Preliminary remarks

MB diesel engines are basically designed for diesel fuels which meet the respective national or European requirements. Other types of fuel are not generally planned for.

Because the most varied of abbreviations are used to describe bio-diesel fuels we have listed below a brief "glossary":

FAME	Fatty acid methyl ester	generic term, to be used in future as part of the European standard
PME	veg. oil fatty acid methyl ester	previously used generic term within German-speaking area
RME	rape oil fatty acid methyl ester	specific "bio diesel fuel made from rape seed oil

We are fundamentally against the use of non-transesterified oils (of vegetable or animal origin) as diesel fuel as a consequence of our negative experience in this area (carbonization, deposits in the combustion chambers etc.).
For the remainder of the text we will refer to "bio-diesel fuel " in keeping with the European standard activities as "FAME", although our experience has shown that we basically tend more towards RME. FAME may have a future as a niche fuel and be used where ecological advantages are required in particular (e.g. in water protection areas).
A distinction is to be made between operating with 100% FAME and mixtures of FAME with conventional diesel fuel. Items 1 to 3 listed below relate to 100% FAME, mixtures are dealt with in item 4.

In the interest of using biomaterials and supporting domestic agriculture the past few years have entertained discussions on the possible application of "Bio-diesel fuels". In chemical terms these so-called "bio diesels" are mainly vegetable oils, which can be transformed as the result of a chemical reaction into appropriately mixed fatty acid methyl esters (FAME).

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1. Approval status

A general approval for passenger cars is not possible due to material incompatibility. As of 8/99 for individual models, E 200/220 D or CDI, C 200/220 D or CDI - irrespective of the respective engine designation - FAME-able vehicle equipment is available as special equipment. The vehicles mentioned mainly contain other, consistent elastomers in the fuel and fuel injection system.

Further details, in particular on the replacement parts valid for this, can be obtained from the Service Information 00.40-P-0005A dated 30.03.2000.

The approval of MB commercial vehicles and MB industrial engines for FAME operation are governed by service information releases (STIN, e.g. No. 00.00S0028), which are available to the MB field organizations; they describe the approval status with regard to type of vehicle, year of construction, any possible conversion measures required etc. for SK, MK, trucks, omnibuses, vans and Unimogs.

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2. Technical situation

2.1 Engine values

In comparison with diesel fuel operation the following applies to the engine values when operating with FAME:

- The volumetric fuel consumption is slightly higher because of the lower calorific value.
- The rated output is slightly lower due to the lower calorific value and higher viscosity.
- The emissions are at a similar low level on direct injection engines (trucks, buses). The black smoke level is considerably lower. Slightly higher NOx values are monitored.

In the event of unfavorable conditions, in particular where the engine idles for a long time, an unusual odor may result. The use of an oxidation catalytic converter will result in a significant reduction in HC, CO and particulate emissions as well as any odors.

2.2 Fuel

Items 1 to 3 of this sheet apply to pure FAME, not to mixtures of FAME with diesel fuel. In vehicles approved for FAME operation it is however permissible to use FAME or diesel fuel alternately, without the need for any additional measures. For mixtures of FAME with diesel fuel, see Item 4.

The fuel, also in the case of mixtures, must meet the requirements of the standard draft EN 14214.
It is particularly important to pay attention to complying with EN 14214 as operating with fuel of lower quality can result in malfunctions and damage.

2.3 Engine oil

With regard to its disposal the following applies in general:
Not every producer of rerefined engine oils is in a position to process engine oils, which exhibit a specific FAME content. The customer should ask at his/her used oil dealership.

2.3.1 Cars

The same oil change intervals apply here as for diesel fuel.
Replace the fuel filter at 1000 to 5000 km as well as every 30.000 km.
When diesel fuel is used for longer periods (> 10000 km) the fuel filter must be changed shortly after converting to FAME (at 1000 - 2000 km).
Vehicles, which are converted to FAME and which are shut down for more than 2 weeks are to be converted to diesel fuel beforehand and driven for at least 30 minutes.
When temperatures drop to below - 10 °C it is advisable to change to commercial winter diesel fuel.

2.3.2 CVs

Engine oil quality in accordance with MB Specifications for Operating Fluids, Sheet 228.0/1 to Sheet 228.5 is suitable (preferred in accordance with Sheet 228.3 or 228.5). The reduced oil change intervals when operating with FAME are specified for all commercial vehicle engines in the Service Information SI 00.40-N-0008A dated 27.05.2002
It has not yet been finalized as to whether all engine oils approved for diesel fuel operation are also suitable for FAME operation.

2.4 FAME resistance of components

Passenger cars:
The material in elastomer hoses and seals in the fuel supply system has to be converted to fluorocaoutchouc; the availability of such parts is permissible for specific models only (see "Approval status"). More details are given in the service information releases as listed under 1).

Commercial vehicles:
In some vehicle models not all components, particularly those made from elastomer material, are resistant to FAME when subject to continuous operation. Suitability for FAME operation has to be checked for each individual vehicle model for reasons of road and operating safety and may, where applicable, in some cases be given through specific modifications. More details are given in the service information releases as listed under 1).

2.5 Miscellaneous

The question regarding winter capability/cold starting has not been solved. Depending upon the vehicle and the engine it may be necessary to install a fuel preheater system to cope with minus temperatures.

FAME is an excellent solvent. Therefore it is advisable to prevent coming into contact with the paint surface when refueling.

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3. Legal situation

3.1 Fuel standard

Valid for FAME as a diesel fuel is the standard EN 14214 Issue 09/2003.

3.2 General operating permit

When in FAME mode the rated output as specified by the manufacturer may drop by more than 5%. This does not invalidate the general operating permit.

When an oxidation catalytic converter is used in a commercial vehicle, the question as to the validity of the general operating permit remains unresolved.
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4. Mixtures of FAME with mineral oil diesel fuel

4.1 Background relating to tax law

It is to be assumed that with effect from 01.01.2003 when mixing FAME with diesel fuel, the biogenic fuel components are freed from mineral oil tax. The consequence of this may be that the mixture of FAME with diesel fuel in accordance with EN 590 will be available at fuel pumps in Germany provided the valid DIN EN 590 does not expressly forbid this mixture.

4.2 Normative information

From a political aspect (EU commission) the use of bio fuels in the EU is to be favored. Therefore in the next revision of EN 590, mixing of up to **5 vol. % FAME** in accordance with EN 14214 was expressly allowed. Identification of the gasoline pumps is not planned.

4.3 Technical implications

The regulations described in 4.1 and 4.2 presuppose that all vehicles on the European market withstand continuous operation with up to 5 vol. % FAME without disadvantages for the customer or environment. This cannot be assured completely.
According to a statement of the ACEA (Association of the European automotive industry) a concentration of 5 vol % of FAME can be tolerated, although there are certain risks with older vehicles. The mixture, however, must fully conform to EN 590 and the FAME share to EN 14214. Higher concentrations of FAME must be noted and should be avoided on vehicles which have not been adapted.