

## WOOD CHIP HEATING SYSTEMS

Countries in South Eastern Europe have high but often unused wood resources. Therefore, the main objective of the EU-funded project “BioVill” is to foster the local use of wood and biomass for energetic purposes. Bioenergy offers a great way to save fuel costs and to strengthen the local economy. This factsheet provides information on wood chip heating systems - their main features, important aspects regarding installation and characteristics of wood chips.

### WHY HEATING WITH WOOD?

#### Wood offers high value for money

The costs for heating with wood chips are usually lower and more stable compared to fossil fuels or electricity.

#### Wood heating is clean, comfortable and efficient

Modern wood chip heating systems are very clean and comfortable and their high efficiency reduces fuel costs.

#### Wood is a regional resource

The local community is usually able to produce wood chips by their own which shortens transport distances and keeps the money in the region.

#### Wood is sustainable

Sustainable forest management secures long-term wood chip supply as well as balances ecological, economic and socio-cultural aspects.

#### Wood is energy security

Wood chips can be available in the local community, regardless the season or economic and political developments.

#### Wood is climate friendly

The emitted CO<sub>2</sub> during burning woodchips fuel equals the amount of CO<sub>2</sub> the tree assimilated for growing.

### TYPES OF HEATING SYSTEMS:

Due to efficiency reasons and fuel storage requirements, wood chips heating systems are suitable for centralised heating systems in larger buildings (apartment blocks, agricultural buildings, etc.). The storage of wood chips requires considerable space (Figure 1). Wood chips are usually delivered by trucks and directly filled into the storage room. Heating of single family homes is also possible but requires a suitable storage capacity or regular delivery. Heating single rooms is theoretically possible but not very common at the moment.



Figure 1: Wood chip boiler installation including fuel storage, © KWB

A wood chip boiler integrated in a **central heating system** produces hot water which is then circulated in the house to where heat is needed. This heating system usually consists of two parts - the fuel transport system and the boiler (Figure 2). The system offers high comfort and is comparable to heating with fossil fuels. The fuel is automatically fed to the burning chamber and the combustion is electronically controlled.

Modern wood chips heating systems offer additionally the following advantages:

- Wood chips are automatically filled
- Automatic ignition and combustion control
- Optimized temperature and fuel control by the thermostat
- Cleaning and maintenance only once a year

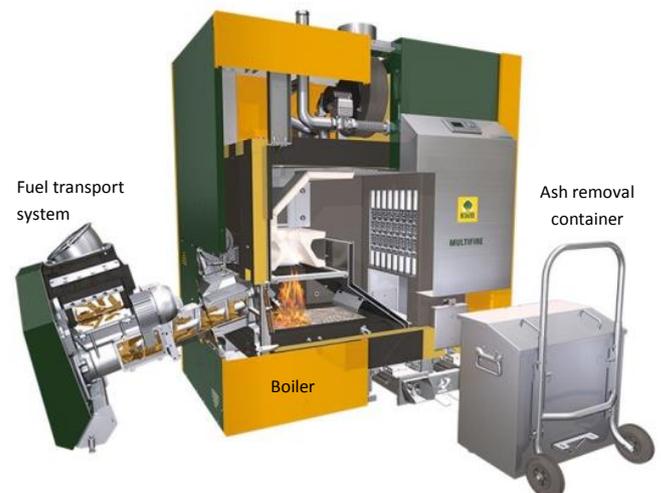


Figure 2: Wood chips boiler and fuel transport system design, © KWB

Wood chip boilers for in-house installations require a homogenous fuel consisting of small size chips class P16 or P45. The most common technique to transport the fuel from the storage to the burner is the screw conveyor or auger feed screw (Figure 2). The small chips size allows a continuous transport in the screw. Larger installations instead use hydraulic piston feeders which are less sensitive regarding variations in chips size.

