

# Technical Service Information



TSI-05-12-21

**Date:** May 2005  
**Subject File:** Engine

**Subject:** Biodiesel Fuels

Engine Family: All Diesel Engines, **except** Green Diesel Technology™ (ultra low sulfur fuel only)

## Description

Biodiesels are methyl or ethyl esters derived from a broad variety of renewable sources such as vegetable oils, animal fats, and waste cooking oils. They are oxygenated organic compounds that can be used in compression ignition engines because some of their key properties are comparable to those of diesel fuel. Soy Methyl Ester (SME) is the most common compound used to make biodiesel within the United States.

Biodiesel (neat biodiesel) may be blended with petroleum-based diesel fuel. Such biodiesel blends are designated as BXX, where XX represents the percentage of pure biodiesel contained within the blend (e.g., B5, B20, and B100).

Depending on biomass feedstock and the processes used to produce the fuel, the fuel should meet the requirements of either ASTM D 6751 or an approved European specification, such as CEN 14214.

International's stated opinion on the use of biodiesel follows the official position of the Engine Manufacturers Association (EMA) on biodiesel fuel. Refer to the following web site for further information ([www.enginemanufacturers.org](http://www.enginemanufacturers.org)).

## Low Biodiesel Blends (up to 5%)

The properties of these blends are within diesel specification limits and meet the ASTM D975 Diesel Standard. All blends up to B5 biodiesel should not cause engine or fuel system problems. International Truck and Engine Corporation will warranty engines using fuels up to and including the B5 blend.

## Higher Biodiesel Blends (greater than 5%)

The characteristics of higher biodiesel blends are not within ASTM D975 diesel specifications. A blend of 20% biodiesel and diesel fuel (B20) is typically used in commercial fleets that are subject to environmental concerns in the urban environment. Work is underway within ASTM to issue a specification for B20. Until then, the user must rely on the fuel supplier to properly blend the components and insure quality.

B100 (neat biodiesel) is generally not recommended for use in engines. Special uses of B100 are considered (such as in National Parks), but these are the exception from common commercial applications. B100 biodiesel costs more than diesel fuel and its availability is limited.

International Truck and Engine Corporation's stated warranty policy does not deny warranty coverage solely for the use of higher biodiesel blends, but only if the failure is attributed to higher biodiesel blends.

## Engine Performance and Durability of B100 and High Biodiesel Blends

- Maximum power output using B100 is reduced by 5 - 7%.
- Low temperature viscosity of biodiesel is higher than viscosity of diesel fuel and some flow impairment may occur in fuel filter and lines.
- Elastomers and various seal materials may harden or swell. Sealing materials must be monitored when using biodiesel blends, especially in older engines.
- Thermal and oxidative stability of biodiesel blends is inferior to that of diesel fuel. In general, fleets fueled by B20 must consume their fuel blend inventory within a 6 month period.
- Water separation efficiency when operating with higher biodiesel blends is inferior to that of conventional diesel fuel. This may lead to corrosion of engine fuel supply and fuel injection hardware. Furthermore, water may combine with biodiesel Fatty Acid Methyl Esters (FAME) to create acids that greatly accelerate corrosion.
- The use of higher biodiesel blends may reduce the engine oil service life and drain interval. Oil sampling and analysis may be used to determine the effect on engine oil service life.

## Fuel Tank Care

Any residue or microbial growth in the tank will compound with the use of biodiesel. This can cause serious plugging of filters and deposits in the fuel system. Fuel tanks should be thoroughly cleaned and dried before operating with any biodiesel blends. Adding biocides will help minimize growth.

## Engine Emissions

The use of biodiesel blends may reduce smoke visibility and particulate emissions, which are of special concern for older diesel engines used in urban environments that do not meet EPA quality standards. Biodiesel blends can achieve some reduction in HC (hydrocarbons) and CO (carbon monoxide) emissions, due to the presence of oxygen in the fuel, however tend to increase NO<sub>x</sub> (oxides of nitrogen).

In new low emissions engines, the use of biodiesel does not have a practical emission reduction benefit.

Statistical information about the effect of biodiesel blends on catalytic exhaust after treatment devices is not yet known.