



Mercedes-Benz Biodiesel Brochure



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# Definitions of Bio-Based Diesel Fuels

## Biodiesel

Biodiesel fuel is chemically referred to Fatty Acid Methyl Ester (FAME) and is produced from raw vegetable oil or animal fat plus methanol. Biodiesel is chemically different from petroleum diesel and poses quality risks that depend on feedstock, as well as the physical properties and accuracy of the production process. As such, the use of biodiesel can impact the operation of the engine and fuel system.

Renewable Diesel Fuels = Non-biodiesel fuels, produced from different biological materials through various production processes:

Hydrotreated Vegetable Oil = HVO: A high-quality paraffinic fuel produced from vegetable oil or animal fat, converted into liquid fuel by hydrotreatment.

Biomass-to-Liquid = Sun Diesel (BTL): A high-quality paraffinic fuel produced from waste biomass that is converted through high-temperature gasification into a synthetic gas, which is then converted into liquid fuel.

Vegetable Oil: Non-biodiesel fuel. Unprocessed vegetable oil extracted from plants, which is not suitable as fuel for on-road diesel vehicles due to its low cetane number (<40), high viscosity and high potential for coking.

## “Home Brewed” versus Commercially Produced Biodiesel

For “home brewing,” the production process cannot be controlled in an adequate manner concerning completeness of reaction, conditioning, processing and cleaning.

A qualified production process and biodiesel blending require a complete analytical fuel laboratory, which home brew producers would most likely not have at their disposal. This may lead to fuels not meeting ASTM specifications.

Private fuel storage facilities may not be suitable for proper storage of biodiesel fuel.



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# Main Quality Characteristics of Straight Biodiesel (B100/100%)

## Fatty Acid Methyl Ester (FAME) content:

Describes the purity of biodiesel and is not regulated in the USA.

## Aging characteristics:

Biodiesel tends to oxidize more rapidly than petroleum diesel by forming acids and polymers. The oxidation stability depends on the feedstock used. Soybean Methyl Ester (SME), which is mainly used in the United States, has a lower oxidation stability compared to that of biodiesel from other feedstock.

## Contamination:

Due to production shortcomings it is possible for harmful by-products like metals or free fatty acids to contaminate biodiesel. Some distributors and retailers sell biodiesel blends that are not certified for the quality of their product and production processes.

Use of biodiesel from non-name brand distributors/retailers increases the possible negative effects of the above mentioned quality deficiencies and can cause possible damage to the engine and fuel system.



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# Technical Risks from the use of Diesel Fuel Containing Biodiesel

Examples of damage that can be caused by the use of biodiesel fuel include the following:

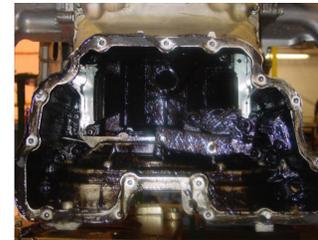
- Clogging of fuel filter caused by soaps, which may be formed by biodiesel components such as products of aging or products due to production shortcomings, which may contaminate biodiesel blends.
- Clogging of fuel filter due to the growth of microbes in free water containing biodiesel blends.
- Fuel gelling under cold climate conditions, because biodiesel may have poor cold flow properties depending from the feedstock and because additives in biodiesel and conventional diesel are sometimes incompatible.
- Corrosion and sticking of low-and-high pressure fuel system components such as pumps and injectors, especially after a long storage period of the vehicle, due to the formation of sticky polymers and acids during biodiesel aging/oxidation.
- Sludge formation in engine oil due to the formation of biodiesel aging products.
- Deposit formation on piston rings, oxygen sensors and exhaust gas recirculation (EGR) system parts.



*Fuel filter clogging due to soap deposition*



*Fuel filter clogging due to (bio) diesel gelling under cold climate conditions*



*Engine oil sludging due to biodiesel aging in engine oil*



*Deposit formation in the high pressure pump due to aging*



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# Technical Risks from the use of Diesel Fuel Containing Biodiesel

- Nozzle coking and injector deposits accelerated through metallic by-products of biodiesel.

