

# Heating with Bioheat and Waste Oil

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Increasing interest in alternate fuels has led to development of heating equipment that will utilize fuels other than the conventional oil and gas. Biodiesel is one that can be produced in large enough quantities that it has an impact on total consumption in the U.S. Waste oils from vehicles, machinery and cooking are others that have high heat value and can fit into many greenhouse operations.

## Bioheat

Biodiesel is an alternative fuel produced from vegetable oils and animal fats. Soybean oil is the most common feedstock but other sources, such as, rape seed (canola), mustard seed, corn oil, coconut oil, sunflower seed, recycled cooking oil and rendered animal fats can be used. Biodiesel is made by reacting a wood or grain alcohol, such as methanol or ethanol, with the feedstock and with the help of a sodium hydroxide catalyst the reaction produces biodiesel and glycerin.

To have production consistency, the American Society of Testing Materials has established quality standards. Pure biodiesel is designated B100. It has a heat value of 118,170 Btu/gal, about 8% less than No. 2 diesel. This is due to about 10% less carbon.

For use as a fuel in the transportation industry, a blend of 20% biodiesel to 80% petrodiesel (B20) is fairly standard. For use as a heating fuel a blend of 2 to 20% biodiesel with No. 2 fuel oil is acceptable in most existing heating systems without any modification. This is referred to as bioheat.

Many fuel oil dealers across the U.S can now supply a bioheat blend of up to 20%. There are several reasons for not going higher than 20% at this time. Biodiesel has a higher viscosity than fuel oil. This means that its pour point (the temperature below which the fuel will not flow) is higher. The pour point for No. 2 fuel oil is -11°F and for B20, 0°F. In cold climates, bioheat fuel needs to be stored inside a building.

Biodiesel is also a solvent. This can present some problems in an existing heating system until all the sludge is removed from the tank and supply lines. The filter may have to be changed several times until everything is cleaned up. Once the system is clean, the burner will probably be more efficient. When ratios of greater than 30% are used, the rubber seals in the fuel pump can break down causing leaks. Manufacturers are now incorporating better seals in new pumps to overcome this.

## Bioheat is Environment Friendly

Although bioheat fuel is generally 5 to 10% more expensive than No.2 fuel oil depending on the blend ratio, it is cleaner burning, biodegradable and reduces hydro and particulate emissions. Research at nationally recognized testing agencies have shown that Nitrogen Oxide emissions are frequently reduced up to 20% and Sulfur Oxide, up to 89%. Smoke levels are reduced with bioheat resulting in less maintenance.

Biodiesel gives a much better energy balance than petroleum fuels. Typically it takes more energy to extract, process and transport fuel oil to your greenhouse than the heat that is generated. With biodiesel made from soybeans, 3.2 units of biodiesel are produced for every unit consumed in production. The most recent plants put on line are now achieving a ratio of 7 to 1.

Further information on biodiesel and bioheat including handling and burning, storage, suppliers and distributors is available at [www.biodiesel.org](http://www.biodiesel.org).

## **Waste/Used Oil**

Another category of fuels that is becoming popular as a heat source for greenhouses is oil that is a byproduct of other processes. These include crankcase oil, transmission fluid, cutting oil, hydraulic fluid, antifreeze, cooking oil and certain solvents. They have the advantage of being inexpensive as compared to No. 2 fuel oil and are readily available in some areas. Burning is an approved method of getting rid of this material.

Some growers set up collection routes that include garages and oil change service centers, vehicle dismantlers, machine shops and contractors that do heavy equipment repair. Other growers have developed a relationship with fast food restaurants and institutional kitchens that have considerable used cooking oil. Some growers just purchase waste oil that has been collected by a recycling firm.

Handling these oils can present some problems. You will need drums or tanks to collect the oil. In large quantities it has to be pumped. Once you have it at the greenhouses it will need to be filtered and stored. In most cases the tanks should be placed in a containment area as a precaution against a spill.

The oils can contain many impurities including metal chips and filings, lead from bearings, sludge, gasoline, potato chips and water. Usually a 40 or 50 mesh strainer will remove most of the solids. The material may be considered a hazardous waste and have to be disposed of according to Environmental Protection Agency regulations. This can be expensive if it has to be burned at an incinerator designed to handle hazardous waste.

Burning the oil will require a furnace or boiler designed to handle it. Several companies have developed burners that use compressed air to get the atomization of the fuel. Some also use a preheater as some fuels have a higher viscosity than fuel oil. Burner size is limited by EPA to no more than 500,000 Btu/hr input. Some growers have installed multiple units to get a higher heat output. All of these heaters will burn No. 2 fuel oil or kerosene if you run out of waste oil.

To avoid any sludge pickup, the intake pipe and strainer to the burner should be set 3 to 6 inches above the bottom of the supply tank. An oil filter should be installed just before the burner.

A two to four cubic feet per minute compressed air supply at 15 to 40 psi is usually required depending on the output of the burner. This can be from an integral compressor or from a separate air supply.

### **The following are companies that manufacturer furnaces and boilers that will burn waste oil:**

Clean Burn, Leola PA – [www.cleanburn.com](http://www.cleanburn.com)

Compuheat, Inc., North Ridgeville OH [www.wasteoilburners.us](http://www.wasteoilburners.us)

Firelake Manufacturing LLC, Mt. Crawford VA [www.firelakemfg.com](http://www.firelakemfg.com)

Norki Energy Systems, Inc. – Poughkeepsie NY – [www.norki.com](http://www.norki.com)

Siebring Manufacturing, Inc. George IA – [www.siebringmfg.com](http://www.siebringmfg.com)

The use of alternate fuels such as biodiesel and waste oil can go a long way to reducing our dependence on foreign oil. As compared to other alternatives such as wood and coal, oil fuels require less work and maintenance.