

Waterford Energy Bureau-Energy Efficiency/Renewable Energy

Fact Sheet No.10

Wood Fuels

Biomass

Biomass (wood fuel) includes all plant and animal matter on the earth's surface. Harvesting biomass such as crops, trees or dung and using it to generate energy in the form of heat, electricity or motion is known as bio energy from biomass. The CO² released during the generation of energy from biomass is balanced by that absorbed during the fuels production. This is known as the carbon neutral process.

Wood Biomass

Wood biomass includes forest products, untreated wood products, energy crops, short rotation coppice (SRC) e.g. willow, miscanthus (elephant grass). These sources are converted into useable heat, electricity or motive power.

Why use wood as a fuel?

Using wood fuel has a number of important benefits but the main ones relate to the environment and sustainability. Wood is a renewable form of energy. Wood is formed in 3 to 70 years compared to thousands or millions of years for fossil fuels coal, gas and oil. Heating our houses and water accounts for over 80% of energy in our homes, so greener heating choices make a big contribution to sustainability. Modern wood fuel systems have a high degree of convenience to the wood fuel choice. Using indigenous wood fuels reduces the amount of other fuels imported into the country. Wood fuel Industries have the potential to create many long-term jobs, many of which will be in rural communities.

Wood fuels fall are under the following categories.

Wood biomass includes forest products, untreated wood products, energy crops, short rotation coppice (SRC) e.g. willow, miscanthus (elephant grass).

1. Logs/Blocks

Logs and blocks are the most familiar form of wood fuel, but are not the only choice. Systems have been developed for wood as a fuel in a variety.

2. Wood Chips

Wood Chips are processed from such as willow, miscanthus or from forestry tinnings/residues. Wood chips are a dry and of familiar size and from (typically 25mm square) which makes storage and handling easy. Wood chip may require forced or natural dried & storage in a hopper until used in a



Wood Pellets



Wood Chips



Wood Logs

wood chip boiler. Wood chip heating is most suited to buildings with heat loads in excess of 100kW due to boiler size and storage requirements.

3. Wood Pellets

Wood pellets are upgraded wood fuels which have been produced from saw dust, shavings, bark, cutter chips or by drying and pressing the raw materials which are leftovers after processing trees to timber and other wood products. Pellets have a cylinder or ball shaped form High-density pellets produced from saw dust or ground-up wood (10-30mm in length and 5-15m in diameter). Pellets have been proven to be as reliable and efficient as oil or natural gas based boilers.

Wood Pellet Bulk Option

Price for 1 Tonne	Price per Year
€200	€625** “(200/4,800)*15,000

- Minimum delivery = 3 Tonnes
- 3 Tonnes storage hopper cost = €3000
- **: Consumption of 4,800 kWh (kilowatt hour) per Tonne
- Energy Efficiency Consumption for house (150m²) = 15,000 kWh per year

Wood Pellet Bag Option

Price for 55 bags	Price per Year
€320	€1000** “(320/4,800)*15,000

- 1 bag = 18 kilograms (1 tonne equivalent to 55 bags)
- Storage box cost = €200
- **: Consumption of 4,800 kWh (kilowatt hour) per Tonne
- Energy Efficiency Consumption for house (150m²) = 15,000 kWh per year

4. Wood Briquettes

Larger versions of wood pellets, similar in dimensions as firewood.

Wood Gasification Boilers

The combustion system employed in the woody Gasification Boiler solves most of the problems associated with conventional wood boilers. Combining wood gas and smoke with high

temperature and oxygen results in super-hot flame in the combustion chamber. The gases stay in this hot, turbulent environment long enough to achieve an 85% combustion efficiency, this process is called wood gasification. Generally a gasification boiler can be manually filled at a convenient time as there is a large heat store via the buffer cylinder (approx 750 litres).

Heat is transferred to the buildings requirement from the cylinder via a conventional heat distribution network. Wood gasification boilers are ideally suited to areas where there is a large supply of wood blocks.

Installation Conditions

- Must be fitted with at least a 750 litre buffer Vessel.
- 1.5 bar Safety Valve.
- A mixing valve on the return.

Wood Pellet Stoves

Wood pellet stoves can either be stand-alone stoves or can also provide central heating and hot water to buildings. Typically wood pellet stoves are manually filled with enough storage capacity for 1-2 days heating.

Typically pellet stoves for central heating are ideally suited to houses less than 100m² and have a heat load less than 12kW. There is an automatic ignition on most stoves meaning lighting the fire is simple and easy. Unlike traditional stoves, pellet stoves do not heat up themselves but radiate warm air into a room. Pellet stoves can be either free standing or fireplace inserts.

How much wood pellets do you need?

Approximately 3-4 tonnes of wood pellets per year is required to provide, heat and hot water to a typical family home with 150m² floor space and 15-20 kilowatt heating requirement.

Wood Pellet/Chip Boilers

Wood pellet/chip boilers can be completely automated resulting in no manual loading of pellet/chips. Typically wood pellets/chips can be stored in a storage hopper, which feeds a wood pellet/chip boiler via an automated conveyer. Adequate space needs to be provided to accommodate an internal/external storage hopper and chip boiler. Efficiency of wood pellet/chip boilers is between 90-95% which, ensures that most of the heat generated during combustion, is transferred into the building for central or hot water heating.

The high boiler efficiency and low cost of pellets/chips makes them cost effective when comparisons are made to oil/gas costs.

The availability of multiple fuel boilers for the burning of grain/pellets and wood chips provides options/flexibility in regards to the sourcing of fuels etc.

Energy Cost Comparison Table			
Fuel	Unit	Conversion (kWh)	Cost /kWh(€)
Electricity	1kWh	1	0.17
Heating oil	1 Litre	10.56	0.08
Natural Gas	M ³	38,000	0.055
LPG	1 Litre	6.9	0.07
Coal	1 Tonne	8,300	0.04
Peat/briquettes	1 Tonne	5,400	0.04
Woodchip	1 kg	3.7	0.035
Wood Pellet	1 kg	4.8	0.0450
W.Pellet Bulk	1 Tonne	4,800	0.041
W.Pellet bag	55 bags(18kg)	4,752	0.066

Cost Analysis of Installing a Wood Pellet/Chip Boiler in a House (150m ²)			
Typical Pellet/Chip Boiler Cost	Storage Facilities Silo/heating Pipe work modifications	S.E.A.I Grant	Typical Installation Cost
€7,000 to €14,000	€2,000 to €5,000	€2,500	€4,800 to €14,800

Annual Energy Cost Saving Analysis in 150m ² house (Built pre-2002)				
Fuel Source	Typical Energy Consumption	Factor for Boiler Efficiency	Cost per kWh	Typical Annual cost
Oil	15,000 kWh	0.75	€0.08	€1,600
Pellet	15,000 kWh	0.91	€0.045	€742
Chip	15,000 kWh	0.91	€0.035	€577
W.Pellet Bulk	15,000 kWh	0.91	€0.041	€675
W.Pellet Bag	15,000 kWh	0.91	€0.066	€1,088

Waterford Energy Bureau is a sub-section of the Waterford City & County Council Environment Department.



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