BROOKHAVEN NATIONAL LABORATORY

B20 to B100 Blends as Heating Fuels

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Technical Summary

Industry Survey on the Use of Biodiesel (Bioheat®)Blends

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Introduction – Bioheat® is a trademark maintained by the National Oilheat Research Alliance (NORA). The term refers to the use of biodiesel / heating oil blends for stationary boiler and furnace applications. Fuel marketers obtain a license for the use of this trademark for the purpose of advertising their offering of these blends. The use of Bioheat® is now common and while most marketers have been offering blends at the B5 or lower level, there have been numerous informal reports of marketers using higher blends, even to B100. This large base of experience with B5 blends and blends at higher levels could provide an opportunity to learn and document the field experience with this relatively new fuel, and to understand any differences in the magnitude and type of operational problems which have occurred vs. those considered normal within the heating oil business. Thousands of homes using this fuel present a level of experience which is not possible to replicate in a laboratory environment.

Key Result: The results from the in-use fuel survey, which include over 13,000 buildings using at least B20, show that B20 and lower blends operate in the field in a similar manner as that of conventional heating oil. Thus, based on this survey B6-B20 blends will operate as expected in the field.

Bioheat® Use Survey – In 2013, an initiative was made to attempt to capture the experience that the fuel marketers involved with Bioheat® have had. The set of marketers chosen to invite to participate was the list of companies which had taken the Bioheat® trademark license from NORA. This group then represented companies which were clearly involved with or interested in Bioheat® use.

A survey to collect the data was developed by the Brookhaven National Laboratory (BNL) Information Technologies Division, based on a commercial on-line software tool – Novi Survey. A complex survey flow chart was developed to feed specific survey questions to specific groups. For example, groups which have not used Bioheat® were asked why and then the survey was complete. Groups which have used Bioheat® were asked detailed questions about their experience, system service requirements, and plans for the future. The survey focused on groups

which have explored or regularly use Bioheat® blends at levels over 5% to capture their experiences and any areas of concern. Participants were invited by email and the survey was open for a two-week period in February, 2013. A total of 78 companies responded to the survey. Some of the questions refer to Bioheat® generally and, in this case, the fuel actually used could be anywhere from B5 to B100. Other questions were focused on the higher-level blends.

Findings – A detailed analysis of the survey responses is provided through the software, with more detail available in the power point slides attached, "Bioheat Use Survey, Dr. Tom Butcher, Brookhaven National Laboratory, April 2014". Key findings can be summarized as follows:

- 81% of the respondents have used Bioheat®. Of the 19% who did not, the most common reason stated was lack of interest.
- Of those who have used Bioheat®, 93% are still using this fuel.
- 67% of those using Bioheat® have more than 3 years of experience with this fuel. 35% have more than 6 years of experience.
- For those using Bioheat® generally, 56% reported no unusual problems when using biodiesel blends. For the rest the results were distributed among the service requirements normally associated with no. 2 oil and were at a level consistent with that experienced with conventional heating oil [1]. This is illustrated in Figure 1, below.
- For those using blends over B20, 57% reported no unusual service requirements.
- For all respondents, a total of 90,711 buildings using Bioheat® blends at levels up to B5 were reported. A total of 37,632 buildings reported using Bioheat® at levels of 10% or greater, and 13,111 reported using B20 or greater. 380 buildings were reported to be at the B80 to B100 level. This is illustrated in Figure 2.

