

HEATING WITH WOOD

For climate-change purposes, wood can be considered a relatively benign fuel. This is because trees trap CO₂ (that is present in the air) in their woody tissue and when that wood is burnt the CO₂ is only being put back into the air where it recently came from. As long as suitable replacement trees are planted, this process can be continuous and is therefore sustainable.

In addition to burning in log form, wood can be reduced to a particle size as wood chips or pellets for fuelling room heaters and boilers. Chipping or pelleting wood facilitates automated handling and operation. Wood burning technology has been widely developed and adopted in Scandinavia, North America, Austria, Germany and many other countries. Sweden, for example, has a pellet production capacity of over 1 million tonnes per year and the whole of Stockholm is heated by wood pellet fuel. The heating of homes and commercial premises, schools, colleges and factories using wood as a fuel is perfectly feasible. This can be a straightforward replacement for a conventional fuel system, however, the space requirements of wood fuel often means that its incorporation into existing buildings can be difficult, especially where vehicular access is poor.

Where new buildings are designed for wood heating, particular attention should be paid to lowering and steadying the heat load, possibly including the use of under-floor heating, in order to reduce the size and cost of the woodfuel installation. Most larger woodfuel heating systems are 'wet', using radiators and convectors, but warm air systems are also possible.

Appliances: An automatic woodfuel heating system will normally be required to supply the correct amount of heat and run unattended. Most systems are highly automated with automatic ignition, thermostatic controls and can be operated on a timer. This is more easily based on wood chips or denser briquettes and pellets, rather than logs. Prices obviously vary according to boiler/heater size. Typically a 15Kw boiler would cost in the region of £4,000. This does not include the cost of storage or heat distribution systems (radiators etc).

Wood-Pellets

What are they: Basically they are made from compressed sawdust so utilising the waste material from sawmills. Each pellet is typically around 10mm diameter and 15mm long and is of consistent hardness, energy density and moisture content.

Pellets have a higher energy density than wood chips and are far more homogenous. The small size of pellets allows for precisely regulated fuel feed. In turn, combustion air can be regulated easily for optimum burn efficiency since the amount of fuel in the burn pot is predictable and consistent. High combustion efficiency is also due to the uniformly low moisture content of pellets (consistently below 10% compared to 20 to 60% moisture content chips and logs). Uniformly low moisture, controlled fuel batches, and precisely regulated combustion air means high heat output and a very low level of unwanted emissions.

Supplies and cost: Pellets can be supplied in bags (16-25Kg) or in bulk. A typical year's domestic requirement would be around 2 tonne. One tonne of bulk pellets should cost around £150 but this does not include delivery (currently around £100 into mid-Cornwall from the nearest supplier in Devon). Pellet production in the UK is under way but most supplies are currently imported (typically from Finland).

How it works: Deliveries of pellets can be made to your external pellet storage tank (similar to an oil storage tank) and are fed automatically into the pellet-fired central heating system. If you installed a new storage bin for wood pellets to hold 2 tonnes of pellets a volume of about 3 cubic metres would be needed. Alternatively you could have a smaller storage bin and have deliveries more frequently.

40kW pellet boiler in small industrial unit office premises.



11kW pellet room heater



Wood Chips -What are they: Basically waste wood, including bark, from small diameter (up to 100mm) branches and twigs are shredded into flakes or chips of around 20mm diameter and 4mm thick. The wood is usually a by-product of forestry work, tree maintenance, timber harvesting etc. Moisture content of fresh chippings will be variable and can be high (up to 60%), chip sizes may be also vary significantly.

Cost: This will be highly variable. Wood chips are currently often left on the ground where they are produced so in theory they are virtually free. If these can be utilised in your system the cost is merely that of collection. This in turn can help benefit the local economy by using local suppliers and also helps reduce environmental impacts from road transport. However, obtaining quality-controlled dried chips from a reputable supplier may overcome some of the problems mentioned below



'Chippy' 100Kw boiler + auto chip feed and hopper

Storage, handling and supply of wood chips: Accounting for the delivered quantity of wood chips can be on the basis of weight, but will more usually be volume related. If delivered fresh, the chips may need to be held in storage, often for several weeks, before transfer in small, metered volumes to the boiler house. The equipment for these tasks is often bulky, and the store must be located quite close to the boiler house.

The wood chips will need to be compatible with the requirements of the boiler. The reception of this fuel, its storage, and any subsequent chip handling must also be designed to handle these specific grades. A major problem with most equipment is the presence of material (larger wood pieces, stones, nails etc) that can break, or otherwise damage, the working parts. Systems vary significantly in robustness. It is essential therefore that a reliable supplier with good quality control is employed.

Fuel Storage: The size of fuel store required for a wood chip boiler depends on several factors. Where wood chips are produced on demand the chip store may be no more than a hopper attached to the boiler. For smaller boilers running on dry wood chip a 1m³ hopper will provide up to 24 hours of continuous running based on fairly dry (MC25%) chips with a density of 220kg/m³.

In practice, daily filling may be awkward and a larger hopper - 4 m³ - will provide up to 4 days of continuous operation and approximately 1 week of normal operation. Larger

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Cornwall Energy Efficiency Advice Centre, South Crofty House, 1 South Crofty, Tolvaddon Energy Park, Camborne, Cornwall, TR14 0HX.
Telephone - Advice: 0800 512012. Office: 01209 614975

boiler units require separate (external) storage silos. One week of operation on a 100kW boiler would require a silo storing 6m³.

Whilst wood chips do not occupy any more *volume* when wet than when dry, greater volumes of wet chip will be required due to their lower energy content (lower calorific value). This does not become really significant until considering quite wet chips. For example to give the same operating time of the same boiler, chips at MC50% will require 16% more storage volume than if they were oven dry, or 12% more than if they were at MC20%. For wet (MC45%) chips with a density of 300kg/m³ a week's worth of storage will require approximately 48m³.

