was 1 per cent by weight after a running time of 501 hrs max.
2. The extra biodiesel quality of 10 ppm of phosphorous produced for the endurance test represented, as expected, the worst case for the exhaust gas aftertreatment system. The endurance-testing catalytic converter showed a marked loss in activity after 1,000 hours of operation with RME 10 ppm phosphorous. The phosphorous had mainly deposited itself in the incoming flow area of the catalytic converter. A heating-up trial showed that the accumulated phosphorous could be extracted from the catalytic converter by a phase of heating up, and that regeneration of the exhaust emissions aftertreatment systems is, in parts at least, possible.
3. What must be emphasised is that the particles emitted by RME can clearly be better reduced by means of the SCR catalytic converter than those emitted by diesel fuel.
4. The rapeseed oil methyl ester with 10 ppm of phosphorous (worst case) results in a

markedly increased discharge of ultra-fine particles. The normal biodiesel (conforming to standards), however, showed no emissions disadvantage in this measurement range. The fraction of ultra-fine particles is reduced by the fresh catalytic converter operating with RME.

5. During the entire duration of the trial, no thermal ageing of the endurance-testing catalytic converter occurred.

This project proved that:

- the use of customary rapeseed oil methyl esters causes no problems with the engine and the SCR exhaust gas after treatment system. Prerequisite: the biodiesel must comply with European Biodiesel Standard DIN EN 14214 and contain as little phosphorous as possible;
- phosphorous alone is responsible for the deactivation of the catalytic converter and not the biodiesel itself;

This revealed that if the potential for further improvement in the quality of biodiesel is exploited to the full, then continuous operation with a modern SCR exhaust gas aftertreatment system should cause no problem. Understandably, the commercial vehicle industry is urging that the quality reserves of biodiesel be fully exploited, and that not just the phosphorous content but basically all ash-creating components such as calcium and magnesium are reduced to the lowest possible level that technology will allow. Quality could be verified by continuous sampling from the production departments of biofuel producers, which belong to the Arbeitsgemeinschaft Qualitätsmanagement Biodiesel e.V. ([www.agqm-biodiesel.de](http://www.agqm-biodiesel.de)) (Working Committee of Quality Management Biodiesel).

With regard to future sales of biodiesel in the commercial vehicle sector, this project provides important arguments for the future market perspectives of biodiesel as a pure fuel if it is used in EURO-4 and EURO-5 commercial vehicle engines.

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