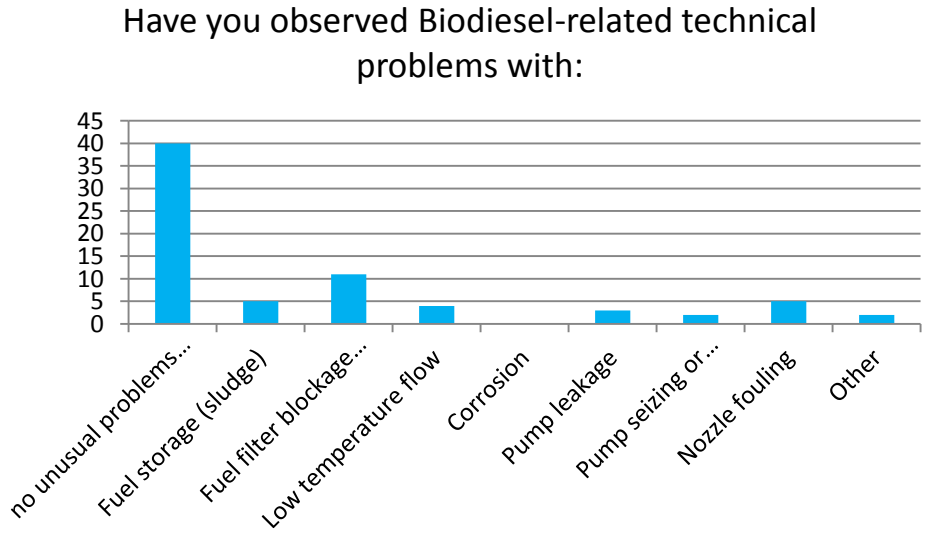

Figure 1 Survey results - reports of technical problems with all Bioheat® users.

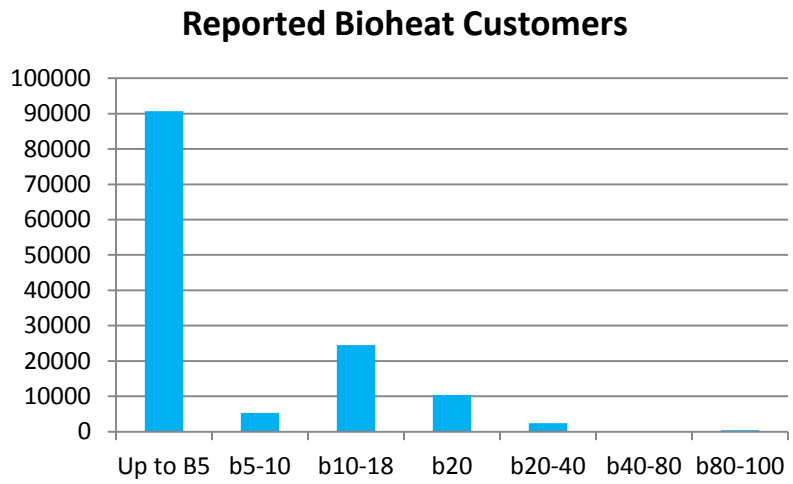

Figure 2 Survey results- number of buildings using Bioheat® at different levels

Regarding the service concerns illustrated in Figure 1: fuel quality, degradation in storage, related service requirements, and performance-enhancing additives have been high priority topics for the heating industry for many years, predating the use of biodiesel in heating oil blends. An industry survey in the early 1990's showed that fuel-related service requirements such as nozzle fouling, filter blocking, cold flow, and sludge formation in tanks dominated service requirements [2]. A broader survey in early 2000's including 65,000 service histories showed similar results [3]. One response to these concerns was the publication of an industry guide to fuel properties and problems in 2004 [4].

References

1. Personal discussion with Vic Turk, R.W. Beckett; April 2013
2. Coughlin, R.T., *Fuels, fuel quality, and storage*, in Proceedings of the 1990 Oil Heat Technology Conference and Workshop, R. McDonald and J. Andrews editors, Brookhaven National Laboratory Report BNL 52284, pp.123-136. Nov. 1990.
3. Litzke, W.L., and Hedden, R., *National Oilheat Research Alliance fuel performance research update*, in Proceedings of the 2003 National Oilheat Research Alliance Technology Symposium, R. McDonald editor, Brookhaven National Laboratory Report BNL 71337, pp.45-62. June 2003.
4. Litzke, W.L., A Guide to Fuel Performance – The NORA Fuel Quality Manual, published by the National Oilheat Research Alliance, August, 2004.