Introduction to bio-liquids for home heating & cooking

The introduction of bio-liquids into the home heating and cooking markets creates opportunities for a cleaner, sustainable and renewable future for the liquid fuelled industry.

What is a bio-liquid?

Bio-liquids suitable for use in the home heating market are commonly Fatty Acid Methyl Esters (FAME) derived from either used cooking oil or virgin plant sources such as Rapeseed and Soya, etc. grown specifically for this purpose.

The use of FAME in liquid fuels creates overall carbon reductions in lifecycle analysis of emissions when compared to the use of traditional mineral (fossil) fuels such as kerosene or gas oil. This is as a result of the carbon absorbed by the plant during its lifecycle offsetting carbon emissions from the combustion process.

Producing FAME from used cooking oils gives a higher carbon saving to that of virgin plant stock*.

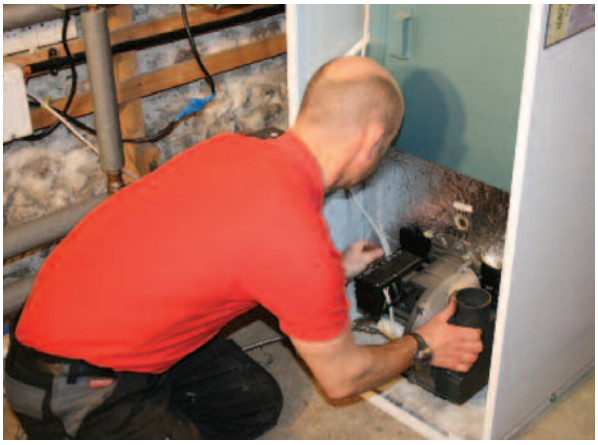
FAME for heating purposes should meet the requirements of EN 14213 (EN 14214 for automotive use can be considered to be a higher standard but some additional tests requirements from EN 14213 will be required to be satisfied before use) and be produced under strict quality assurance systems to achieve consistent quality and properties of the fuel.

*source Renewable Fuels Agency.

FAME to EN 14213 can either be used as part of a blend with mineral fuels such as kerosene or gas oil or even in its pure form as a 100% bio-liquid fuel with bespoke equipment.

OFTEC Heating Oil Project

For the production of new bio-liquid compatible equipment such as boilers, burners and oil tanks, as well as the conversion of existing installations and equipment, it is vitally important and necessary that the properties of the fuel to be combusted are not only known but are consistent in supply.



OFTEC Information Sheet No. 56

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ISSUE 02.00
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To establish this, a bio-liquid fuel project was undertaken by OFTEC and its members in partnership with Carbon Connections, University of East Anglia, ICOM Energy Association and Clean Energy Consultancy. The project involved extensive research including live trials held at various domestic and commercial sites, all of which were closely monitored and the equipment analysed over a 12 month period. In short, no problems were encountered and the results obtained proved positive in confirming that a mixture of FAME and kerosene or FAME and gas oil can be successfully used as a replacement fuel to reduce carbon emissions.

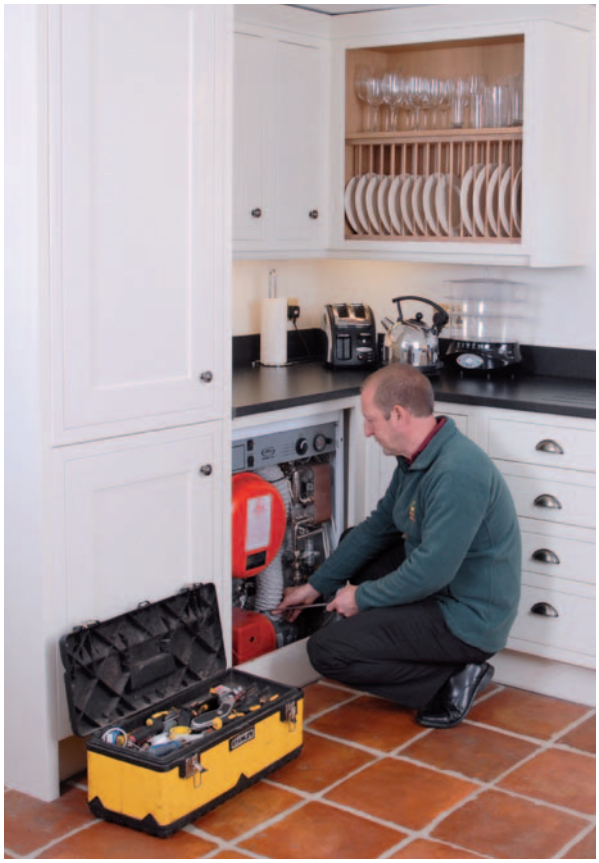
A number of different bio-liquid blends were tested, with B30K (30% FAME and 70% kerosene) chosen to be the most favourable blend used amongst domestic oil users. This is predominately due to the ease in which existing equipment can be successfully converted and it's convenience given that the majority of flue systems are low level discharge.

From the intensive academic laboratory and industry supported field trial analysis, OFTEC is drafting an industry blend standard PrOPS24 – due for publication in 2011.

What are the implications of using bio-liquids in existing appliances?

The properties of bio-liquids and bio-liquid blends in comparison to mineral fuels such as kerosene are different. This is an important factor to bear in mind as this means that to change from 100% mineral fuel (even to a kerosene or gas oil bio-liquid blend) will require formal conversion and re-commissioning of installations and equipment. Results following fuel analysis identified the viscosity of the bio-liquid to be significantly higher than that of kerosene; literally speaking it is thicker and heavier. The properties of bio-liquids being different to mineral fuels mean that it reacts differently to different materials. Traditional oil carrying seal materials, which are commonly encountered in existing mineral fuel installations, were not found to be reliably compatible with bio-liquids.

