



SMALL-SCALE BIOMASS HEATING APPLIANCES

In the Western Balkans, the producers of wood-fueled heating appliances— such as stoves, small boilers, and wood-pellet and wood-chip appliances— are located mainly in Bosnia and Herzegovina, Croatia, Macedonia, and Serbia. Usage of wood stoves and wood-log small boilers is widespread in all the countries of the region, while wood-pellet and wood-chip appliances are less common.

The nominal efficiency of the appliances is declared by the producers and usually is higher than the efficiency of the appliances operating in real-life conditions. Typically, the efficiency of the appliances sold on the local market is measured in national or manufacturer laboratories that are not accredited for certification of appliances against Euro Norm (EN) harmonized technical standards.

Existing legislation for residential heating appliances in W-B countries requires mandatory attestation of electronic components only. Certification of all other components and parameters is voluntary, not mandatory, and is market-driven.

Considering the lack of legislation related to the efficiency of the heating appliances, only market supervision inspectorates (generally parts of the ministry responsible for trade) are authorized to perform testing of the heating devices—although the testing determines only whether the efficiency of the appliance is in line with the declared and displayed efficiency. Because of budgetary restrictions and lack of funds for these purposes, this kind of testing is rare.

The availability of highly efficient, EN-certified biomass heating appliances is limited for two reasons: higher prices (50–100%) compared to the (mainly uncertified according to EU standards) appliances currently available on the market, and lack of consumer awareness of the benefits of efficient appliances. As a result, efficient appliances are significantly less available in the distribution chains, compared to inefficient appliances. Should demand for them increase, however, local manufacturers of small-scale biomass heating appliances in the Western Balkans would be in a position to supply the market with the efficient appliances.

Wood Stoves

A deliverable of Heat Wisely, public awareness raising project on biomass-based heating in the Western Balkans



Leading biomass fuels suitable for the use in the wood stoves include wood logs and wood briquettes. The conversion efficiency of the efficient wood stoves can be as high as 80%. However, although wood stoves are widely used in all the countries of the region, their efficiency is generally low. Investment costs are in the range of EUR 50–100 per kilowatt of installed capacity.

A wood stove is a free-standing appliance designed to heat the space in which it is located, without the use of ducts to distribute the heat. Stoves release useful heat energy by radiation and convection to their surroundings.

Wood-Log Small Boilers

Wood is fed through the upper door and ashes are removed from the lower door. Unlike a stove, the heat produced is not directly transferred to space where it is located; rather, it is used to heat water that is then sent to heat exchangers (such as radiators or the equivalent) to warm the heated ambient.

The water is not usually sent to these exchangers directly: the over-fire boilers are usually connected to heat storage tanks so as to uncouple heat production and utilization. This fact enables optimal combustion at nominal load; the supply of heating and hot water then comes from the tank. It is very important that the heat storage tank be large enough to accumulate the total heat released from a wood batch. Also, a well-insulated tank is a prerequisite for the high overall efficiency of the system.

Over-fire boilers with no storage tank may have high emissions of unburned hydrocarbons, since they need to be operated at low burning rates in spring and autumn. An environmentally optimal combustion can only be obtained if the boiler is operated at nominal heat output.

Wood-Pellet Appliances

Pellet-fired systems allow continuous automatic combustion of a well-defined fuel. Some burners are equipped with a small pellet-storage area (enough for one or a few days of operation) that can be refilled either manually or automatically.

Wood-pellet-fired appliances have a significant share of the domestic heating market in countries with developed bioenergy use. Pellet stoves combust only pelletized material and depend on electricity for their operation: an electric fan controls the combustion process by varying the supply of combustion air.

Pellet fuels have the potential to burn with very low emissions. Moreover, pellet burners can replace oil burners in existing boilers, thus reducing payback time. Well-designed pellet-fired systems can achieve efficiencies of over 85%, although at part load and varying load, or with a very high excess air level, their efficiency falls to 50–60%. Investment costs of the wood-pellet appliances (stoves and small HOBs) are in the range of EUR 150–300 per kilowatt of installed capacity.

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Wood-Chip Appliances

Wood chips haven't been used for home heating furnaces as wood chip is not usually available as ready-to-use fuel for small-scale devices due to their irregular size and high moisture content. Modern wood chip furnaces generally require an industrial size burn chamber (eg. a blown or "fluidized bed" combustor) and large-scale fuel feed designs, with chip storage buildings and automated augers and conveyors. This complex and expensive equipment is considered necessary because of the uneven size of chipped wood—often mixed with twigs and sawdust. This mixture tends to jam in small feed mechanisms.

Thus, the wood chips heating systems (boilers) can be used mainly for heating larger houses and farms, schools, or for commercial and municipal scale operations. Advantages of using woodchips instead of firewood are automatic operation and much lower emissions because of the use of feed rate rather than air supply to control heat release rate. Wood chips boilers are often sited in basements, in free-standing heating containers (that combine boiler and storage) or in their own separate buildings. The wood chips are transported to the boiler, often using a screw feed system. The size of the storage depends on the specific situation and should be correctly sized on the basis of energy demand.

Appliances for Agricultural Biomass and Dedicated Energy Crops

Agricultural biomass and dedicated energy crops have high ash, chlorine, nitrogen and sulphur content and major element contents, and are recommended to be used in appliances which are specially designed or adjusted for this kind of pellet.

For example, during the combustion of straw, maize, energy crops and rape straw, the potassium and the chlorine content combines and turns into a salt that appears to be a white-brownish dust. This dust deposits in the pipes of the heat exchanger and in the dust-extractor, that has to be cleaned frequently.

If the salt gets damp, it becomes extremely corrosive. In case of using sunflower husks as a heating fuel, boiler must be constructed with stainless steel parts in order to avoid corrosion of the boiler tank.

The long-term use of agricultural biomass and dedicated energy crops in residential-scale appliances require technological developments in both burners and filtration. Thus, the agricultural biomass and dedicated energy crops preferably should be used in larger-scale biomass combustion plants (DH/CHP), which apply electrostatic precipitators or bag house filters for particle removal.

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