

- ▶ Suppliers and buyers of wood chip fuel should be completely clear on what and how much is being ordered.
- ▶ There must be clarity on such specifications as the type and scale of installation in which the fuel is to be used, the quantity (volume, weight or moisture content) to be delivered, the frequency of delivery, the kind or source of wood chips (e.g. whole trees, harvesting residues).
- ▶ Agreement on the method of volume measurement and quality assessment should be made prior to delivery, to prevent any misunderstandings or disputes.

Ordering and receiving wood chip fuel

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Background

More and more people and institutions have installed a wood boiler and are on the look out for a fuel supplier. This COFORD Connects Note outlines how suppliers and buyers can work together to supply wood fuel and avoid common misunderstandings.

Ordering fuel

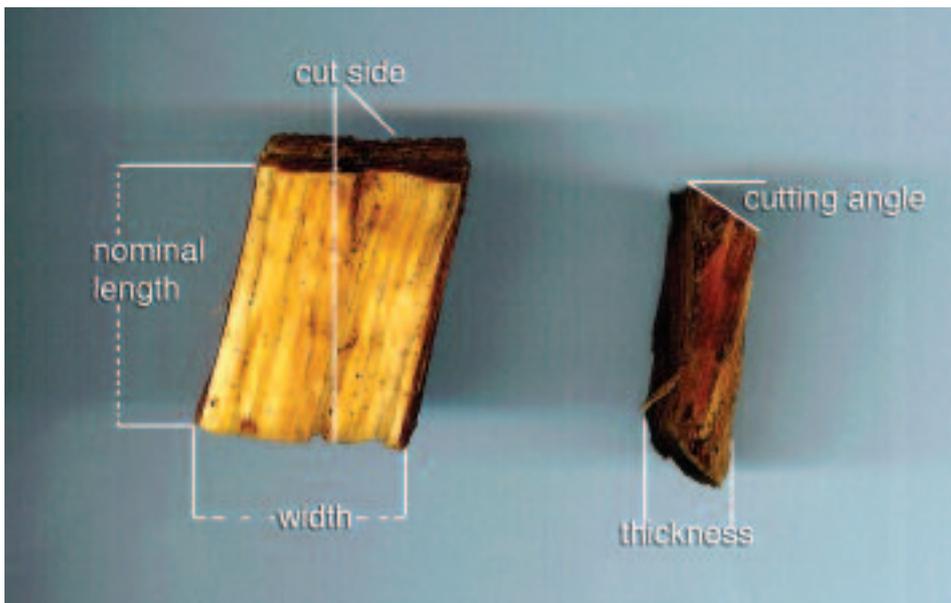
When ordering fuel it is important that a proper description is given of what and how much you are ordering. It is essential that the supplier knows whether the chip fuel is to be delivered to a domestic boiler, to an institutional sized boiler or to a large scale application as there are significant differences in the nominal chip size, and size distribution for each of these three applications.

Nominal sizes for wood chips are based on the European (CEN)/IS Technical Specification 14961 'Solid biofuels - Fuel specifications and classes' for the different classes of wood chip (the nominal size of wood chips is discussed in COFORD Connects 2007 *Quality wood chip fuel*). While size specification can be modified for a particular application, using the CEN technical specification has the advantage that the measuring methods are described in detail and can be repeated if necessary by the buyer. (The CEN specification will be revised before being issued as a formal standard. This may entail changes to the size specifications – an updated version of the note will be issued in that event).

For small-scale applications (less than 100 kW) a P16 size chip is recommended with the modification that oversize particles may amount to 1% of total weight. For medium size (between 100 and 1000 kW) installations a P45 is advised and here 2% oversize should be allowed. For large installations (over 1 MW) the P45 or the P63 are suitable.

It is also important to specify clearly the moisture content range of the chips. For domestic installations the moisture content should be below 30%, for

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◀ Measurement of wood chips.

medium size installations it should be below 40% and for large scale installations preferably between 30 and 50, or even 55%.

Also it is important for the supplier to know what quantity to deliver and at what frequency. The supplier should know if he has to deliver a certain volume, a certain weight or a certain amount of energy. For example, if the supplier's vehicle has a capacity 40 cubic metres loose volume of chips, then it can be very expensive to deliver a load of 5 cubic metres. If the specification is by weight, then a weighbridge receipt may be needed, or if the contract is based on energy content then the weight and the moisture content of the load may need to be known.

The supply contact should also specify the kind of wood chips. Typically these can be sourced from: whole trees, stemwood only, harvesting residues, sawmill residues, or willow chips from short rotation coppice. Recycled wood is normally not used for combustion, except where it clearly untreated.

A supply contract is usually more secure in terms of fuel quality if a long term contract is entered into. If poor fuel is supplied the contract may be cancelled with a resulting loss on the part of the supplier of an investment in wood and machinery.

Receiving fuel

The first few times one receives a load of fuel from a new supplier, it is important that each load is properly inspected to see if it confirms to what one has ordered. The inspection should be carried out before the load is unloaded, so that if one does not agree with the specification, it can be easily taken away again. Easy methods exist to establish if the right fuel has been received and a visual inspection of the load can reveal many things.

