



How to Buy Wood Fuels

A guide to choosing and buying wood fuels for heating

Logs, Chips, Pellets and Briquettes



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Introduction

Wood has been used as a fuel for millions of years. In much of the developing world it continues to be the main source of energy for heat and cooking. In Europe, it is a widely used form of renewable energy and its use is encouraged because heating with wood can reduce the use of non-renewable fossil fuels, which would otherwise be depleted. By growing trees to replace the wood that we use, we can reduce carbon dioxide emissions which contribute to global warming. This is because growing trees absorb carbon dioxide and are part of the carbon cycle, whereas carbon in fossil fuels has been locked up for millions of years.

This leaflet sets out some of the issues you need to consider when you are buying wood as a fuel for heating. Choosing suitable wood needs care to avoid inefficiency, increased maintenance and unwanted smoke. The main choices of wood fuel are:

Logs



Briquettes



Pellets



Chips



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What type of wood fuel?

The main forms of wood heating are listed in the table below, along with their key properties.

	Log / briquette stove	Log / briquette boiler	Log /briquette ceramic stove	Pellet stove	Pellet boiler	Chip boiler
Single room	✓		✓	✓		
Whole house	✓	✓			✓	
Larger house		✓			✓	✓
Group of properties					✓	✓
Wish to use own fuel	✓	✓	✓			✓
Domestic hot water	✓	✓		✓	✓	✓
Attractive feature	✓		✓	✓		
Boiler space required		✓			✓	✓
Level of automation	0	1-3	0	2-4	3-5	3-5

0 = no automation 5 = complete automation

(Adapted from Glasu's Wood Fuel in Wales leaflet.)

Moisture content

Which ever type of wood fuel you use, its moisture content (MC) is going to be one of the most important issues affecting the way it burns and the amount of heat it gives out. Fresh wood with high moisture content won't burn well. It will be hard to keep it alight, won't give off much heat, will emit lots of smoke and may even corrode your appliance and cause the chimney or flue to become coated in tar. Burning wet, unseasoned wood is the equivalent of throwing a mug or two of water into the fire every time you re-fuel! Freshly felled wood usually has moisture content of over 50% whereas well- seasoned wood will be below 20%.

Wood that has been dried in an oven and no longer contains any moisture at all (0% moisture content) is referred to as 'oven-dry' but this is not commonly used for heating. Wood will dry naturally over time if it is in a ventilated spot, protected from the rain but in Wales the moisture content is unlikely to drop below around 20 % without artificial drying.

Measuring moisture content

Moisture content is expressed as a %, though there are two ways of calculating this:

- Wet basis
- Dry basis

The wood heating industry generally uses the dry basis, while foresters often use

the wet basis. The two ways sometimes give different readings for the same piece of wood! In general the drier the wood, the less difference between the two methods.

Imagine you have a freshly felled log that weighs 1 kg, half of which is the weight of the actual wood, the other half being the weight of the moisture contained within the log. With the Dry Basis, it would be described as having a moisture content of 50% (because the water weighs half the total weight of your log) whereas Wet Basis would have a water content of 100% because the water weighs the same as the wood. Which ever method you use, its best to be clear and consistent and if in doubt ask for both measurements so you can see which is the lower (wet basis) or higher (dry basis).

Moisture content can be measured by drying wood in an oven, and comparing its starting weight with its final weight. The difference will be the amount of water that the wood contained. For dry basis, simply divide the difference by the final weight or for wet basis divide by the initial weight.

Moisture content can also be measured with an electronic moisture meter though this only measures the moisture content dry basis of the wood on the surface and is not always reliable.

Calorific value

When oven dry, all wood produces a very similar amount of energy (kWh) for the same weight (kg). However, the kWh amount is much less when the wood is unseasoned. This kWh amount per kg is called the calorific value. Fresh wood has almost no calorific value whereas all oven dry wood has a value of just over 5 kWh per kg. Typical two year seasoned logs will have a value of 2.5, pellets 4.7 and chips 3.6 kWh per kg.



Seasoning wood logs

Wood that has only just been felled will have high moisture content and in order to allow the moisture within the cells of the wood to be driven off, wood should be left to 'season' for at least a year, or preferably two. Wood that is felled in the winter will have less water within the cells in the first place and will be quicker to

dry. To season wood, it should be left in a dry, airy place, lifted off the ground and protected from rain. Bringing it into the house a day or so before burning will help drive off any surface moisture before burning. Seasoned wood will be much less dense than fresh felled.

