Is Wood Heat the Answer?

By installing a modern wood-heat appliance, you can save money this winter and reduce your environmental impact

BY MATTHEW TEAGUE

Drawing facing page: Martin Gagnon, courtesy of Industrial Chimney Company

They say that where there's smoke, there's fire. What they fail to tell you is that smoke means the fire isn't burning as cleanly or as efficiently as it should. In the past, the trails of gray-blue smoke that rose from much of our landscape not only marked the onset of winter but were also indications of incomplete combustion and air pollution.

Fortunately, in this era of rising fuel prices, new wood-burning technologies can allow you to enjoy the warm hearth of home with something other than guilty pleasure. If the old fireplace is a gas-guzzling SUV, then many of the newer wood-burning appliances are superefficient hybrids.

Simply burning wood doesn't guarantee that you're saving money or the environment, however. To do those things, you have to start by choosing the right wood-burning appliance for your home. The rest depends on the wood you choose and the way you burn it.

An industry transformed

During the oil crisis of the 1970s, people turned desperately to burning wood. Not only did it fit the self-reliant urges of the era, but it also allowed homeowners to save money. Unfortunately, there was a price to be paid for the plumes of smoke floating across North America. The typical stove from the '70s would emit as much as 50 g of particulate into the air every hour, resulting in serious air-quality issues.

In 1988, the Environmental Protection Agency (EPA) began restricting the amount of particulates that wood-burning appliances could emit into the air. After a few years of increasingly stringent requirements, manufacturers could no longer sell stoves that released more than 7.5 g of particulate per hour (4.1 g per hour if the appliance was catalytic). By the mid-'90s, the number of manufacturers that were building wood-heat appliances plummeted, and individual states began introducing their own laws that were designed to cut down on the amount of air pollution from wood-burning stoves.

But even the manufacturers of wood-burning appliances admit that the EPA's restrictions proved to be a blessing. In the years between the first oil crisis

OPEN FIREPLACES ARE CHARMING BUT INEFFICIENT

There's little debate over the efficiency of a conventional fireplace; it's quite poor. The heat it produces can't compete with the massive amount of indoor air that escapes up the chimney.

This is equally true of many existing fireplaces and many of today's ready-to-install units. Zero-clearance, factory-built, and prefab fireplaces are all the same thing and are little more than a firebox encased in a steel cabinet. They provide ambience, not heat.

If you're considering a site-built open fireplace, consider a hand-built Rumford design. These fireplaces have a tall, shallow firebox intended to reflect heat into the room and a narrow throat that limits indoor-air and heat loss up the chimney. When combined with an outside air source to fuel the fire, these fireplaces are a lot more efficient than conventionally built open fireplaces.

Hybrid units are made by companies like Quadra-fire (www.quadrafire.com) and Fireplace Xrtraordinair (www.fireplacex.com). These units are marketed as fireplaces, but are more like woodstoves fitted with air-intake controls and blowers to increase their heating capacities.

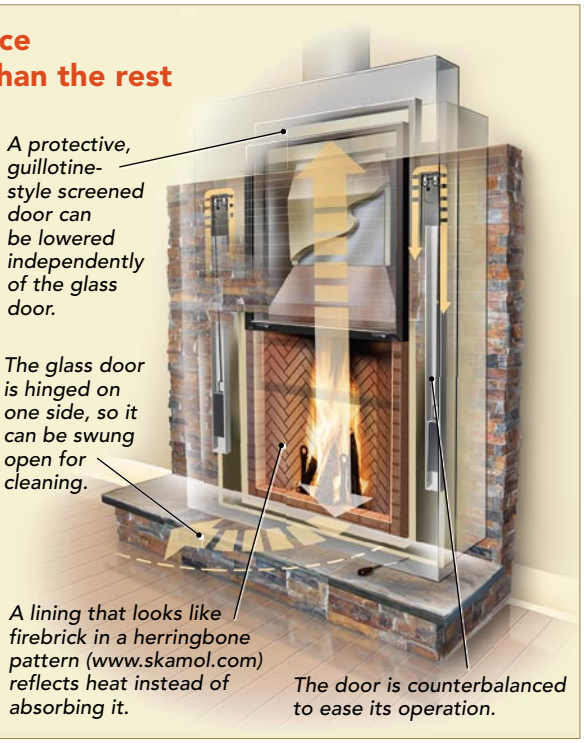
For more information

To find a certified fireplace installer in your area, visit the National Fireplace Institute at **www.nficertified.org**.

To provide your mason with plans to build a Rumford fireplace, visit the Resources section of The Brick Industry's Web site at **www.gobrick.com**, and click on Fireplaces and Chimneys.