- ▶ What kind of chip is being delivered? Look for pieces of wood that originate from sawn timber, which show nail holes or even nails. Are there coloured pieces of wood, showing that the wood has been used previously for other purposes?
- ▶ Is the size of the chip homogenous and in compliance with the size of the chip you ordered? It is easy to see if chip can be classified as P16: 80% of the particles should be smaller than 16 mm. Of the larger particles, only very few should be longer than 100 mm and those particles should be less than a couple of centimetres in thickness.
- ▶ If the chip contains green needles it is not a suitable fuel, may cause problems in the boiler and is a sign that the moisture content may be above the specification.

Assessing moisture content is not straightforward and takes some time: First take a representative sample of the entire load by going around the pile and taking at least 10 shovel loads from 10 different places. The sub-samples are placed in a heap and then mixed thoroughly. Once the small pile has been mixed, a sample of exactly 500 grams is placed in a wide aluminium foil tray. The tray is placed in an oven which is preheated to 100°C. After 24 hours, or once the tray has reached a stable weight (often after 16 hours), the contents of the tray are weighed again. The difference between the fresh weight and the dry weight multiplied by 2 and divided by 10 is the moisture content:

$$((\text{fresh weight} - \text{dry weight}) * 2 / 10)$$

After fuel delivery, the reception area should be left clean and free of spilled fuel.

Amount and payment

There should be prior agreement on the amount of fuel being delivered. If a certain volume of fuel is to be delivered (as is the case for domestic installations) it should be clear how and when that volume is measured.

The volume of the chips should be measured on the transporting vehicle before dumping the chips. A heap of loose chips is difficult to measure and the transporting vehicle usually has a boxed loading bay, which is easy to measure. The chips should be measured on arrival, because

the load settles during transportation - this can amount to up to 10% of the volume.

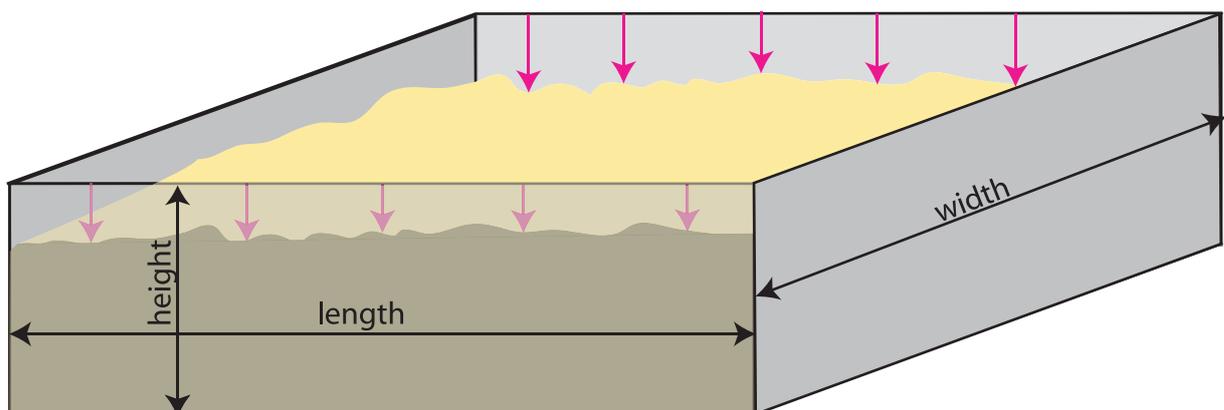
Measure the length and width of the box. The height of the chips will vary, so measure the height difference between the top of the board and the surface of the chips at regular intervals along the length of the load. At least 10 measurements are required, five at each long side. By totalling these numbers and dividing them by 10, the average height difference between top of the board and the chips is calculated. Once the load has been dumped, the height of the board over the loading floor is measured and the actual depth of the chips is then calculated by deducting the height difference from the actual height. Calculating the volume is then simply: length*width*height.

For larger consumers it is much simpler to buy wood chips based on the energy content. The weight of the load is usually established on a registered weighbridge and a sample of the chips is tested for moisture content. Using an appropriate formula, it is then possible to calculate the amount of energy which has been delivered.

The usual formula for softwood chips is:

$$X \text{ GJ} = 19.2 - (0.2164 * \text{moisture content in percent}) * \text{weight in tonnes}$$

Agreement should be reached when ordering the fuel how and when it will be paid for.



▲ Volume in delivery after the load has settled during transportation.

$$l \times w \times (h - h_c)$$

$$h_c = (10 \Delta h / 10)$$

l = length, w = width, h = height of board, h_c = height of board above the chips

Disputes

It is a good idea to have an agreed procedure to settle disputes, but of course these are best avoided by adhering to some of the simple procedures outlined in this note. A useful approach to adopt is to agree a dispute mediator in the course of establishing a contract and to abide by their decision in all cases.

Further information

More in depth information on aspects of this note are available in the COFORD/Danish Centre for Biomass Technology publication *Wood for Energy Production – Technology – Environment – Economy* available from COFORD (www.coford.ie).

For information and a free on-line advisory service on the wood energy supply chain, the quality of wood fuels and internal handling visit www.woodenergy.ie

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