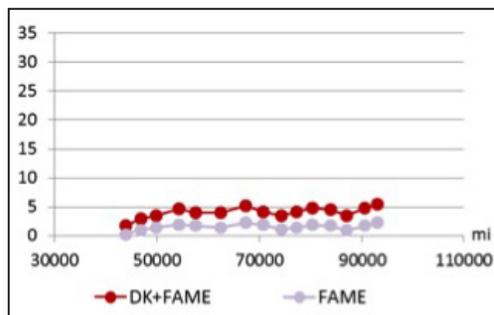


*External deposits – fuel injector tip (nozzle coking)*

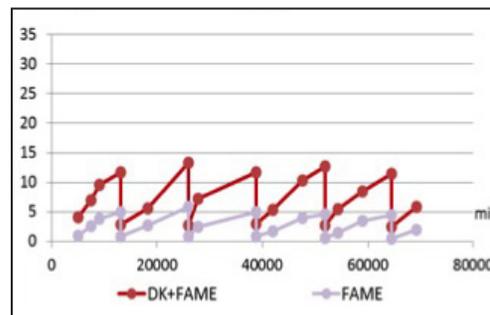


*Internal deposits – fuel injector needle and armature*

- Engine oil dilution, especially when driving under low load and engine temperature conditions, because biodiesel is not evaporating from engine oil. Fuel enters the engine oil during particulate trap regeneration.



*Engine Oil Dilution with B5 Fuel*



*Engine Oil Dilution with B20 Fuel*



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# Impacts of Biodiesel on Vehicle Characteristics

## Impact of Biodiesel on Engine Noise

There is no negative impact on noise, vibration, or harshness when using approved biodiesel-blended ULSD.

## Burning Properties of Diesel Fuel Containing Biodiesel (Emissions)

There is no change in the level of regulated emissions when using approved biodiesel-blended ULSD.

## Exhaust Smell When Using Diesel Fuel Containing Biodiesel

The use of B5 will not result in a different smell.

Properly blended B6 to B20 biodiesel should not exhibit an exhaust odor.

B100 exhaust has a different smell than that of B5 and B6 – B20 diesel exhaust. B100 exhaust has a French fry odor.

## Fuel Consumption and Engine Power Comparison (Diesel vs. Biodiesel-Blended Diesel)

Biodiesel containing up to B5 will have no difference in terms of power and fuel economy as compared to conventional petroleum-based ULSD fuel.

Biodiesel contents greater than B5 have a lower energy content than diesel fuel, which may result in slight horsepower loss and slightly increased fuel consumption.



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# Fuel Regulations in the USA Concerning Biodiesel

Regular Ultra-Low Sulfur Diesel (ULSD) fuel meeting ASTM D975 can contain biodiesel up to 5%.

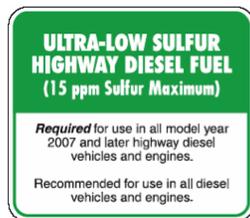
ULSD fuel meeting ASTM specification D7467 can contain biodiesel from 6% to 20%.

Biodiesel that is used for blending and straight biodiesel (100% or B100) must fulfill ASTM D6751. All BlueTEC® diesel vehicles of Mercedes-Benz cannot use straight biodiesel due to its lower energy content compared to conventional diesel, which does not allow for thorough particulate trap regeneration.

Additionally, B100 and B20 increase the risk of harmful oil dilution. Due to quality variations, B20 is generally not suitable for passenger car and light duty truck applications in Mercedes-Benz vehicles. B100 must never be used in Mercedes-Benz vehicles.

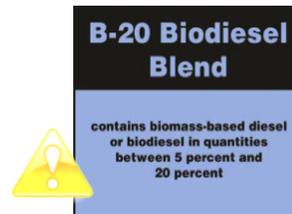
Fuels that are labeled like this are:

Approved by Mercedes-Benz



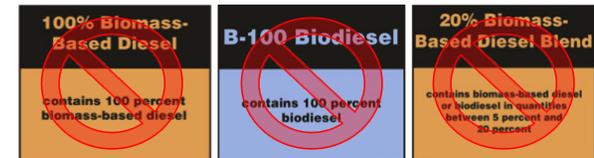
Only diesel with the ULSD label is approved (up to 5% biodiesel).