Hardwoods and softwoods

Hardwoods from deciduous trees like oak, ash and beech contain more or less the same amount of energy by weight as softwoods like Douglas fir, larch or spruce. However softwoods are less dense – there are more air gaps within the structure of the wood – so a dry softwood log will weigh less than a dry hardwood log of the same size, and will contain less energy. Because there are more air gaps within softwoods, they can potentially hold more water, so a freshly felled softwood log will probably have a higher moisture content than a hardwood log of the same weight. A trailer load of seasoned softwoods will contain less energy than a trailer load of seasoned hardwoods, so should cost less.



Different types of wood fuel

There are basically four types of wood fuel for domestic or small commercial properties; Logs, Pellets, Briquettes and Chips. If we assume that that the ‘average’ house uses 20 MWh for heating and hot water in a year, then the following table indicates the weight and volume of each of these per annum,

To produce 20 Megawatt hours (MWh) of heat – approximate figures		
	Tonnes	Volume m ³
Logs – hardwood @ 30% mc	6	12.5 (stacked)
Logs – softwood @ 30% mc	6	15 (stacked)
Chips @ 30% mc	6	20 (trailer)
Pellets or Briquettes	4	7 (bagged)



Logs are the form of wood fuel that we are most familiar with and are traditionally used in open fires and wood stoves. They can also be used in log boilers and wood-fired cooking ranges. Of all the fuels mentioned here, they are the least processed and can also be the least consistent.

Logs are usually bought by the 'load' – an unspecified weight, usually with an unknown moisture content, often of

mixed species. This makes it very hard to know what you are really buying and to compare prices between different suppliers. Logs may also be available in large sacks or in bags from retail forecourts. If you are carrying a moisture meter, you can get an approximate idea fairly quickly. It is best to be organised with a reputable supplier and take a small sample of a larger load before delivery and agree a price according to its likely calorific value. Some people use microwave ovens to gently heat a sample over a few hours. As with all ovens, care must be taken not to char the sample. Suppliers can be found via the organisations listed at the end of this leaflet.


Consider a few basic questions to the supplier which should help you find good quality logs, and the most important point to remember is that your fuel needs to be WELL SEASONED before burning.

- What species of wood is it?
- How long has it been seasoned for?
- Has it been kept under cover and is it dry?
- Is the price quoted per 'load', per tonne, per m³?
- Are the logs split to no more than 15 cm, preferably 10 cm diameter?
- What lengths are the logs (and will they fit in your stove)?



Wood chips are used in special boilers with automated fuel mechanisms which are generally suitable only for larger applications such as very large domestic properties with outbuildings, community centres, schools and hospitals etc.

Chip boilers will be designed to run off wood chip of a specified size and with a specified moisture content – for example, chip with a diameter of less



than 50mm and less than 35% moisture content. Some boilers can take higher moisture content chip, but it is essential to specify a boiler that will match the fuel that is locally available.

Good quality chip is crucial in preventing breakdowns and ensuring that the equipment runs smoothly and efficiently. In general, most problems that have been encountered by users of chip boilers have been due to the quality of the fuel rather than the boiler itself.

Wood chip is usually sourced from forestry waste, off-cuts from sawmills and wood processing operations and occasionally from reclaimed clean timber. Cuttings from hedgerows and arboricultural work can often contain too much green leafy material to provide a good fuel. If there is a lot of bark, it will result in large amounts of ash when burnt, which could affect the running of the boiler.

To ensure good quality chip of a consistent quality, the wood needs to be chipped in a good quality chipper machine suitable for chips for heating boilers – most simple arboricultural chippers will not produce consistent enough chip and long slithers may block feed systems into the boiler.

Wood should be first seasoned on bearers, off the ground, before it is chipped. Once it has been chipped it is much harder to season naturally as air cannot circulate easily through the chip.

For most domestic customers wood chip won't be an option. Most wood chip boilers start at about 30kW and the need substantial space for the boiler and wood chip storage. However, if you do have a big building and a large heat demand, wood chip can be worth considering.

Supply options

If you have access to wood, self-supply might be an option and it may be possible to hire in a chipper / log splitter and operator for a couple of days a year to process the wood that you need. Otherwise you will need to find a local wood fuel supplier. (See the organisations listed at the end of this leaflet for contacts).

Chips will be sold by volume or weight, with a specified maximum moisture content. Ideally, an agreement on the method of taking a representative sample of chips for checking should be made before purchase.

In some cases the supplier may supply heat rather than chips – the user will then be billed per kWh used, measured by a heat meter rather than by volume or weight. The responsibility of servicing the boiler may then fall to the supplier.





Pellets are made from compressed dry sawdust, usually sourced from off-cuts from joiners, furniture factories and wood processors. They are cylindrical, typically with a diameter of 6 to 12mm and length of 10 to 30mm and have a very low moisture content – typically 10% or less.

