



# Biodiesel Tech

Issue TN #31 (February 2018)

Biodiesel Education Program, University of Idaho  
Sponsored by USDA under 2014 Farm Bill

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## HANDLING AND STORAGE OF BIODIESEL

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Biodiesel can be blended with petro-diesel and in some cases is used as a drop-in replacement. In many ways it is a superior fuel for diesel engines with its excellent lubricity, high cetane number, biodegradability and lower tailpipe emissions. However, there are some unfavorable differences. In general, biodiesel has a higher cloud point, a shorter shelf-life and is more hygroscopic (water absorbing) than diesel. Hence, it should be handled and stored accordingly for maximum performance.

The ASTM D6751 standard developed for biodiesel dictates certain properties or characteristics the fuel must meet in order for it to be called biodiesel and certified. To meet these stringent conditions, the fuel must be produced properly and, in most cases, must also be additized (an added performance product) to comply. See our Technote #29B (ASTM tests explained) for more information.

Post production, each lot or batch of biodiesel is generally stored in one or more tanks while samples are tested for certification before it can be shipped out or dispensed for use.

These tanks must be clean and dry to begin with and maintained to keep water and oxygen out. This can be done with small tanks by keeping them full and sealed. Large tanks can employ a floating lid and a nitrogen blanket that effectively keeps the moisture and oxygen away from the stored fuel as the level drops. Some companies that provide petro-diesel and biodiesel blends of B5, B10 and B20 store biodiesel as B50 and formulate the various blend levels from that starting point. This strategy has the advantage of added stability and better cold weather protection. Tanks, fittings and hoses must be made of biodiesel compatible materials. Materials in contact with biodiesel must avoid containing zinc, copper and brass. See our Technote #30 (Material compatibility) for more information.

### Additization

There are many products that can enhance certain qualities of biodiesel. To improve shelf-life, an antioxidant can be added, typically at a dose of 200 parts per million. This is usually enough to protect the fuel and enable it to meet the oxidative stability specification. See our Technote #12 (Comparison of oxidative stability additives on biodiesel) for more information. When ambient temperatures are below the cloud point, an anti-gel should be added to keep the fuel flowing. Anti-gelling agents tested here at the University of Idaho have showed minimal effect on the cloud point but much more promise in lowering the pour point of biodiesel; in some cases, more than 30°C improvement. As long as the temperature is at or above the pour point, the fuel can still be pumped from one place to another but ideally storage tanks as well as vehicle tanks should be maintained at a temperature above the cloud point for optimum operability. Alternatively, winterized diesel can be blended at a rate that suits the environment. See our Technote #3 (Impact of additives on cold flow properties of biodiesel) for more



information. In rather harsh conditions of high humidity and widespread temperature variations a biocide can be used as added protection against microbial growth. This was found to be particularly helpful for the Washington State Ferry system during their transition to a B20.

### Use in Diesel Engines

Some engine and vehicle manufacturers warranty their products to run on biodiesel up to a certain blend level. A few allow 100% but that is rare. A 5% blend (B5) is virtually indistinguishable from petro-diesel D2, meets the diesel specification of ASTM D975 and does not require distributors or station owners to placard for biodiesel. Blends of B6 to B20 must meet ASTM standard D7567. Regardless of the level, any biodiesel used for blending must be certified under ASTM D6751.

Some companies warranty their engines to run on blends up to B20 but some users may opt to use a higher blend and the question arises: if a fuel related problem or breakdown occurs, who is to blame, the engine manufacturer or the fuel supplier? The answer seems obvious but resolving such issues can be costly and complicated; it is advisable to follow the manufacturer's recommendations until the warranty period is up. That said; according to federal law (U.S.C. Title 15 - Commerce and Trade: Chapter 50 - Consumer Product Warranties) vehicle warranties cover parts and workmanship, not fuel. Minnesota recently mandated the use of B20 state-wide with the exception of the coldest months when it scales back to B5.

There are still quite a large number of older diesel engines, off-road vehicles or stationary equipment in use today that can benefit from biodiesel. One of the most obvious benefits is a reduction of particulate matter (smoke) and other toxic tailpipe emissions. See our Technote #2 (NO<sub>x</sub> emissions) for more information. Additionally, older engines tend to run a little quieter due to higher lubricity and certain

burning characteristics of biodiesel. Some farmers have the unique ability to grow enough oilseeds for biodiesel to power their entire farming operation thus affording them greater autonomy. Biodiesel has also found a niche market in the mining industry by providing power underground safer and without the harmful effects of petro-diesel exhaust. Another niche market for biodiesel is in the environmentally sensitive areas such National Parks and marine use where air quality is paramount and spills can be devastating.

Regardless of how or where biodiesel is used, there are some precautions that should be followed. Older diesel fuel tanks generally have a layer of sediment that can be dissolved by biodiesel due to its excellent solvent ability. This can lead to partially dissolved diesel sediment then filter plugging for a period of time after the tanks are filled with biodiesel. Optimally tanks should be cleaned out before using biodiesel, but this can be difficult task, so users should be prepared to change the fuel filter if it becomes clogged. Older flexible fuel hoses may also deteriorate with biodiesel and should be carefully monitored and replaced with compatible lines if they start to soften and leak.

High blend level users should be aware of the cloud point of their fuel and take necessary measures (outlined above under additization) to avoid getting stranded during cold weather operation of biodiesel use.

For more detailed information on the subject of biodiesel handling and use, please consult the document of Biodiesel Handling and Use Guide prepared by the U.S. Department of Energy at: [https://www.afdc.energy.gov/uploads/publication/biodiesel\\_handling\\_use\\_guide.pdf](https://www.afdc.energy.gov/uploads/publication/biodiesel_handling_use_guide.pdf).