Restricted by Mercedes-Benz



B20 blends are generally not approved and should be only used on a very limited basis and only if unavoidable.

NOT approved by Mercedes-Benz



100% Biodiesel (ASTM D6751): B100

20% Biomass Biodiesel



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# Mercedes-Benz USA Approval Concerning Biodiesel

Mercedes-Benz USA approves the use of B5 according to ASTM specification D975 [Ultra-Low Sulphur Diesel (ULSD) with a maximum of up to 5% biodiesel] in all Common Rail Injection (CDI) and BlueTEC® diesel engines.

The only approved processed biodiesel for B5 blending is one that meets the ASTM D6751 specification, to prevent damage to the engine and fuel system from deposits and/or corrosion.

The use of diesel fuels containing a higher percentage of biodiesel, (B6 to B20) according to ASTM D7467 as well as straight biodiesel (B100) according to ASTM D6751 may cause severe damage to your engine and fuel system, and are not approved by Mercedes-Benz.

The Mercedes-Benz New Vehicle Limited Warranty generally does not cover damage caused by the use of fuels that do not meet Mercedes-Benz approved fuel standards.

*If customers cannot avoid the use of biodiesel fuel between B6 and B20, it's critical for them to monitor their engine oil level and engine running performance.*

Customers of Mercedes-Benz vehicles must use only qualified commercial brand fuels that meet Mercedes-Benz approved fuel standards. Biodiesel fuel from non-name brand stations must not be used.

Important: Fuel that contains any percentage of “home brewed” biodiesel does not meet Mercedes-Benz fuel standards and must never be used in Mercedes-Benz vehicles.



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# Recommendations for a Vehicle with Extended Storage Periods

Apply to vehicles that will not be driven for a period of four (4) weeks or longer:

Before parking the vehicle, the fuel tank should be filled with conventional ULSD fuel with maximum B5. Reducing the empty volume of the fuel tank reduces the amount of oxygen left in the fuel tank and can minimize fuel aging.

The vehicle should not be parked in the sun. Higher ambient temperatures can cause faster biodiesel aging and can lead to the formation of corrosive acids and sticky polymers.

When vehicle idling is not possible during and after the storage period, an authorized Mercedes-Benz dealer may have to change fuel system parts and pump out the fuel tank.



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# Warranty Guidelines for Biodiesel Usage

Diesel fuel with up to B5 biodiesel content according to ULSD specification ASTM D975 meets Mercedes-Benz approved fuel standards and will not void coverage under the Mercedes-Benz New Vehicle Limited Warranty.

Diesel fuels between B6 and B20 or higher pose risks of engine and fuel system damage, and are not approved by Mercedes-Benz. Please refer to the following recommendations to help avoid engine and fuel system damage if you do not have the chance to refuel your vehicle continuously with ULSD, maximum B5:

- Fill up with ULSD (B5 or less) whenever possible, from a name brand fuel station.
- Regularly monitor your engine oil level if you have no choice but to use B20 fuel.
- Strictly follow the oil change intervals quoted in the instrument cluster and within your maintenance booklet, and use ONLY engine oils and filters approved by Mercedes-Benz for use in the vehicle.
- If you do not plan to drive your vehicle for several weeks, fill your vehicle's fuel tank completely in advance with ULSD fuel.
- Limit engine idling time to five minutes or as mandated by local ordinance.

Fuel with biodiesel content greater than 20%, including B100, is not approved by Mercedes-Benz due to the risk of severe engine damage. Any damage caused by the use of such non-approved fuels will not be covered by the Mercedes-Benz New Vehicle Limited Warranty.

Please refer to your vehicle's Maintenance Booklet for maintenance schedules and requirements.



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