Above ground hoppers and silos permit gravity, or gravity assisted, feeding direct to the boiler. Ground level stores normally require more complicated arrangements involving several mechanical steps to remove the chips from store and convey them to the boiler. The larger the store the more difficult, and expensive, it is to accommodate the necessary equipment. For a large wood boiler the investment in storage may represent up to 50% of the total costs of the boiler installation.



'Moving grate' 20kW wood chip boiler with chip hopper

Logs

Apart from the standard manually filled log-burning room heater or boiler, automated versions are now available. Although requiring more physical handling of fuel than chips or pellets, logs have a significant advantage in that no significant processing is required to convert them to an immediately useable fuel.

For larger installations, boilers are available that deliver individual logs automatically into the burning chamber. For single domestic dwellings, a 25kW log-fired boiler is available that can burn for up to 30 hours per load. Rather than be natural draught boilers, they are normally have a fan-driven air supply. This allows rapid start-up from low-burn/stand-by mode and a therefore a response to a demand for heat. Either of these systems would normally be expected to be linked to a standard thermostatic, timer/programmer.



25kW Vigas auto log-fired boiler

Grants: A government 'Low Carbon Buildings Programme' grant of up to £1,500 is currently available towards the cost of certain wood-fueled boiler systems. See

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information sheet 2 - 'Grants for Renewable Technologies' or call 0800 512 012 for details. The grant is at a lower level of up to £600 for Room Heater/Stoves with automated wood pellet feed.

Contact: <http://www.lowcarbonbuildings.co.uk/> or call 0800 915 0990 or contact Cornwall Energy Efficiency Advice Centre on 0800 512012.

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COMPARISONS BETWEEN FUELS

Approximate costs of installing and running a small domestic size wood-fuel boiler of around 10-15kW. The table below gives a summary of the **installed costs, per kW of heat output, for a professional installation:**

Fuel	Capital costs/kW	Unit energy costs
Logs	£500	1.7 p/kWh
Wood Pellets	£600	1.78 p/kWh
Wood Chips	£650	1 p/kWh
Oil, eg, rapeseed oil	£150	3.0 p/kWh

Assumptions made on costs:

Log Wood: £55 per tonne delivered at 25% moisture content and boiler efficiency of 80%.

Wood chip. £30 per tonne delivered at 25% moisture content, wood chip appliance 80% efficient.

Wood pellet. £75 per tonne delivered, wood pellet appliance 90% efficient.

Heating Oil: 30p/litre delivered, oil appliance 90% efficient

SOME CONTACTS

Econergy Limited

69 Hampton Park, , Redland Bristol Bristol BS6 6LQ. Tel: 0870 054 5554 Fax: 0870 054 5553 -

Email: info@econergy.ltd.uk Website: www.econergy.ltd.uk Contact: Jim Birse

Radius delivery is down as national. Already has existing woodfuel supply operations in East Anglia and the Marches but can supply nationally. Also offer contract mechanised whole-tree chipping services. Supply woodfuelled heat and Combined Heat and Power and offer a full range of products from complete contract energy management services to turnkey boiler installations and arrangement of fuel supplies.

Kernow Coal and Fires

Unit 2, Trenant Industrial Estate, Wadebridge Cornwall PL27 6HB. Tel: 01208 812527 Fax: Mobile: 07977 058 212

Email: kernowcoal@aol.co.uk Website: www.kernowcoalandfires.co.uk Contact: Simon Breckon

We also sell pellet stoves and have a working model in the showroom.

South West Woodburning Centre. The Old Airfield, Exeter Road, Torrington Road Winkleigh Devon EX19 8HR

Tel: 0183783333 Fax: 0183783777 Mobile: Email: sales@stoves-cookers.co.uk Website: www.stoves-cookers.co.uk

Contact: Jason Collins

Suppliers of Aga, Alpha, Esse, Rayburn, Stanley and Wamsler stoves and cookers. Have pellet burning Wamsler stove on display in there showroom. This stove can be fitted with a back boiler. Also agents for Traditions and Cascade pellet burning stoves from Canada. Based in Devon but supply all over UK.

Wendron Stoves Ltd

Mallow Court, Wendron, Helston Cornwall TR13 0NA. Tel: 01326 572878 Fax: 01326 562796 Mobile:

Email: pennyward66@hotmail.com Contact: Nathan Ward

Wood, multi fuel, oil and gas stoves and flues. Also Harman pellet stoves.

Wood Energy Ltd

Pinkworthy Barn, Oakford, Tiverton Devon EX16 9EU. Tel: 01398 351349 Fax: 01398 351115 .

Email: admin@woodenergyltd.co.uk Contact: Keith McKendrick

Sole UK distributor of Binder wood chip and wood pellet boilers 15kW - 3000kW, UK Distributors of EcoTec AB Pellet burners (13kW - 300kW) and Primdal and Haugesen pellet and chip boilers (13kW - 47kW). South West England distributors of the Enviro range of pellet stoves. Pellet manufacturers and suppliers.

Dunster Wood Fuels Ltd. Loxhole Sawmills, Dunster, Somerset. TA24 6NY. 01643 821188.

Suppliers of Vigas log and log/pellet boilers.

Blue Spot Biomass

40 Malabar Road, Truro. Cornwall. TR1 3NX. 08454 569 838

Logs, Chips, Pellets, Kindling.

Kernow Coal and Fires

Unit 2, Trenant Industrial Estate, Wadebridge. Cornwall. PL27 6HB. 01208 812527

Logs, Pellets, Charcoal, Kindling,

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