

## **Biodiesel Storage and Handling Guidelines**

### **General Overview**

Biodiesel is frequently blended with petroleum diesel for storage and use in engines. The blend level is denoted as B, followed by the percentage of biodiesel content. For example B5 represents a 5% blend and B20 represents a blend of 20%. Handling and storage requirements will vary between pure biodiesel and different blends. Pure biodiesel, or B100, will have different requirements than most common blend levels such as B5 and B20. Low level blends such as B2, which are largely petroleum diesel, can be stored, delivered and handled in largely the same way as petroleum diesel.

### **Stability During Storage**

B100 has sufficient stability for storage for normal use. However, if it is stored for extended periods of time oxidization can occur if precautions are not taken. The length of time depends on a number of different factors such as climate and location of tank. General guidelines include:

- If possible B100 should be stored away from sources of heat and light. Heat and sunlight can accelerate the oxidization process. In colder and dryer climates B100 and biodiesel blends can be stored longer because there is less heat and moisture;
- Acceptable materials for storage tanks include aluminum, steel and most fiberglass. Soft metals such as copper, brass, lead and tin are not recommended as they will contribute to the oxidization process;
- Biodiesel should be protected from oxygen by using a nitrogen blanket or sealed containers;
- If the B100 is stored for longer than two months it should be tested regularly for oxidization stability; and
- B100 should be blended with diesel fuel as quickly as possible. B5 can be stored for up to one year. B20 can be stored for eight months to a year. It is still advisable to add anti-oxidants and test periodically.

B2 storage methods are essentially the same as petroleum diesel. A clean, dry tank is required and it should be kept protected from extreme temperatures. If anti-oxidants or fuel stabilizers are normally used in petroleum then they should be used for a B2 blend. If kerosene or another additive is generally used during cold temperatures for petroleum diesel, they should be added to a B2 blend.

### **Water Absorption**

B100 attracts water more readily than petroleum diesel. The lower the blend level the less pronounced this will be. If water is absorbed, bacteria and fungus can grow which may plug filters and cause corrosion. As with diesel fuel, tanks should be dry before beginning to store or use B100 or blends, and they should be checked often for water build up at the bottom of the tanks.

### **Solvency Impacts**

B100 will dissolve sediment accumulated in tanks or engines, which can plug filters.

Tanks should be cleaned thoroughly before starting to use or store B100. Filters may initially need to be changed more often to ensure they do not become clogged. Blends of B20 and less will minimize the solvent effect, but minor filter plugging could result in the first couple of weeks of use. Tank cleaning may be necessary for B20 and less, and

it is advisable to check the filters in the first few weeks. The solvency effect should not be an issue for blends of B5 and lower.

### **Material Compatibility**

B100 will degrade, soften or seep through some hoses, gaskets and seals. The type of material that will be affected, mostly soft metals often found in fittings, such as brass, copper, tin and lead, can be found on some tanks, and vehicle models before the mid 1990s. Blends of B20 or lower minimize most issues of material incompatibility. Any oxidization will increase this effect. Stabilizing B100 or blends with antioxidants when storing for multiple months is advisable.

### **Transport**

Transport tanks should be cleaned and inspected. There should be no residuals or water left in the tank. Ensure there is a method for heating the truck or railcar during cold weather transport.

During cold weather B100 is usually shipped:

- Hot or warm for immediate delivery (approximately 27°C to 54°C);
- Hot in railcars for delivery within a week (approximately 50°C);
- Frozen in railcars with external coils to melt the fuel; or
- In a blend with winter diesel or kerosene.

### **Blending**

In-line or injection blending is the preferred method of blending biodiesel. In-line blending involves adding biodiesel to a petroleum diesel as it passes through a pipe or hose, similar to the way most additives are blended. This ensures a complete mix of the fuels and allows for more accurate blend levels as the fuel can be metered.

Splash blending is usually not recommended but may be appropriate for separate loading of fuels or when the fill rate is high enough to properly mix the fuels (several hundred gallons/minute). Often the blend needs to be mixed further or the heavier biodiesel will sink to the bottom. In a bottom loading truck the B100 is usually loaded with diesel at several hundred gallons/minute which ensures the products will mix. Delivery to storage tanks will usually ensure the mix as well.

Cold weather blending is an issue, especially if the diesel is below the cloud point for the B100. Biodiesel should be at least 6 degrees Celsius above its cloud point for blending. For more detailed information on blending biodiesel with cold diesel fuel, please see the section on blending and storage in the documents from the National Renewable Energy Laboratory referenced below.

Blends can be stored underground in most climates and above ground depending on the temperature. It is advisable to retain a 1 litre sample of each part of a blend, diesel and biodiesel. If any issues arise with the blended fuel they can be tested separately to determine the source. If there are no issues they can be mixed into the next batch of fuel.

**For more information on any of the above, please refer to Natural Resources Canada's *Biodiesel Handling and Use* page, available at <http://oee.nrcan.gc.ca/transportation/fuels/biodiesel/biodiesel-handling.cfm?attr=16>; and to the National Renewable Energy Laboratory's *Biodiesel Handling and Use Guide – Fourth Edition*, available at <http://www.nrel.gov/vehiclesandfuels/pdfs/43672.pdf>.**