

Bioenergy: The energy from biomass

INTRODUCTION

Energy from biomass is harnessed through its combustion and can be used to generate heat and/or electricity and can also be used as a transport fuel.

In houses and buildings, biomass is mainly used to space heating and, additionally, to provide domestic hot water. This technology can be used also combined with other systems, namely solar thermal, where solar thermal complements biomass, producing domestic hot water especially in the summer, when the biomass stove is not in use.

THE TECHNOLOGY

Biomass has a great potential to deliver significant and cost-effective solutions to a concerning heat demand. Biomass heating can be achieved with a wide variety of fuels such as wood pellets, wood chips, briquettes or wood logs. A stove burns logs or pellets to heat a single room. A boiler can provide heating and hot water. A boiler burns logs, pellets or chips, and is connected to a central heating and hot water system.

Biomass heating systems can often integrate into existing heating systems, or replace them, and fulfill all of the heating needs of a home.

For domestic purposes, firewood or wood pellets are most frequently used.

Biomass stoves: Biomass stoves produce heat only, typically for one single room but sometimes more than a room. Biomass stoves are installed indoors, ideally central to the volume to be heated. They are logwood, woodchip or wood pellets burning stoves that can complement or replace your conventional boiler to supply heating. Traditional wood burning stoves are using wood logs. More sophisticated models run on pellets which are mainly made of compressed sawdust. The use of the resource is highly efficient as the thermal efficiency of modern stoves ranges from 80 to 91%.

- **Firewood stoves:** These stoves can be used to heat single rooms or small houses and are available with outputs from 3.5 kW to 20 kW. Stoves can be found in wide variations in design, such as doors with or without viewing glass or casings of tiles or soapstone.



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- **Wood pellet stoves:** Pellet stoves are more sophisticated than firewood stoves because of the automatic operation. Pellet stoves usually have a small fuel pellet storage, from which the pellets are conveyed by a small auger to shaft from where they fall into the combustion chamber. A fan provides the air needed for combustion. Advantages as compared to firewood stoves are: fully automatic operation, higher efficiency, cleaner burning, and easier to use. Capacity range of domestic pellet stoves is between 1.5 kW and 12 kW.



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Biomass boilers: Biomass boilers for residential purposes can be used to provide heat and domestic hot water, and can replace your conventional boiler as they can be fully automatic just like their oil and gas equivalents. Modern boilers are also highly resource efficient as they achieve efficiencies between 80 and 107%.

- Firewood boilers are more suitable for houses and they are popular in rural areas. Firewood boilers are designed to be loaded with more wood than wood stoves. Wood is manually loaded into the appliance, and their capacity range is between 15 kW and 70 kW. The technology has been improved dramatically, achieving efficiencies of more than 90%.



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- Wood chip-fueled boilers may be used to provide heat in larger houses, for farm buildings, or for industrial furnaces. Automatic operation and low emissions because of continuous combustion are the advantages of wood chips heating systems. Wood chip-fueled boiler capacity ranges from 15 kW to industrial scale.



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- Wood pellet boilers are used for capacities between 15 kW and industrial scale. These boilers are usually installed in a basement or in a separate container outside the house and the fuel storage should ideally be located close or next to the boiler room. These boilers operate fully automatically, and ash removal is generally automated and the exterior ash box requires emptying once or twice a year.



Credit: Nino Aveni / AEBIOM.

BENEFITS AND CONSIDERATIONS

Biomass has the advantage of being controllable and available when needed, similar to fossil fuel heating. The disadvantage of biomass for facility heating is that the fuel needs to be purchased and stored.

Also, biomass is considered a low-carbon option through substituting fossil fuels, since when wood is burned the amount of carbon dioxide emitted corresponds to the same amount that was absorbed over the period that the plant was growing and will be absorbed again when the plant starts growing again. The carbon emissions caused by the cultivation, manufacture and transportation of the fuel, especially when the fuel is locally/regionally sourced, are much lower than the emissions from fossil fuels. Also, the process is sustainable as long as the biomass used for fuel is regenerated.

Biomass, being sourced locally contributes to local economic development and job creation, stimulating local economy and creating jobs, by driving fuel supply in agriculture, forestry, logistics, installation and maintenance activities, and giving value local resources that were not mobilized and used before.

COSTS USING THE TECHNOLOGY

The costs linked to the installation of equipment depend a lot on the characteristics of the house where the installation will be made. Therefore, this cost is not addressed here. However, biomass fuel costs are usually lower than conventional fuels and its price evolution is more predictable.



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