Wood as fuel
a guide to choosing and drying logs

Wood was the traditional fuel in Britain until the industrial revolution. It has been replaced by coal, oil and gas over the last two hundred years. Our increasing awareness of the environmental damage caused by our use of fossil fuels has led to growing interest in using wood as a sustainable, renewable, low carbon alternative. Wood is a major source of renewable heat energy and, burned efficiently, it produces virtually no smoke. As trees grow they absorb carbon dioxide (CO_2), incorporating the carbon into new growth and returning oxygen to the atmosphere. When the wood is burned this carbon is oxidised and released as CO_2. As a result, using wood from sustainably managed trees reduces net CO_2 production (small amounts are released by the activities of processing and transportation) compared to using fossil fuels. This means that heating using wood can significantly reduce our reliance on fossil fuels while also reducing our CO_2 emissions.

The woodland area in Britain is limited, but with effective management, there is more than enough timber to meet foreseeable demand for many years. Managing woodland improves biodiversity and increasing the proportion of managed woodland supports jobs in the forestry industry.bhj Replacing imported fossil fuels for locally produced wood fuel improves fuel security and encourages local community.

Choosing logs

When choosing wood for burning there are two significant factors which have an effect on the net calorific value (CV) or the amount of available heat per unit (volume) of fuel:

1. Moisture content
2. Wood density

1. Moisture content

The moisture content of wood has by far the greatest effect on net CV. Any water in the timber has to evaporate away before the wood will burn, and this will reduce the net energy released as useful heat (as opposed to steam up the chimney). If you can get them to light at all, logs that aren't dry will result in a fire that smoulders and creates lots of tars and smoke. These tars can be corrosive, potentially damaging the lining of the flue and increasing the danger of a chimney fire. Wet logs will tend to blacken glass in stoves even if the stove is designed to keep the glass clean. Well seasoned logs can have approximately twice the CV of green logs.

You should always take care to burn only dried (seasoned) wood, either by buying it dry, or by buying green logs and drying them yourself. Radial cracks and bark that comes off easily suggest well-seasoned wood.

The moisture content of a piece of wood is a measure of the relative weight of water and weight of solid wood. This can be expressed as either 'dry basis' or 'wet basis', most fuel suppliers use a wet basis measurement (weight of water divided by weight of wet log).

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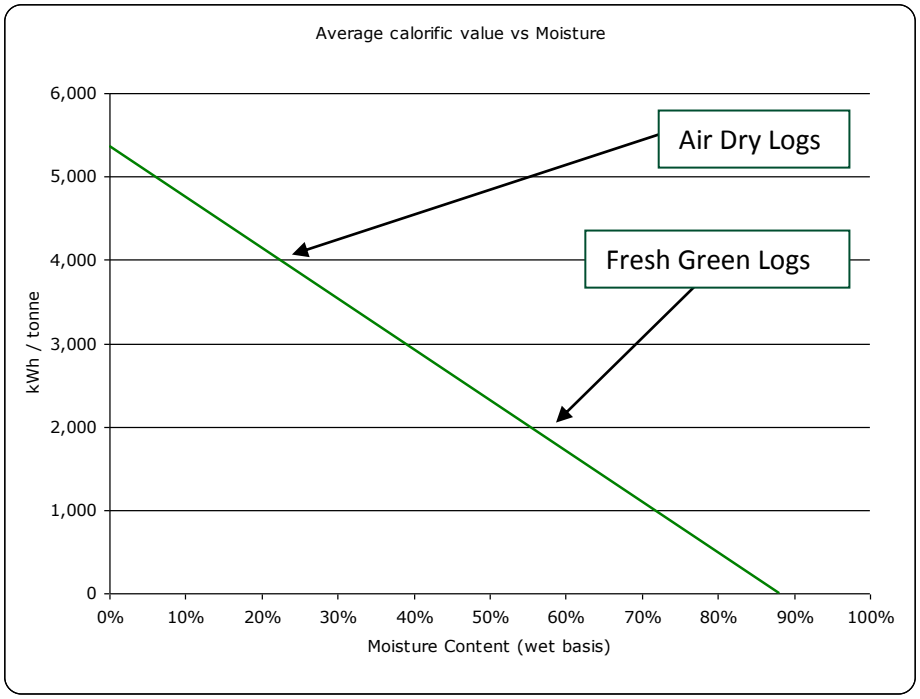
The effect of drying on Calorific Value



