FOR10

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Wood-Fueled Home Heating Systems - Which is Best? [1]

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With other fuels scarce and expensive, many Floridians are turning to wood for home heating. Today more than 50 U.S. companies make wood stoves, 5 times as many as twenty years ago, and many stoves are imported from foreign countries. A stove buyer will be amazed and confused at the variety available. This publication can help you decide which wood heating system is best for you.

Factors to be Considered

Florida winters are mild, and cold days usually alternate with warm. An occasional fireplace fire may be sufficient, but if you really want to reduce your heating costs, you probably need something more. Many people supplement their conventional heating systems with wood heat, and others find wood can be their major source of heat.

To decide which system is best for you, consider your housing situation. If you live in a mobile home, local codes, H.U.D. requirements, and insurance and lending agency rules may restrict your type of heat. Fortunately, there are stoves and fireplaces designed for or adaptable for mobile homes. These heat adequately and meet most restrictions. If you rent, your wood heating opportunities may be limited. However, many older homes have chimneys with fireplaces, or wall thimbles for venting wood stoves. Thimbles are often covered in remodeling ask your landlord.

If you own your home, you are limited by the amount of effort and/or money you can invest. If you have a fireplace, it may be in a den or family room which is not centrally located, making heat distribution difficult. To get the kind of well distributed heat a central heating system provides, you would need several stoves at strategic points in the house. Decide how much space you need to heat, and for how long. Also, think about outdoor storage space for firewood and indoor space near the stove or stoves for a day's supply of wood and kindling.

Young children are attracted to the flame of a fireplace or the warmth of a stove, so consider this. A circulating heater with an exterior shell which may become warm but seldom hot might be a good choice for a home with children. You could also locate a stove away from the normal traffic pattern. Glass fireplace doors add safety when there is a child, a disabled person or an elderly person (who might fall) present. Some parents have installed wrought iron fences around stoves to keep toddlers from investigating the source of heat.

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Wood heating systems need tending, some more often than others. Think this out carefully, particularly if you are away most of the day. If wood is the only heat, remember that water pipes may freeze if you are away for an extended time. If you move frequently, the cost and difficulty of moving the heating system can be important.

Heating Efficiency

There is no form of home heating more enjoyable than an open fire. Yet the fireplace is the least efficient of all forms of wood heat. Efficiency varies from about 10 percent while the fire burns vigorously, all the way down to a negative value as it dies down. You can't close the damper while fumes are being emitted, so the fireplace steals warm air from the room.

How Wood Burns

To understand fuel efficiency, you need to know how wood burns. For our purposes a simplified description is sufficient. Wood burns in three stages. First, heat provided by burning small pieces of dry kindling produces temperatures high enough to ignite the outside of larger pieces of wood. In this stage, heat is needed to drive off the moisture present even in the driest wood. The heat used in this process is lost so you can see that dry wood is important. In the second stage, temperatures approach 500 degrees F and a chemical breakdown of the wood begins. Volatile liquids and gases are driven off, leaving charcoal behind. About half the available heat is in these gases, however a temperature of at least 1,100 degrees F is needed to ignite them and more air is needed to support combustion. Charcoal burns in the third and final stage at temperatures above 1,000 degrees. Since fresh wood is usually added during the burn, these stages are not separate - all three may go on simultaneously.

Wood Stoves

Wood stoves come in many models, sizes and shapes. Besides the fireplace inserts mentioned above, there are others which are stove-fireplace combinations. These are called free-standing fireplaces because they are not built into the wall. The main difference between a fireplace and a stove is that a fireplace has no control over the supply of combustion air and a stove provides some control. From the preceding section you can see that modification can help provide control. A free standing fireplace often has a conical hood. In recent years these have been converted from fireplaces to stoves with glass or metal sides and doors. The Franklin fireplace and similar models are really stoves with doors which can be opened for viewing the fire.

Stoves are divided into two classes - airtight and non-airtight. The pot-bellied stove and the parlor stove, popular earlier in the century, and the Franklin stove popular today are non-airtight. These are less efficient because entering air is not completely controlled. Air control is important since the rate of combustion and thus the rate wood is used depend on it. Without proper air control, gases from the wood escape up the chimney unburned. Many older model stoves were designed to burn coal, but used wood occasionally as a substitute. These are equipped with grates with an air intake below the grate. In these updraft stoves, gases and other products of combustion were drawn rapidly away from the flames and up the chimney. This method is seldom used in airtight stoves. Some of these have the air intake above the fuel. Air, mixed with gases, is drawn down through the hottest part of the fire. Then secondary air is fed in to aid complete burning. This is the downdraft method. Other stoves use a cross-draft in which air fed in low on one side passes across the burning fuel and exhausts low on the other side. Turbulence over the flames causes the air to mix with the released gases and if temperatures are high enough, the mixture is at least partly burned before it reaches the chimney. In some stoves an "S" pattern is created by shaping of the firebox or by placement of baffles (Figure 3). Air passes over the fire and curves back through the flames. This longer flame path helps burn gases and holds heat in the stove for a longer time.

