

Seasoning wood for fuel.

By Phil Potter.

Seasoning wood for fuel is an art rather than a science but much is common sense. If round timber is stacked across drains under the drip-line of standing trees in the middle of a humid forest the chances are that it will be as wet or wetter after two years than it was when it was put there. On the other hand, with a little planning and timely action, those logs could have been turned into excellent fuel in half that time. The following is a general guide to the seasoning of wood for fuel. For detailed advice on individual aspects of wood fuel preparation (cross cutting & stacking, use of firewood processors, chippers, etc) refer to the Guides produced by the Health and Safety Executive, all of which are available free online (www.hse.gov.uk/pubns/forindex.htm).

The prime objective of seasoning is to reduce the moisture content (MC) of wood to make it suitable for use as fuel. Confusingly there are two very different ways of expressing MC, dry basis and wet basis. For clarification the two different methods are described in a note at the end of this guide but the guide will stick to wet basis. At 50% MC wet basis half of the unit under consideration is wood and the other half is water.

One of the most important ways of reducing the MC of firewood is to fell trees at a time of year when they contain least moisture, during the winter, when the sap is down. If felling has to be carried out during the growing season there is some evidence that leaving the branches, complete with leaves or needles, attached to the tree until they wither can draw moisture out of the wood. This approach is called sour felling.

Conventionally firewood is felled in the winter with a MC of around 50% and must be seasoned down to between 20% and 30% to make it suitable for use as fuel in smaller combustion systems like wood burning stoves. Larger combustion systems can burn wetter wood but they sacrifice considerable amounts of energy for the convenience of using such fuel. A tonne of wood at 50% MC has a calorific value (CV) of only around 2,300 kWh but a tonne of wood at 20% MC has a CV of over 4,100 kWh. In money terms, if a kWh of heat is worth 5p then a tonne of wood at 50% MC is worth £ 116.38 but a tonne of wood at 20% MC is worth £ 206.55. The higher value takes a bit of time and effort to achieve but the rewards are clear.

Writing about firewood in the early eighties Geoff Keighley identified three states of seasoning: Fresh felled; air dry; and house dry. Wood holds water in two different ways, inside the cells and within the cell walls. Air dry is a pragmatic description of the point at which all (or most) of the water has been lost from inside the cells, around 25% MC. House dry describes air dry wood that has been stacked indoors for a short period, perhaps 20% MC.

After felling timber should ideally be extracted to an exposed site outside the woods where it can be stacked off the ground on bearers, facing the prevailing wind. Dense hardwoods with smaller cells like oak, beech, sycamore and hornbeam need to be seasoned for two summers and a winter. Conifers and fast growing broadleaves like ash, birch and poplar, with larger cells, can often be seasoned in one spring and a summer depending on the weather.

Stacked logs would benefit from covering during the winter to prevent reabsorption of moisture. Anecdotal evidence suggests that it is particularly important to prevent snow from settling on seasoning timber.

Seasoning for the log market can be speeded up by logging, splitting and covering soon after felling. Storage in a well-ventilated area under cover is ideal for logs. Seasoning for the chip market is often best done in the round although larger diameter logs would benefit from cracking.

Chips made from wood that is less than 30% MC can be stored for relatively long periods of time. Green chips must be used relatively quickly or they will degrade (however, there are textiles on the market that claim the ability to assist the drying of green chips). The accuracy of moisture meter readings can be improved by testing the centres of cut or split logs.

Handling timber costs money. This should be taken into account when designing a wood fuel supply chain. The less money spent on delivering wood fuel to the consumer the more of its energy value can be retained as profit. Another consideration is the loss of weight due to seasoning where fuel is bought and sold by weight. If a tonne of roundwood is bought for £ 45.00 at 50% MC there will only be 700 kg left after seasoning down to 20% MC so, in this case, the raw material cost per tonne of wood fuel sold at 20% MC would be £ 58.50.

Note: Moisture content.

That there are two different methods for assessing MC is important as it leads to the potential for serious misunderstandings. Many commonly available moisture meters are calibrated in dry basis. This method is also used by some European combustion equipment manufacturers and is the stated preference of the Forestry Commission. However, wet basis is much more intuitive and has become the norm for the UK wood fuel industry (it is also used in the CEN standards for wood fuels, see below).

The equations for the two different methods of calculating MC are presented below followed by a worked example based on fresh pine (in kg).

$$\frac{\text{Wet weight} - \text{Dry weight}}{\text{Wet weight}} \times 100 = \text{MC\% wet basis.}$$

$$\frac{\text{Wet weight} - \text{Dry weight}}{\text{Dry weight}} \times 100 = \text{MC\% dry basis.}$$

$$\frac{1,000 - 410}{1,000} \times 100 = 59\% \text{ MC wet basis.}$$

$$\frac{1,000 - 410}{410} \times 100 = 144\% \text{ MC dry basis.}$$

To avoid confusion the method to be used should be agreed by all parties before any negotiations commence. In both cases the reference method for defining MC involves weighing a sample then drying it in an oven at 105⁰ C for 24 hours (or until the weight of the sample is constant over several spaced readings) and then re-weighing it to determine the dry weight.

Woodfuel East Business Development Advisors are equipped with moisture meters for either solid or chipped wood fuel and are happy to help with the design of fuel supply chains and fuel quality assurance. The UK, through the British Standards Institute (BSI), is helping with the development of standards for wood fuels that will be adopted across Europe in the near future. The body co-ordinating the standards is called CEN Technical Committee TC/335. The standards have been published in draft form and are available to be downloaded free from the Biomass Energy Centre web site (www.biomassenergycentre.org.uk). These normally cost between £30 and £60 each and won't be available for long so get them while you can.



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