This graph shows how significant moisture content is in determining the CV of wood. A fresh green log of about average moisture content has only around half the energy content of an equivalent, well seasoned log. While the type of tree the log comes from can have some impact on the calorific value, it is usually extremely small. Most of the variation in calorific value between species is due to natural differences between moisture content in fresh cut logs (e.g. Ash has a particularly low moisture content when green).

2. Wood density

When buying logs, it is common for the seller to let you know whether they are from hardwood or softwood tree species (or mixed). The general difference is that hardwoods (deciduous, broadleaved tree species) tend to be denser than softwoods (evergreen, coniferous species). This means that a tonne of hardwood logs will occupy a smaller space than a tonne of softwood logs. Denser wood tends to burn for a longer period of time meaning fewer 'top ups' are required to keep a log stove burning for a given length of time. If you buy wood by volume you will receive more kilowatt hours (kWh) of heat from a cubic metre (m^3) of hardwood than softwood (at the same moisture content).

Finding a Log Supplier

Lists of log suppliers are available on the Biomass Energy Centre website (www.biomassenergycentre.org.uk) in the woodfuel suppliers section, or by searching for 'firewood' in your local Yellow Pages or other business directory. Alternatively you can contact your regional woodfuel officer from the Forestry Commission

There are a number of issues to consider when choosing a log supplier in addition to who is offering you the best price:

- Are the logs the right size for your stove?
- Are the logs green or seasoned? It is usually cheaper to buy green logs and dry them yourself, but you will then need to consider how much space they will take up.
- Are you buying by weight or volume? Most log suppliers supply by the 'load'; what does this mean for your individual supplier?
- Where are the logs coming from? Is the woodland sustainably managed, and reasonably nearby (have they been imported?)

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- Does the quoted price include delivery? Most suppliers will just tip the logs or leave a dumpy sack when they arrive, so you will have to stack them yourself unless you can accept a delivery tipped directly into a bunker or shed.

How to dry your own logs

Fell by April (earlier for broadleaves)

Stack for summer (on bearers)

Cover in autumn

Winter, bring logs into house

- Green logs are considerably cheaper to buy than seasoned logs, but will be heavier and will require space to stack and dry before use.
- Timing of felling is important as standing timber will be driest in winter. Many stove manufacturers often specify 20% moisture content or less, and this is likely to take two summers or more to be achieved by air drying.
- Drying timber should be stacked on bearers (off the ground) in a sunny, windy location, ideally under some form of waterproof cover with open sides. Ideally the prevailing wind should blow through the stack. If possible, cross cut logs should be split to less than 10cm diameter. This allows moisture to move from the centre of the log to the surface more easily
- To achieve low moisture content for burning, bringing cut, split logs indoors for a few days or more before use will help.

Using logs efficiently

Open Fires

An open fire is the traditional way to burn logs and can be attractive and cosy. It is however, a very inefficient method of heating as the uncontrolled air flow takes the hot air from the fire up the chimney, and draws warm air in from the rest of the house as well. This is replaced with cold, outdoor air drawn in to the house through drafts and vents. Often an open fire will run at very low efficiencies (≈25%) resulting in large amounts of smoke and ash for very little useful heat output. It is also worth remembering that when an open fire is not in use then the chimney can allow large amounts of cold air into the room (products are available to close off a chimney when not in use). So an open fire may well be increasing other heating costs. Open fires need a solid base to retain an ash bed in the smallest practical fire base. A coal grate is not suitable for wood, the best solution to this is to cover it with a metal base plate. All open fires need a fine mesh spark guard.

