



Morri Consult Ltd

Biomass Technology





What is a Biomass System?

Biomass is a form of stored solar energy and although burning biomass releases carbon dioxide into the atmosphere, this is offset by the carbon dioxide absorbed in the original growth of the biomass, or captured by the growth of new replacement biomass. It is therefore seen as a very low carbon energy source, especially when compared to traditional forms of heating such as gas, oil or electricity.

A Biomass system is a boiler that is designed to burn solid fuels classed as biomass and normally the most popular biomass fuels are wood chip and wood pellets. Biomass heating systems can be used for space heating of buildings, hot water production and steam production. In terms of scale they can range from small domestic systems of say 10kWth through to medium systems of 50kWth to several MWth and to industrial or district heating systems of up to hundreds of MWth.

Benefits of a Biomass System

The benefits of using Biomass as a heating solution include:

Carbon Savings - Research indicates that using biomass for heating can typically give reductions in carbon emissions of around 90% relative to using fossil fuel heating systems.

Cost Savings – Biomass fuel costs are typically lower than the fossil fuel being replaced. The scale of savings depends on the price of the fossil fuel being replaced and the cost of the biomass fuel used. When replacing oil, LPG or electric heating systems the capital repayment can be quick and the savings significant.

Fuel Price Stability - When compared to fossil fuels biomass fuel prices are more stable and less affected by worldwide events. Although there will be some changes these are likely to be less extreme and more manageable than fossil fuel price changes.

Components of a Biomass System

The main components of a Biomass boiler system are:

- Biomass plant - the boiler
- Fuel and fuel store
- Method for getting the fuel from the store into the boiler
- Flue/chimney
- Ancillary equipment – e.g. Buffer vessel/accumulator – required for the majority of installations



Biomass Boiler Plant

Biomass plant can range from small manually fed systems with few controls to fully automatic systems with sophisticated controls and monitoring facilities. Currently there is a wide range of biomass boilers to choose from, with the majority being from Europe. Several boilers can burn both wood chips and wood pellets, although generally those that are designed for pellets cannot be used for wood chips. Some of the key features of boiler plant are as follows:

- Automatic ash removal
- Sensors to constantly monitor flue gasses and enable automatic adjustments to combustion controls in the event of changes in the fuel
- An automatic fire flap or similar feature in the fuel feed to eliminate burn back
- An overheating cut out



Biomass Boiler Plant - continued

- A robust fuel feed system
- A comprehensive set of controls to maintain optimum performance
- Plant that has been designed for minimal maintenance

The fuel that is intended to be used largely determines the choice of boiler and then the level of automation required.



Biomass Fuel & Fuel Store

The main types of biomass fuel are normally wood chips and wood pellets and the main characteristics of these are the moisture content, which determines the energy content (i.e. the calorific value) and the particle size/grade.

The cost of the biomass fuel is determined by the following:

- Type of fuel
- Market availability
- Quality of the fuel
- The form the fuel is delivered in
- Proximity of fuel source to the point of use

In terms of fuel store these can be in several types:

- Dedicated fuel store – above or below ground
- Integrated facilities within the building
- Removable external storage containers

For the larger systems the fuel (e.g. wood pellets) is normally delivered by a dedicated fuel supplier, typically in a 20 ton wagon and delivered into the dedicated fuel store. The pellets are normally 'blown' into the fuel store and are then transferred into the combustion grate of the boiler via a mechanical handling system (e.g. screw auger).

Biomass Flue

The type and size of flue required is determined by the type and size of boiler, the local authority requirements and the types of building surrounding the site.

Ancillary Equipment

Biomass boilers are best being operated more or less continuously (ideally between 30 and 100% of the rated output). The consequence of this is that a heat store (buffer vessel/accumulator) is often required to manage peak demands. Ultimately the exact design is determined by the site heat load and reaction times required.

Other ancillary equipment associated with a Biomass boiler includes connecting pipe work, ash extraction, fire dousing system, control and monitoring systems.





Funding – Commercial Biomass Systems

The supply and installation of a non domestic Biomass system (which includes district heating systems) would be undertaken by the Energy Supply Company (ESCO) which owns the boiler and all equipment for the duration of the contract. The client simply pays an annual heat charge to the ESCO.

The benefits of such an arrangement to the client would be:

- **No** capital outlay for the Biomass system
- A more efficient, **renewable** energy solution
- Yearly energy payments for heating and hot water that are **below** the oil/lpg/electric/gas equivalent
- **Fixed fuel price** for an initial five year period (subject to RPI increase)
- **Reduced** carbon footprint
- **No** annual service or maintenance costs
- Annual heat payment is for heat used and **not** the fuel bought, i.e. the client does **not** pay for any efficiency losses in the boiler.

Typical Financial Illustration:

	Existing Oil System	New Biomass System
Heat Requirement of Building	400MWh	400MWh
Efficiencies	85% (Current Boiler Efficiency)	5% (Pipe Work Losses Only) ¹
Energy Usage	470.59MWh ²	421.05MWh ³
Energy Cost p/kWh	6.50p	5.00 ⁴ p
Annual Energy Costs	£30,588.24	£21,052.63
Annual Maintenance Charge	£500.00	£0.00 ⁵
Total Charges Per Annum	£31,088.24	£21,052.63

Energy Savings Per Annum £10,035.60 (32%)

¹The client does NOT pay for any efficiency losses in the boiler. ²Fuel energy required by the boiler to cover boiler losses. ³Energy delivered by the Biomass boiler and includes pipe work losses. ⁴Fixed for 5 years (subject to RPI increases only). ⁵Maintenance is included in the energy cost.

Renewable Heat Incentive (RHI)

If a funded Biomass system is not for you and you want to purchase the system then the RHI is available to help finance it. There is a tariff for non domestic systems and a domestic scheme for individual households is planned from summer 2013.

Currently the 20 year tariff for non domestic systems is:

Tariff name	Eligible technology	Eligible sizes	Tariff level (p/kWh)
Small biomass	Solid biomass including solid biomass contained in municipal solid waste (incl. CHP)	Less than 200 kWth	8.3 (tier 1)
			2.1 (tier 2)
Medium biomass		200 kWth and above; less than 1,000 kWth	5.1 (tier 1)
			2.1 (tier 2)
Large biomass			1,000 kWth and above

Our Policy

At Morri Consult we are happy to discuss all forms of alternative energy sources with you, to allow you to make the right decision. We won't try to sell you anything that is not economically right for you. We believe in giving it straight, in terms of the facts and figures, and what you can expect from an alternative energy source.

We do not supply equipment from a single supplier; we will advise and help you select the product that best meets your needs. Above all we are always around to answer your questions and deal with any issues that may arise. We are professionally qualified engineers and technicians with teams of trained staff.

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