When considering converting an installation to operate on B30K, it is important to ascertain the exact fuel blend and ensure that the supply will be via proven/approved source. Pressure jet burners can be converted with relative ease as OFTEC Member manufacturers have conversion kits available for their equipment to assist with the modification of existing components to ensure material compatibility. However, in some cases it may be necessary to obtain a bio-liquid compatible burner.



Typically, pressure jet conversion would commonly require at least the replacement of:

- Atomising nozzles
- Fuel pumps
- Flexible oil lines
- Filters and/or filter seals

NOTE: Vaporising burners and appliance installations should not have bio-liquid fuels introduced to them. It has been proven that bio-liquids in kerosene can immediately adversely affect vaporising burner combustion and manifest in the rapid onset of premature carboning in vaporising sleeve burner bases – even within hours. It is recommended that vaporising appliances such as range cookers are converted with appliance manufacturer's (or appliance manufacturer's approved) bio-liquid conversion burners.

What are the implications of using bio-liquids in existing oil storage and supply systems?

Findings from the heating oil project have shown that, subject to the use of bio-liquid compatible filters and fire valves, no other modifications are required to the ancillary equipment to facilitate the safe storage and supply of bio-liquid blends. However, it is recommended that all components in contact with oil are proven to be compatible with bio-liquids.

It should be borne in mind that FAME is hygroscopic. Therefore, it absorbs water and can promote bacterial growth. It also acts as a cleaning agent and will pick up any debris and contaminants contained within an oil storage tank and carry it downstream causing filter blockages.

It is recommended that wherever possible and practicable, new integrally bunded oil storage tanks suitable for bio-liquids are installed as the cleaning effect of the fuel may well find weaknesses in existing tanks which could lead to leaks.

Oil tank husbandry is essential in maintaining equipment reliability. Prior to storing FAME it is recommended that:

- Tanks should be checked for material compatibility, general condition and all water should be removed; and
- A strict maintenance schedule should be put in place to ensure that the tank remains free of water and that bacterial growth does not occur.

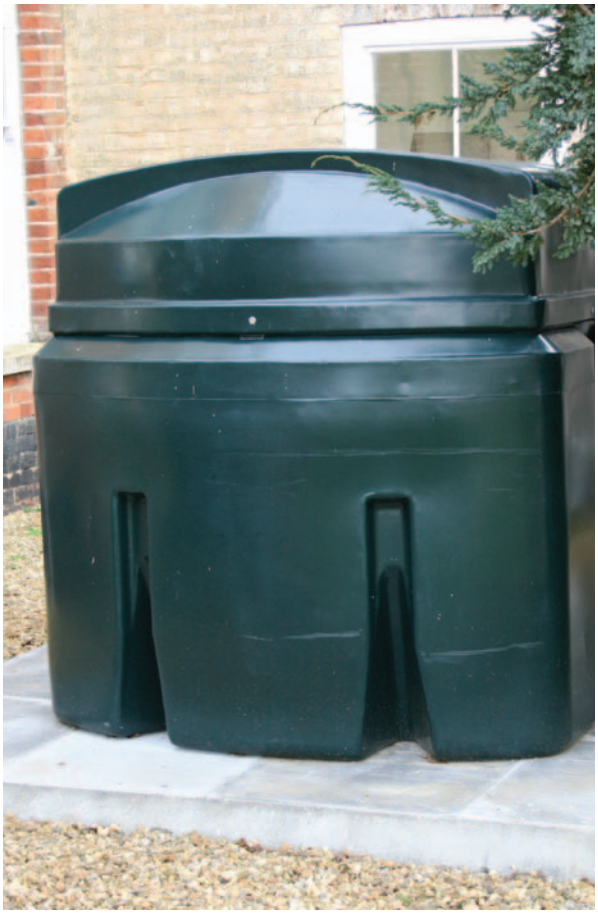
Where bacterial growth is identified, specialist help may be required to assist in tackling the problem in emptying the tank, cleaning it and the possible use of biocide additives and filtering. To help prevent long term storage stagnation it is recommended that smaller tanks are utilised to increase fuel turnover.

Despite bio-liquids being more viscous, field trials during the winter months have shown that the storage and supply of the B30K was not prone to premature waxing and it is unlikely that there will be a need for supply line insulation or trace heating other than in exposed locations which are susceptible to wind chill.

Attention should also be paid to suction line sizing as a correctly sized kerosene suction line may require an increase in diameter for example from 6mm to 8mm or even 10mm due to increased fuel viscosity.

Further information

For general conversion advice, OFTEC is producing a guide for conversion which is due for publication in 2011. For specific advice on the availability of equipment and components for bio-liquid conversions as well as new installations, please contact appliance, equipment and burner manufacturers directly.



Finding an OFTEC Registered Technician

The OFTEC website enables you to locate your nearest Registered Technicians. OFTEC Registered Technicians are appropriately qualified and insured to work on oil fired equipment.

You can also find a list of local Registered Technicians under the OFTEC logo in the ‘Heating Engineers’ section of your local pages.

For further information on oil heating and cooking, please see www.oftec.org

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For more information on this subject or for further information sheets:

t: 0845 65 85 080 f: 0845 65 85 181 e: enquiries@oftec.org w: www.oftec.org
OFTEC Foxwood House, Dobbs Lane, Kesgrave, Ipswich IP5 2QQ

The *energy* behind liquid fuels