

Q. What is BioHeat?

BioHeat is the industry-accepted term for any blend of pure biodiesel with conventional high or low sulfur home heating oil. The heating oil must meet its specification, ASTM D 396 and the biodiesel must meet its ASTM specification, ASTM D 6751, before blending them together.

(Note: the only biodiesel/bioheat that Albina Fuel sells is ASTM rated for consistent quality and control.)

Q. What is Biodiesel?

Biodiesel is a clean burning alternative fuel produced from vegetable oils and animal fats through a chemical reaction and meeting ASTM D 6751. Biodiesel contains no petroleum, but it can be blended at any level with heating oil. It can be used in home heating oil systems safely with no modifications to the fuel tanks, pumps or burners in concentrations up to 20% biodiesel with only minimal precautions (see conditions for use section). For higher BioHeat blends than 20% biodiesel, special precautions are needed (see materials compatibility).

Pure biodiesel is also referred to as B100. In the transportation fuel market where ASTM D 975 is the standard for petroleum-based diesel, biodiesel blends are designated 'Bxx', where xx is the volume percent of biodiesel meeting ASTM D 6751 with conventional petrodiesel. B20, which is 20% biodiesel and 80% petrodiesel, is a common blend for fleets and buses. The heating oil market is focusing on BioHeat, which is a 2 to 20% blend of biodiesel with heating oil.

Q. Is BioHeat the same as Biodiesel, or visa versa?

NO. Biodiesel is the term for the pure biodiesel, B100. BioHeat is conventional heating oil *containing* biodiesel.

(Note: Albina Fuel BioHeat is a 20% biodiesel, 80% conventional oil blend.)

Q. Is biodiesel the same thing as raw vegetable oil, cooking oil or animal fat? Can those materials be blended with heating oil to create BioHeat?

NO. Biodiesel is produced from raw vegetable oils or animal fats, but the oil or fat must go through the chemical reaction (called transesterification) to make it into biodiesel and be tested to make sure it meets D 6751 before it is blended with heating oil. Unreacted or only partially reacted oils not meeting D 6751 can accelerate stability and contamination issues, create fouling and additional cold flow concerns, and increase hazardous emissions of formaldehyde and other aldehydes.

Raw vegetable oils, cooking oil or animal fats do not meet D 6751, should not be blended with heating oil, and can not be used to create BioHeat.

Q. Do oil burner manufacturers recommend the use of BioHeat with their equipment?

At this time the emergence of BioHeat is much too new for burner manufacturers to comment on. However, in work accomplished throughout the northeast, organizations like Carlin, Beckett and Power Flame (notable burner manufactures) all are reviewing BioHeat. BioHeat appears to have little or no negative impact on a burner's performance while providing emissions, sulfur, lubricity, global warming and health benefits.

Q. What about my oil tank—is it compatible with BioHeat?

All known oil tanks and systems are compatible with Bioheat at blends of 20% or less. For higher biodiesel blends, up to and including 100% biodiesel, compatibility will depend on the materials (metals, plastics, and rubber parts) in your tanks, pumps and fuel lines. For blends higher than 20% biodiesel only steel, mild steel, stainless steel, aluminum, fluorinated polyethylene fluorinated polypropylene and fiberglass vessels are recommended. Use of tanks or lines made of brass, bronze, and copper or lead, tin, and zinc (i.e. galvanized) may cause high sediment formation and filter clogging and are not recommended.

Q. What about gaskets, seals, hoses and O-rings—are they compatible with BioHeat?

All known gaskets, seals, hoses and O-rings are compatible with blends of less than 20% biodiesel.

For higher BioHeat Blends than 20% biodiesel, up to and including 100% biodiesel, compatibility will depend on the materials they are made from. For BioHeat Blend concentrations over 20% biodiesel, fluorinated polyethylene, fluorinated polypropylene, Teflon, Teflon lined, or Viton? components are recommended. Use of other types of materials in BioHeat Blends over 20% biodiesel such as nitrile, natural rubber, or Buna-N type rubbers may cause leaks, plugged filters (due to dissolved material) and eventually complete gasket, seal, hose or O-ring failure (i.e. a great big mess on the floor!).

Q. Are there any other precautions for storage and handling of BioHeat?

The same exact standard storage and handling procedures used for heating oil should be used for BioHeat. The fuel should be stored in a clean, dry, dark environment. If storage life enhancing additives (stabilizers) are not used, it is recommended to use BioHeat within 6 months of receipt. For further storage life recommendations, see your BioHeat dealer.