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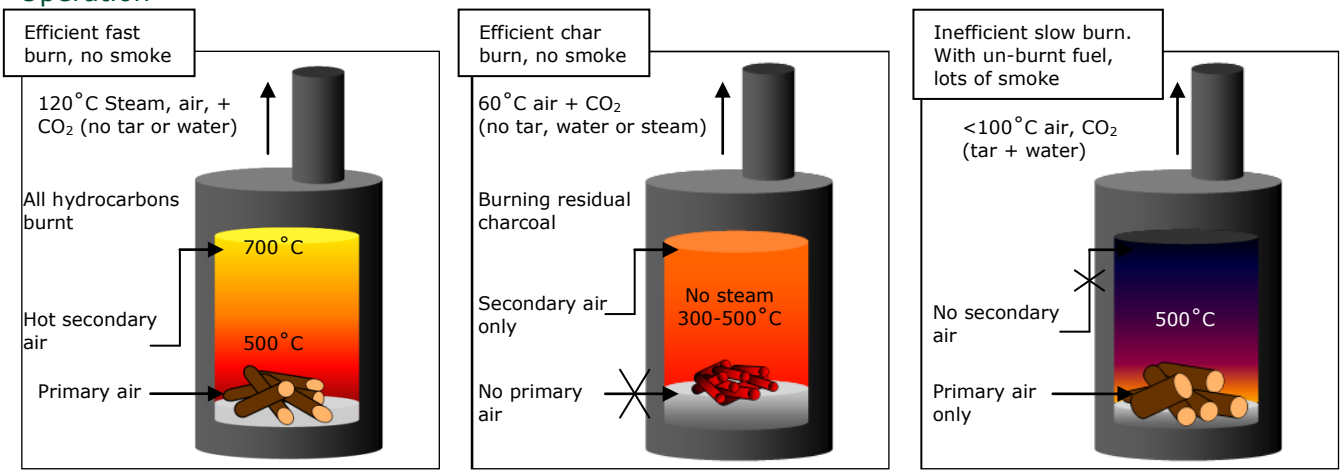
Efficient stoves

Traditional log stoves provide radiant heat to a single room. They offer an attractive, renewable, low carbon heat source that can be relatively cheap to buy and to run. They achieve significantly higher efficiencies than open fires (≈70%), and this results in a lower fuel requirement (and fewer trips to remove ash). Choose the smallest fire box you can for your heat requirement (the installer should be able to help you with this), with controlled hot secondary air, and ash retained in the base of the fire. Operating a stove with doors open considerably reduces efficiency. An insulated chimney is essential. Whenever water vapour is in the chimney, the temperature at its outlet must be above 100°C to avoid water condensing. Visible smoke emission from the chimney is a sign of inefficient combustion. Log stoves are also available with a back boiler to provide hot water, but this usually reduces the efficiency.

Operation



After adding fuel, set to fast burn ensuring all of the gases are fully burnt. Only set to slow burn when all the wood has been reduced to charcoal and ash. Newly added wood set to burn slowly will create smoke and tarry deposits in the chimney. Stoves should not be banked up with logs overnight. A bright fire which has turned wood into charcoal should be left with the day's ash, secondary air and no primary air. Users of older stoves are advised to consult their stove centre about current recommendations on how to achieve the best results.

Contamination

You should not burn anything that has been contaminated or treated with paint, varnish or other coatings and preservatives. Contamination can affect the amount of tar and deposits building up in your chimney, and release noxious chemicals into the smoke. Contaminated wood often leaves melted debris in the ash, and can have serious health implications when burnt. In particular, old CCA treated (tanalised) wood contains arsenic and should never be used as fuel.

Smoke Control Areas

Logs and most wood briquettes are not approved for use in smoke control areas except in officially approved "exempt appliances". The website www.uksmokecontrolareas.co.uk gives lists of Smoke Control Areas, the appliances approved for use in them, and exempt fuels. It is not permitted to burn wood on an open fire in these areas.

There is a technical supplement to this paper for suppliers of logs, available from the Biomass Energy Centre

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