They have a high energy density which means pellets require a smaller amount of storage space compared to logs or chips, and are more economic to transport. In energy terms, it can still make sense to transport them from as far afield as Canada and Eastern Europe,

though the number of Welsh and UK producers is steadily increasing.

The amount of energy used in their manufacture is around 2% of the energy that they can release, though this will increase if the sawdust has had to be dried before manufacture.

Boilers manufacturers will specify the diameter of pellet that can be used in them (typically 6mm for domestic boilers) and as with other wood fuels, good quality is essential. Pellets that break up very easily or contain too much dust can cause the boiler to break down.

Pellets can be bought in bags – typically 10-20 kg – or in bulk with special lorry with a blower and hose which can supply up to 4 tonnes into a storage hopper or container. Various storage options are available including flexible tanks that will fit in a shed, or outbuilding, or purpose-built hoppers.

It is essential to keep the pellets dry as otherwise they will re-absorb moisture and become unusable. The costs of pellets will vary according to quantities bought and the distance transported.



Briquettes which like pellets are made from compressed sawdust, can be used in place of or with logs in most situations. They are much larger than pellets – more than 10cm in diameter and about 25cm in length. They will generally be more expensive than logs but are cleaner to handle, uniform, consistent and require less storage space. They are normally supplied in small 10 kg bags. They are often sold by petrol stations, garden centres or specialist wood fuel suppliers.

They should not be confused with various forms of 'heat log' made from peat which is not considered a renewable heat source

Cost

The costs of wood fuels will vary according a number of variables:

- How processed they are
- Quantity you are buying
- Moisture content
- Distance transported

For this reason it is difficult to give an indication of general costs, but a few points are worth remembering:

Seasoned logs will be more expensive than 'green' logs. If you have sufficient storage space, you can save money and ensure good quality by buying logs one or two years in advance and seasoning them yourself. Producing your own logs can be very satisfying, but hard work and time-consuming. 'Green' logs are a lot easier to split than seasoned ones but they are also heavier.

The amount of heat you get from your fuel will depend on a number of factors including the efficiency of the appliance. Burning logs on an open fire will be one of the most expensive and least comfortable forms of heating and will certainly cost more than running a fossil-fuel central heating system. You will need far less logs for the same amount of heat if you use a log stove or boiler.

Wood pellets are relatively expensive – at the time of writing, about the same price or slightly more than heating oil. Dry sawdust is much in demand, both by pellet producers and by people producing products such as animal bedding. The cost can improve considerably if you are buying pellets in bulk and are near a producer.

Wood chips can be very competitive with oil, LPG or electricity for heating. As with pellets, there is competition for the raw materials from other industries and a fuel supplier may have invested a lot of money in a chipper, storage facilities and vehicles which s/he will need to recoup. Because they are bulky for their weight, they are also expensive to transport.

Briquettes can be cheaper than using electricity or bottled gas. They are initially more expensive than logs but you can recoup some costs as they require little extra processing. Again, prices will fall where they are bought in bulk.

Standards for wood fuels

The European Commission has tasked the European Standards Body (CEN) to provide standards for the trading of solid Biofuels such as wood. These don't dictate the quality of wood, but provide ways of categorising wood fuels so that both buyers and suppliers know that they are referring to the same thing. More information can be obtained from the Biomass Energy Centre (see references at the end of this leaflet).

Sustainability

As our supplies of fossil fuels become scarcer and more expensive, it is important to plan ahead. Wood fuels are a potentially renewable source of energy and one which can bring social and economic benefits too.

Wood fuel produced in the UK will generally be from 'sustainable' sources— if a woodland owner wishes to fell any quantity of trees, they will need a felling licence from the Forestry Commission and a condition of this is that the trees will be replanted. Using wood fuels can encourage woodland owners to manage their woodlands, which is good for wildlife and for the environment in general.

At the moment, we have enough wood available in the UK to provide wood fuel heating for many more homes and businesses. However, wood will not be able to provide all the UK's heating needs, so we need to make other savings by efficiency and insulation so that our wood fuel resources are used to the best effect



Where can I get more information?

Woodfuel Wales – A website providing general information on wood fuel technologies in Wales.

www.woodfuelwales.org.uk

Biomass Energy Centre – a 'one stop shop' able to provide advice to anyone with an interest in biomass derived fuels and associated conversion technologies.

www.biomassenergycentre.org.uk 01420 526197

Centre for Alternative Technology – visitor centre displaying biomass technologies, courses and publications. Free information service.

www.cat.org.uk 01654 705950

Coed Cymru – offer advice on the management of Welsh woodlands and wood products. Fact sheets on wood and energy related issues.

www.coedcymru.org.uk

Glasu – rural development initiative providing assistance and support to businesses, farming families and community groups in Powys.

www.glasu.org.uk