Q. Does the use of BioHeat void my heating oil system warranties?

To date, no manufacturers have written position statements applicable to BioHeat. However, over 40 million miles of positive, trouble-free experience with up to B20 blends in the on-road market provides a level of confidence that there should be little or no issues with equipment if the biodiesel concentration is at the 20% or lower level.

(Note: Albina Fuel BioHeat is a 20% biodiesel, 80% conventional oil blend)

Q. How about BioHeat in large commercial boilers or electric power generation?

The major differences between large commercial boilers and electrical generation units and home heating oil applications are the gallons per hour being combusted. Large or small-scale boilers or electrical generation systems all have the same fundamental considerations as home heating applications. All the same advantages, and precautions, apply to these applications as they do in home heating applications.

Q. How can I get my BioHeat delivered already blended?

It is highly recommended that you source your BioHeat from a reputable fuel supplier that has the ability to economically store, receive, blend and deliver it to your tank to ensure proper blending and storage strategies. Albina Fuel meets all these criteria, and can be reached at 503-281-1161.

Q. Will the cold weather impact my BioHeat?

BioHeat has similar cold weather properties as the heating oil it is made from. BioHeat Blends up to 20% biodiesel may increase the cold flow properties approximately 2-5 degrees Fahrenheit from the base heating oil it is blended with. If cold weather handling and usage are a concern with regular home heating oil, they will be a concern with BioHeat. Cold flow properties can be enhanced by implementing the same solutions used with heating oil: blend the fuel with kerosene, use pour point depressants, or plan your storage accordingly utilizing inside protection or tank heating elements.

Q. Once blended will the BioHeat stay blended with my home heating oil?

Yes. The biodiesel in BioHeat goes completely into solution with heating oil and once it is blended it does not come out of solution and will not separate.

Q. I understand that BioHeat or BioHeat Blends may act like a cleaning agent and start to dissolve and raise the sediment already in my tank. Won't this prematurely plug my oil burner filter, strainer and nozzle?

BioHeat contains biodiesel. Biodiesel provides a cleaning effect and does have a tendency to dissolve or loosen some sediment that can be deposited in tanks and fuel systems from years of conventional diesel fuel or home heating oil use. This cleaning effect is dependent upon the blend concentration of biodiesel. In numerous field tests with on-road diesel fuel using B20, the incidence of initial filter clogging was about 2%. In these cases, after the system was cleaned of the years of deposits left by petroleum diesel fuel the incidence of filter clogging went back to normal or was reduced. There have been no reports of B2 blends causing this

phenomenon. There is very little experience with blends over B20, but with B100 if there is sediment in the system it will most likely end up in the filter until the system is clean.

Q. I understand a great deal of technical and field studies have been performed on Biodiesel and Biodiesel Blends with trucks and buses, but has much been done to validate the positives or negatives about BioHeat or BioHeat Blends in home heating oil applications?

It is true that after a decade of study and field trials and successfully commercialization, biodiesel blends at levels of B20 and lower have been rigorously tested in on-road diesel fuel. To date, BioHeat studies have been conducted by nationally recognized institutions such as the Brookhaven National Laboratory, US Department of Energy's National Renewable Energy Lab, Massachusetts Oil Heat Council, Abbott & Mills Oil Company, NOCO, New York State Energy Research and Development Authority, (NYSERDA) and the National Oilheat Research Alliance, (NORA). Go to www.biodiesel.org, www.clickheatingoil.com and several of these papers are available for download.

These studies benchmarked various aspects of BioHeat and BioHeat Blends as a home heating oil product and are largely the source of data for this Q&A. These results have demonstrated that BioHeat is seamless and transparent to the heating oil network and can function satisfactorily in home and commercial heating systems with no adverse operational characteristics with blends of 20% or less.

Key observations and findings of these combustion tests include Nitrogen Oxide emissions are frequently reduced by about 20%, Sulfur Oxide emissions by 83%, smoke numbers are lower with BioHeat, odor of middle distillates reduced and when gas leakage during transmission, storage, and distribution are considered a BioHeat blend has an environmental cost that is better than natural gas.

Q. How much does BioHeat cost?

BioHeat is made with Biodiesel, a renewable cleaner burning fuel made in America from home grown vegetable oils and animal fats. Biodiesel has virtually no sulfur, decreases harmful emissions of NOx and other toxic compounds, increases lubricity and improves exhaust odor in home heating applications. Using biodiesel also reduces dependence on foreign oil, helps provide new markets for farm based products, and creates manufacturing jobs for American workers at the same time. BioHeat, made with biodiesel, is true premium heating oil that provides many performance and societal benefits.

