WORC
Western Organization of Resource Councils
Grassroots Leadership & Action

FACT SHEET — JULY 2006

# BIODIESEL: POWERING THROUGH THE WINTER

*The Rocky Mountain West is known for its scenic beauty and harsh climate. Western citizens need a reliable fuel that allows us to travel long distances and run our farm and ranch equipment. Biodiesel is already meeting these requirements, delivering power through the coldest of winters.*

## Why Biodiesel?

Biodiesel is a non-petroleum based substitute for diesel fuel that can be grown from oilseeds such as soybeans and canola. Biodiesel has the potential to reduce our demand for foreign oil, reduce green house gases that cause global warming and restore health and vitality to rural communities. WORC supports a sustainable biofuels industry that is environmentally and socially responsible.

Biodiesel offers a number of advantages to regular diesel, including reduced particulate, sulfur dioxide and carbon dioxide emissions. In addition, the fuel adds lubricity when blended with regular diesel extending engine life and performance.

## Cold Diesel Science

Diesel fuels are heavier and have higher BTU content and power than other petroleum fuels, like gasoline. This property causes diesel to have a higher cold filter plugging point or gel temperature than other fuels; the temperature at which the fuel turns into a solid. Pure biodiesel, B100, has a higher gel temperature than regular (#2) diesel. This property also gives biodiesel a higher flash point, making the fuel safer than conventional diesel. The differences in gelling temperature are best captured by a measurement called cloud point: the temperature at which small solid crystals are first visually observed as the fuel is cooled. Pure biodiesel will begin to cloud at 32° F vs. 3° F for #2 diesel.

Successful use of diesel in cold weather, be it biodiesel or regular, requires that the fuel be blended with what is called #1 diesel or kerosene. In addition, anti-gelling agents may have to be added. A variety of agents are available that act on both biodiesel and regular diesel. Blending #1 and #2 diesel is so common that most fuel distributors do it as a matter of course in the fall to accommodate the cold weather needs of their customers. Similar practices must be applied with biodiesel including keeping engines plugged in and vehicles inside. It is crucial that blending occur at 10° F above each fuel's cloud point, to ensure that the mixture does not separate.

When biodiesel and diesel are blended, the cloud point and thus the gel temperature, changes for the fuel, based on its composition. The following table captures these changes:

| *Biodiesel Concentration (vol. %) with #2 Diesel* | *Cloud Point (°F)* |
|---|---|
| *Regular Diesel* | *3* |
| *B10* | *5* |
| *B20* | *7* |
| *B30* | *14* |
| *B50* | *18* |
| *Pure Biodiesel* | *32* |

At biodiesel percentages of 20% or less, the likelihood of gelling is indistinguishable from regular diesel. This property allows biodiesel blends of B20 to be used without changing the fuels normal winter blend of #1 and #2. For instance, in Bozeman, Montana, the fuel distributor supplies a custom blend of 20% biodiesel, 40% artic diesel and 40% regular diesel to power the city's fleet through the winter.

*"We've got down to 46° degrees below zero, and we didn't have any problems."*

—Robin J. Brooks, district fleet manager for the USDA Forest Service in Wyoming, where 55 vehicles run on 20% biodiesel (B20) year-round.

## Yellowstone National Park

In 1995, Yellowstone National Park started running a Dodge pickup up on 100% biodiesel. The truck has traveled over 200,000 miles operating during the cold extremes of the Park. Only once in ten years did the truck fail to start, at a daytime temperature of -37° F. During the winter, the truck was kept indoors or plugged in. A heating loop was added to the fuel system – similar to many diesel trucks and locomotives – for severe winter use. Today, over 600 vehicles operate on biodiesel in the Park.

## Still Not Convinced Biodiesel Works in the West?

Ask these experts who manage biodiesel fleets in some of the coldest areas in the Rocky Mountain West.

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## For More on Biodiesel Use in Cold Conditions

***Biodiesel: Handling and Use Guidelines***
U.S. Department of Energy
*www.nrel.gov/vehiclesandfuels/npbf/feature_guidelines.html*

***Cold Flow Impacts***
National Biodiesel Board
*www.biodiesel.org/resources/fuelfactsheets*

## Sources

*1) "Low temperature Properties of Triglyceride-based Fuels: Transterified Methyl Esters and Petroleum Middle Distillate/Ester Blends," Journal of the American Oil Chemists Society, JACOS, Vol. 72, No. 8 (1995).*

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