Information Sheet 7

Domestic Heating with Woodfuel

Wood can be used for heating in a number of different forms. These have different characteristics, and can require different equipment, there is no one 'best' form.

Wood Pellets

Wood pellets are a processed, clean, consistent form of woodfuel that flows easily, burns efficiently, is pleasant to handle and can conveniently be delivered by tanker. Widely used on the continent for domestic heating, especially in Austria, boilers can be highly sophisticated and efficient (>90%).

Wood Pellets are made by compressing dry sawdust under very high pressure, giving a high energy density, minimising storage volume, meaning a typical domestic house requires only about 5-6 m^3 per year. They are the most expensive form of woodfuel, close to the cost of mains gas, though usually significantly cheaper than oil or LPG. Prices vary considerably between suppliers, and is particularly dependant on order size. Bulk deliveries (typically a minimum of 3 or 5 tonnes), are significantly cheaper than bagged pellets.

A quality standard is important when buying Wood Pellets, and there are a number of alternatives, with the CEN standards likely to become the most widespread across Europe. Pellets are usually <10% moisture content and create <1% ash, should be made from clean, untreated wood and have sufficient mechanical durability not to crumble. Pellets made from other forms of biomass are available, and may be cheaper, but might be unsuitable for many domestic boilers.

More energy is required to manufacture pellets than other forms of woodfuel, however some of this can be recouped in lower energy in transportation. The CO_2 savings of using Wood Pellets are still extremely high, compared with fossil fuels.

Logs

Logs are the opposite end of the woodfuel spectrum from pellets. They are not so consistent or dense, usually require manual loading into the boiler. They are however, significantly cheaper than pellets and represent a fuel that can readily be obtained from a garden, farm or estate with minimal specialist equipment.

It is important that logs are well-seasoned before use, ideally for 1½-2 years, which can bring the moisture content down to about 20-25%. Radial cracks and bark that comes off easily are signs of well-seasoned wood. Logs of about 3-4" (7.5-10cm) and above should be split to assist drying and combustion.

Highly efficient, sophisticated modern log boilers now exist that can easily run a central heating and domestic hot water system, typically requiring daily fuelling.

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Briquettes

Similar in form to logs, but in consistency and properties to pellets, briquettes are made from compressed, dry wood. They are clean and pleasant to handle, can be burned in log stoves and offer greater heat output per cubic metre than logs, but at significantly higher cost and embodied energy.

Woodchip

Although small, domestic scale Woodchip boilers exist, they tend principally to be suitable for those supplying their own fuel, who either possess their own chipper, or use contractors as required.

Woodchips are the lowest energy density form of woodfuel, so a typical domestic house might need around 20m^3 p.a.

However this corresponds to about 5.5 tonnes, which maybe around the minimum delivery quantity of a commercial supplier, and would require a bespoke chip store of at least 30m^3 capacity. The cost and space required for this tends to be beyond the scope of most domestic installations. It can represent a very cost effective, low carbon option for larger buildings, hotels, leisure centres, and businesses with sufficient storage space.

Woodchip specification is critically important, particularly moisture content and chip size. Long slivers can block an auger feed or cause bridging in the store, and dust can build up and jam moving parts. Woodfuel quality chippers are very different from those used by most tree surgeons and produce a different product.

Equipment

Woodfuel can be burned in stoves that heat the room they are in, or boilers that heat water for a central heating system. Some stoves can also incorporate a back boiler to heat a few radiators or provide domestic hot water (DHW).

Pellet Boilers

Pellet boilers are now widely available in the UK, usually imported from mainland Europe or Ireland, through specialist installers. They are now extremely well established in many countries, offering reliable operation for many years.

Pellet boilers are available in a wide range of sizes from very small domestic devices for energy efficient houses, up to systems suitable for conventional dwellings and larger buildings or district heating schemes. Installed coal boilers can also be converted to run on wood pellets. Pellet storage hoppers are available off the shelf, in a range of designs for indoor, outdoor, above and below ground storage. Pellets can be transferred from the hopper by an auger screw or pneumatic delivery.

The boiler itself might cost around three times the price of a top end gas boiler, and most will require in addition a pellet store, pellet feed mechanism and a flue. Some are available with a built in hopper that requires periodic filling from a bag. Small systems tend to be significantly larger than the equivalent capacity gas boiler as a ceramic lined firebox is required as well as mechanical components to feed the solid fuel.

Pellet boilers can be over 90% efficient, with all the features expected from a modern boiler, including on some models the option to control and monitor remotely by telephone or internet. For a domestic house just one delivery of fuel a year may be required, and this can be delivered from a tanker, via a hose up to 30m long allowing convenient siting of the store. Pellet stoves are also available offering compact room heating and a built in fuel hopper.