At the present time, the cost of BioHeat depends on the exact blend used. BioHeat containing 2% biodiesel can cost around 3-5 cents per gallon more than generic home heating oil. BioHeat with 20% biodiesel may cost 20 to 30 cents more per gallon. The cost of BioHeat Blends is dependent upon the level of biodiesel that is used. There is legislation in Congress proposed to provide an incentive for biodiesel use which may bring the cost more in line with conventional home heating oil in the future.

Q. Can I purchase BioHeat on a fixed cost program like I do my existing heating oil?

Albina Fuel provides a variety of budget programs to meet our customer's needs. Call 503-281-1161.

Q. Can I blend BioHeat myself?

While it is possible to purchase the pure biodiesel, B100, and make Bioheat with your conventional heating oil, it is not recommended. While the biodiesel in BioHeat will not separate once it is blended with heating oil, you must still ensure the biodiesel has been thoroughly mixed with the heating oil and that it meets specifications prior to blending. Pouring biodiesel into a stationary tank may not be sufficient to provide this mixing, and a pocket of pure biodiesel could form along the walls or on the bottom of the tank and result in an increased incidence of filter plugging and other materials compatibility problems associated with B100 but that are not found in 20% blends or lower.

In most cases, it is also more cost effective to purchase BioHeat from your local heating oil dealer. B100 is not readily available in quantities less than a semi load and where B20 is available at retail in small quantities its price is probably significantly more than your heating oil dealer pays. If you buy BioHeat from your dealer, it will probably save you money—in addition to saving you the hassle of procuring the Biodiesel and blending it yourself.

Q. Who can answer my questions about BioHeat?

In addition to contacting Albina Fuel, the National Biodiesel Board maintains the largest library of BioHeat and Biodiesel information in the world. Most questions can be answered through a review of the information on the National Biodiesel Board website located www.biodiesel.org.

If further information is desired, you can email your question to the NBB at info@biodiesel.org. Through a well orchestrated petroleum outreach communication program your local petroleum industry leadership group will become more familiar with these issues and be able to offer you regional advice on the advancements involving BioHeat.

Technical

- Biodiesel can be used in its pure form to replace home heating oil, but in an immediate replacement fuel situation, it would most likely be used in blends of five to 20 percent.
- A 1993 study conducted by R.W. Beckett Corp. showed biodiesel and home heating oil were close in performance, with biodiesel burning cleaner and having more thermal stability.
- Biodiesel is used with home heating oil in Europe.

Benefits

- Since biodiesel is made domestically with renewable resources, using it at blended levels would still reduce dependence on foreign oils.
- Biodiesel has the highest BTU content of any alternative fuel (in the range between No. #1 and No. #2 diesel).
- With a flash point of approximately twice that of diesel fuel, and because it is biodegradable and non-toxic, it is the safest fuel to use, handle and transport.
- Biodiesel has the highest energy balance of ANY fuel. For every unit of fossil energy used to produce biodiesel, 3.2 units of energy are gained.
- Biodiesel was the first alternative fuel that fully completed the health effects testing requirements of the Clean Air Act amendments. Test confirm a 90 percent reduction in air toxins.
- A Department of Energy life cycle analysis shows that biodiesel reduces CO₂ by 80%. CO₂ is the primary greenhouse gas attributed to global warming. Since biodiesel has virtually no sulfur, it significantly reduces particulate matter and eliminates sulfates.

Production Capacity and Cost

- The biodiesel industry currently has an annual production capacity of about 200 million gallons.
- The cost of biodiesel depends on many factors including location, feedstock used to make the biodiesel and quantity purchased. The current range is from \$1.50 to \$2.00 a gallon for pure biodiesel. B20 is generally 15 to 30 cents more per gallon than diesel.

Potential Challenges

- Biodiesel by nature is a solvent. The chemical name for biodiesel is a mono alkyl ester, which is a common industrial chemical, used for solvents and other products. Therefore, it had a tendency to clean out fuel systems. This effect should be managed properly when biodiesel is initially used in pure form while the fuel cleans deposits left by dirtier distillate fuels. Using B20 or below will eliminate this concern because the clean process is more gradual.
- The Beckett study showed pure biodiesel to have a slightly higher viscosity and cloud point. A nozzle line heater may be needed with B100, but the effect would be less with biodiesel blends.
- The Beckett study also showed some gaskets were not compatible with B100. Some boiler systems may contain copper fuel lines or nitrile elastomers, which would be degraded by medium to high concentrations of biodiesel. Most of these materials can be replaced at a reasonable cost.

Long-Term Implications

- Griffin Industries is currently talking about the use of biodiesel in the home heating oil market this year because of the high price of heating oil. A long-term strategy that supports the utilization of domestically produced biodiesel as part of a comprehensive solution to heating oil shortages should be developed.