Most modern stoves are made of cast iron, sheet steel, or a combination. Cast iron has properties which make it ideal for stoves. It conducts heat well and is stable through a range of temperatures. It cannot be welded, however, so joints must be tongue-and-grooved or overlapped and the plates

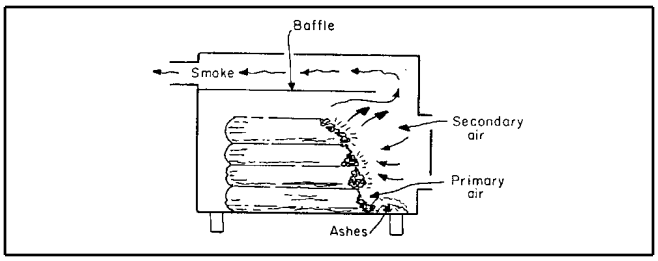

Figure 3 .

bolted together. Furnace cement is used to reduce air leakage. Since the iron is cast in a mold, the surface can be shaped in very elaborate and attractive designs. Cast iron resists wood acids and oxidation or burnout. Thin sheet steel, in combination with cast iron, has been used in stove building for a number of years. It was usually lined with firebrick or with cast iron to reduce oxidation. Unlined drums or thin sheet steel have been used in some wood stoves. Oxidation occurred slowly and burned out drums could be replaced at low cost.

Thicker plates of sheet steel are used in modern airtight stoves. Joints are welded to prevent air leakage. Warping at high temperatures has been a problem. Improved designs have minimized this problem but a smart buyer will look for guaranteed performance. Like thinner sheet metal, the heavier plates will eventually burn out. Lining with fire brick or cast iron will eliminate burnout, but make the stoves heavier and more expensive.

Some stoves have been tested and are listed by Underwriters Laboratories. This means the stove has performed satisfactorily under conditions much harsher than you will impose. Not all models of a single manufacturer are listed, so be careful in your selection. Properly installed and well treated, these stoves should give years of good performance.

Furnaces

A good airtight stove may cost from $1,000-$2,000 more if a chimney must be installed. Considering these prices, a wood furnace may be an attractive alternative. There are a number on the market, some designed to be added to a central heating system. This will allow you to use wood only when it is convenient. The central system fueled by gas or oil will take over automatically if temperatures in the wood furnace drop below a certain limit. However, many of these designs are new and may have problems yet to be overcome. The exhaust vent in your central system may not be adequate for a wood furnace which requires a class A chimney specified for appliances burning solid fuels. Also a wood furnace cannot be controlled as easily as a gas or oil furnace. Surges of heat can push temperatures past the safety point for your existing hot-air ducts. Contact a heating expert before investing in a system which might not be suitable.

If you are planning a new home or remodeling, consider a type of furnace which will burn either wood or conventional fuel. The furnace has its own blower, and the hot air system and pipes can be installed with proper safety clearances as required by local codes.

A furnace has some obvious advantages over a stove:

1. You can get even heat throughout the house from one unit.
2. You will get the same economic payoff from use of wood while having an automatic backup system.
3. If the furnace is located in the garage or some other unheated space, the combustion air will not he drawn from the heated area of the house.
4. The mess and bother of wood handling and ash disposal is removed from your living area.
5. The cost of such a system will probably not be too much more than a system of stoves required to give the same degree of heating comfort

Summary

Which system is best? This is a simple question for which there is no simple answer. Many factors have to be considered and many alternatives weighed, and each situation must be considered individually. Some suggestions are listed here to help you, with knowledge of your own situation, to make a more informed decision.

1. Keep safety foremost in your mind regardless of what you do.

2. Have an expert install your heating system. Most fires caused by wood burning equipment can be directly attributed to improper installation.

3. If possible, buy equipment which has been tested and listed by Underwriters Laboratories.

4. You must observe your local codes.

5. Inform your insurance company.

6. Contact your local stove or appliance dealer. You will be amazed at the amount of information available.

7. Additional written information is available from many sources - some are listed below. You may wish to read some of these books before you purchase or install any wood burning equipment.

Suggested Reading

Coleman, Peter. *Wood Stove Know-how* . Garden Way Publishing Co., Charlotte, VT 05445.

Gay, Larry. *The Complete Book of Heating with Wood* . Garden Way Publishing Co., Charlotte, VT 05445.

Gay, Larry. *Wood Furnaces and Boilers* (Bulletin A-25). Garden Way Publishing Co., Charlotte, VT 05445.

Shelton, Jay W. and Andrew Shapiro. *Wood burners' Encyclopedia.* Vermont Crossroads Press, Waitsfield, VT 05673.

Fireplaces and Chimneys (Farmers' Bulletin No.1889), U.S. Department of Agriculture. Government Printing Office, Washington, D.C. 20250.