Wood chip heating systems require a moisture content of less than 30%. High water contents might have negative effects on the ignition phase and the temperature of combustion. Note that lower moisture contents of the fuel increases the efficiency of the system. Additionally, dry wood chips can be better stored. Low quality wood chips (e.g. high contents of bark and leaves) and contamination by soil can lead to an increase of cleaning or potentially compromise the efficiency of the heating system.

## CHIP BOILERS AND EXISTING HEATING SYSTEMS:

Wood chip boilers can be easily integrated in existing hot water heating systems. The installation of buffer storage tanks help to avoid partially load operations and increases the efficiency of the system. Additionally, the combination with other renewable energy systems e.g. solar or heat pump could be a good opportunity to provide hot water. Adaptations might be potentially necessary in the boiler and fuel storage room and as well as for the chimney. Boiler manufacturers and planners support customers in designing the system and the feasibility assessment.

## ASPECTS TO CONSIDER BEFORE CHANGING THE HEATING SYSTEM:

- ✓ **What is the intended purpose?**  
Heating a single-room, a whole house, an apartment block or agricultural buildings requires different technologies
- ✓ **Available space for the boiler and the fuel storage?**  
Woodchips have a low energy density and need twice the space of logwood, three times the space of pellets and ten times the space of oil for storage – presumed the same energy content. Also the boilers are usually bigger.
- ✓ **How much time does the installation take?**  
The installation of wood chip boilers takes normally 1 – 2 days. Building the storage room can take a few days, depending which adaptations for the automatic conveying system and storage room have to be made.
- ✓ **What is the proper capacity of the heating system?**  
A heat demand calculation helps you to choose the right dimension, avoids partial operation load and saves money.
- ✓ **Which fuel do you want to use?**  
Adequate size and moisture content depends highly on the boiler system. For in-house installations the moisture content should be below 30% (fresh wood ~50% moisture content). In general, dry and good quality chips are prerequisites for a good performance of the system.
- ✓ **What are the investment costs?**  
Depending on the required capacity, adaptations and comfort, the costs can range from several 1,000 euros up to more than 20,000 euros.
- ✓ **Are constructional adaptations necessary?**  
The local chimney sweepers and planners have usually vast experience in installing new heating systems. They can advise which adaptations might be necessary in the fuel storage room and the chimney.
- ✓ **Are there regulations or laws concerning heating systems?**  
This can be clarified by the municipality and the regional experts at the local BioVill information point.

## WHAT ARE WOOD CHIPS?

Wood chips are small wood pieces. They can be produced from sawmill by-products or from fresh wood material such as low quality wood or branches. The size of chips depends on boiler specification and varies typically between 3 and 5 centimetres. Modern chippers are able to produce high amounts of chips within a short period of time. Before chipping, a low moisture content of less than 35% should ensure long-term storability. One cubic meter wood corresponds to about 2.5 m<sup>3</sup> loose wood chips.



Figure 3: Wood chips, © Austrian Biomass Association

### Application

Wood chip boilers are preferably used for space heating and hot water preparation in larger buildings e.g. multi-family dwellings with high heating demand. Wood chips are also often used in small and medium-sized combined heat and power plants. In large heating plants wood chips are often combined with pellets.

### Advantages

- high comfort and automatic heating system
- good storage capability of wood chips
- relatively low and stable price
- different regional fuel producers available
- low CO<sub>2</sub> emissions

### Price

Wood chips can be regionally produced from by-products of the wood processing industry or from regular forest management.

- Wood chips usually provide good caloric value for money
- The price should be calculated according to weight and water content and not volume otherwise a mix of different wood species, variable moisture contents, qualities and wood chip sizes makes a price comparison difficult
- The price is very stable, compared with oil/gas
- The price fluctuates slightly during the year - prices often decreases in spring and raises in autumn

### FURTHER INFORMATION:

BioVill - Bioenergy Villages [www.biovill.eu](http://www.biovill.eu)  
Austrian Energy Agency [www.energyagency.at](http://www.energyagency.at)  
European Biomass Association [www.aebiom.org](http://www.aebiom.org)

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