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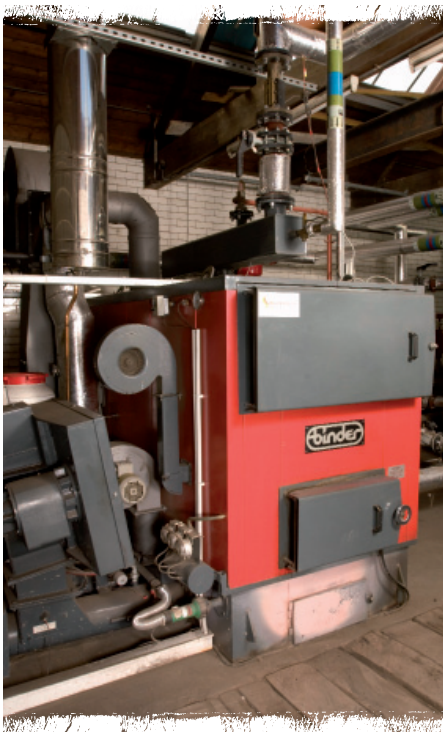

Woodchip Boilers

Woodchip Boilers are available in a wide range of sizes, from those suitable for a single house, up to industrial devices capable of running a large district heating scheme. Chips tend to be less suited to small, domestic installations, except those with access to their own supply. Woodchips do not flow as easily as pellets and so fuel feed equipment needs to be more robust. It is usually necessary to construct a bespoke chip store, though there are some partially off the shelf options such as hook bins. Design and positioning of the store are critical to ensure problem free operation and convenient, efficient fuel delivery. Careful planning and design can save considerable difficulty and expense over the longer term. It is preferable general purpose vehicles, such as tipper trucks, be used to deliver the fuel, rather than requiring specialist vehicles.
(NB. it is usually much easier to take hot water a few extra yards than Woodchip).

These boilers are designed to operate with a specified range of chip properties. Equipment is available designed to burn 'green' chips (i.e. freshly harvested, high moisture content), or high ash material, or high quality chips with low moisture content, but it is important to identify the type of fuel you expect to use and discuss this with the installer at the outset.

Log Boilers

Modern, batch type log boilers also offer very high efficiency, which they achieve by burning a batch of logs, one after another, in a high temperature environment, storing the energy as high temperature hot water in a highly insulated accumulator tank. This heat is then supplied to the central heating and DHW circuits. Only when the temperature of this accumulator tank drops to a pre-set point does the boiler need to fire again. In this way, a flexible, sophisticated central heating and DHW system is available on demand. The boiler must be loaded manually, typically once a day or so, from a store of well seasoned logs.

Log Stoves

Traditional log stoves provide radiant heat to the room. They need to be manually fed with fuel as required to maintain the heat output, and achieve significantly lower efficiency (around 70%) than the batch type boiler. However, they offer an attractive, renewable, low carbon heat source that can be relatively cheap to buy and to run. A flue will need to be added to the cost if there is no chimney already present. Many stoves are also available with a back boiler option, allowing the generation of hot water to heat a few radiators or provide some DHW. Wood briquettes can also be used in a wood stove. Pellets need a pellet basket, which cannot be refilled until it has burned out and cooled down.

Many solid fuel kitchen ranges can be run on logs. Some are designed for wood, while some require a specific grate option. These allow both radiant heat and cooking from wood, and some also include a back boiler option to heat water.

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Open Fires

An open fire that burns logs to produce heat can be attractive and cosy. An open fire, however is very inefficient as the very high, uncontrolled air flow takes not only the hot air from the fire up the chimney, but also draws centrally heated air in too, replacing it with cold, outdoor air, drawn in to the house through drafts and vents.

Smoke Control Areas

None of these types of woodfuel are approved for use in smoke control areas except in officially approved 'exempt appliances.' The website gives lists of Smoke Control Areas, and the appliances approved for use in them. It is not permitted to burn wood on an open fire in these areas.

Further information is available at
www.uksmokecontrolareas.co.uk

Useful Links and Further Information:

Biomass Energy Centre

"A 'one stop shop' to provide information to anyone in the UK with an interest in biomass derived solid, liquid and gaseous fuels and associated conversion technologies."
www.biomassenergycentre.org.uk

Logpile

For information on fuel suppliers and boiler installers.
www.logpile.co.uk

Forestry Commission

Further information on using wood as fuel and finding your regional contact:
www.forestry.gov.uk/woodfuel
www.forestry.gov.uk/yhwoodfuel

HETAS

Expect to see quality suppliers signing-up to an assurance scheme run by HETAS. With consistent product labelling, it will be easier to choose appropriate fuel for an appliance. See **www.hetas.co.uk/public/Solid_Biomass_Assurance_Scheme.html** for further information.

BIOMASS Energy Centre

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