WOOD to ENERGY

Fact Sheet

Small Heating Units

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Wood-burning heating systems are an affordable energy source for heating buildings during the cold season in areas where wood is plentiful. Wood-burning units can be indoor boilers or stoves, or outdoor furnaces that provide heat for buildings. Indoor units can be installed in a basement or utility room to distribute heat with forced hot-air or circulating hot-water systems throughout the building (Paul 2003). Some wood-burning units can use other types of fuels, such as oil, electricity, or natural gas, instead of or in combination with wood. Substantial improvements have been made toward making wood-fired heating units cleaner and easier to use and maintain during the past several years.

Size and Types of Wood-burning Units

Wood-burning furnaces come in a variety of sizes and are typically made out of stainless steel. Outdoor wood furnaces can heat buildings from 2,000 to 30,000 square feet. Indoor wood units tend to be used to heat smaller areas.

Forced Hot-Air Systems. For buildings with existing forced air ductwork, a wood-fired furnace can be installed easily. These furnaces usually have a firebox, a chamber where combustion occurs, and optional hot-water coils controlled with a thermostat. This type of system burns wood to heat air in a heat exchanger that is distributed to the living spaces through the ductwork. Such equipment does not have heat storage capacity, requiring it to be refueled regularly to maintain a consistent and comfortable temperature (Paul 2003).

Hydronic Systems. Hydronic systems burn wood, wood pellets, or coal to produce hot water that is used to heat buildings. They have a firebox with heavy cast-iron doors, surrounded by a water jacket (a water-filled void that surrounds the device). The heated water is circulated through the building using a system of pipes that emit heat. The water jacket protects the firebox from overheating, a feature not available with hot-air furnaces. This type of system may include an extra heat-storage tank which can store excess heat for later use.

Combination. Combination systems allow for wood to be used together with fuels such as oil or gas, which can be used as a backup when using wood is not possible. Such systems may also be equipped with an electric backup heating coil. One disadvantage is that combination systems are almost twice as expensive as single-fuel heaters (Paul 2003). Presently there are wood/gas, wood/oil, and wood/electric heating combination furnaces on the market.

Outdoor Boilers. Outdoor boilers have a water jacket that surrounds the boiler's firebox, similar to the hydronic system, and heat is transferred from the fire to the water, which is pumped through insulated underground water pipes to the building. The hot water then passes through a heat exchanger, or into a variety of heat emitters, and can be designed to provide hot water as well. One disadvantage of outdoor boilers is that they usually have to be refueled daily. These boilers are exempt from U.S. Environmental Protection Agency (EPA) emission standards; however, due to periodic smoke emissions, they may not be appropriate for use in populated urban areas. Figure 1 shows an example of an outdoor heating unit.

Capital and Operating Expenses

The cost of a wood furnace depends on its type and size. The average price for a 100,000 British thermal units (Btu)/hour hot-air furnace ranges from $2,000 to $3,000 including installation. A complete hot-air heating system costs $6,000 to $7,000 installed. A typical 100,000 Btu/hour boiler costs $3,000 to $5,000. A complete hydronic heating system costs $6,500 to $7,500 including installation. A high-end multi-fuel hydronic system may cost as much as $10,000 installed (Paul 2003).

A unit that provides heating for 12,000 square feet and produces up to 450,000 Btu/hour uses on average fifteen cords of wood per winter (one cord is 128 cubic feet of

wood). Since the length and intensity of the cold season varies in different places, an accurate estimate of operating expenses needs to be based on where the boiler is being used. Handling and storing wood requires sufficient space and equipment.

Figure 1. *Outdoor boilers heat water that warms nearby buildings.* Photo by Phillip Badger.

Summary

Wood-burning units can provide a less expensive option to oil or natural gas for heating air and water in buildings. They can provide building heat, domestic hot water, or even heat for swimming pools. These systems may be installed in new buildings or added during renovation. When burned correctly, wood is generally environmentally cleaner and carbon neutral. See the fact sheet, *Comparing Wood and Fossil Fuels,* for more information. While not appropriate for every situation, wood furnaces make some of the benefits of using wood for energy available on a small scale.

For more information about using wood to produce energy, visit http://www.interfacesouth.org/woodybiomass and read other fact sheets, community economic profiles, and case studies from this program, or http://www.forestbioenergy.net/ to access a number of other resources.

References

Paul, Greg. 2003. Wood-fired central heat. *Mother Earth News.*, Issue 96, February/March 2003. http://www.motherearthnews.com/DIY/2003-02-01/Wood-Fired-Central-Heat.aspx (accessed March 19, 2007).

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