A brand-new fireplace that burns cleaner than the rest

Industrial Chimney's new Renaissance Rumford **(www.renaissancefireplaces.com)** is characteristically tall and shallow (photo left). A high-end unit that sells for just less than $6000, this prefab fireplace has a large ceramic-glass guillotine-style door that can be left open or closed when the fireplace is being used. With the door open, the emissions are 25% that of a conventional open fireplace. Closing the door, though, puts them on par with EPA-certified woodstoves in terms of emission output.



WOODSTOVES AND INSERTS EXCEL AS SPACE HEATERS

Harman Stove Company

Morsø

Morsø

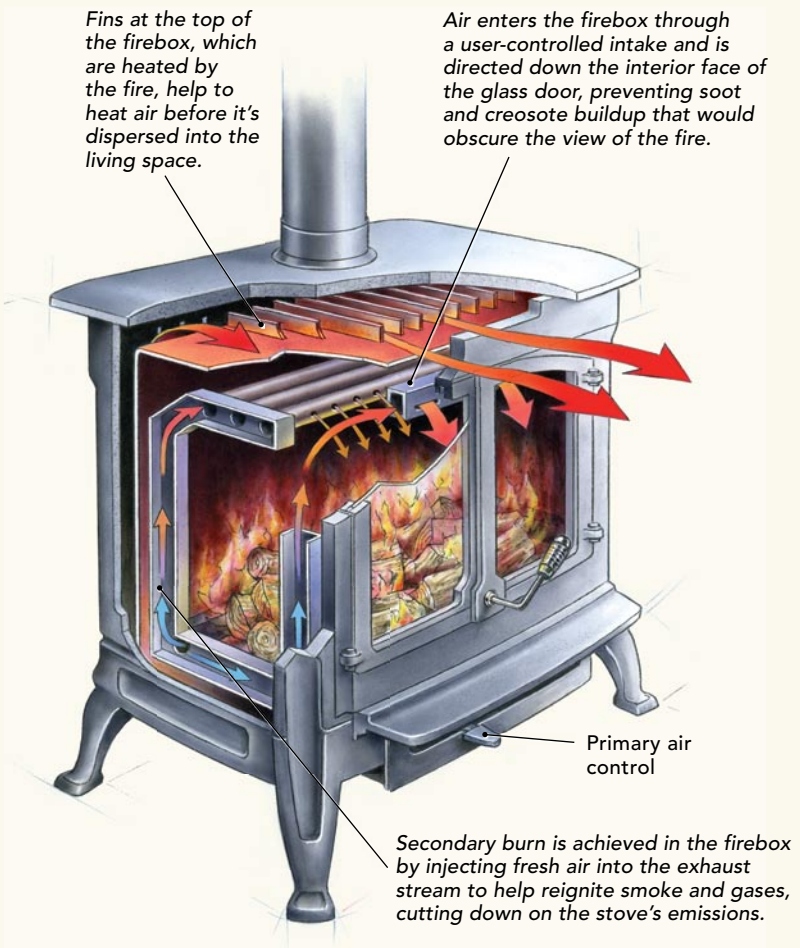
Woodstoves and inserts are two of the most popular ways to supplement a home's heating needs. Although woodstoves and inserts are technically different products, they are essentially the same type of appliance. Both rely on an enclosed firebox and an air intake that allows air to be fed to the fire in a controlled way. The ability to control air intake is integral to their efficiency, which for EPA-certified woodstoves falls between 60% and 80%, slightly less for the most advanced inserts. While woodstoves are usually more expensive, you can expect to pay between $2000 and $4500 for either appliance.

Woodstoves, which are stand-alone units, come in two basic types: catalytic and noncatalytic. Catalytic stoves draw flue gas through a honeycombed catalytic element in a secondary chamber where gases and smoke are burned off. Noncatalytic stoves achieve this same type of combustion right in the firebox.

While catalytic stoves were popular when they came on the market 15 years ago, the bulk of stoves sold today are noncatalytic due to their improved combustion, longevity, and lower cost. EPA-certified catalytic stoves are required to release less than 4.1 g of particulate per hour, while noncatalytic stoves must release less than 7.5 g per hour to achieve certification. Catalytic stoves have tighter restrictions because it's assumed that their emission rates increase as the catalytic element ages.

To clarify any confusion, a fireplace insert, in essence, is simply a woodstove that's retrofitted into an existing fireplace opening. Hearth-mount woodstoves sit in front of a fireplace opening and make use of an existing chimney.

For an extra $200 to $300, all three appliances can be outfitted with blowers designed to direct heat into the room. The effectiveness of blowers is a subject of great debate. Because hot air rises naturally, a blower should cause a bump in the natural upward plume of heat. Most manufacturers say that blowers are a great benefit, but there's little proof. At least one salesperson tells his clients, "I can take your $200 and give you a blower, or you can take your $200 and throw it in the stove. The difference in heat output will be about the same."



For more information

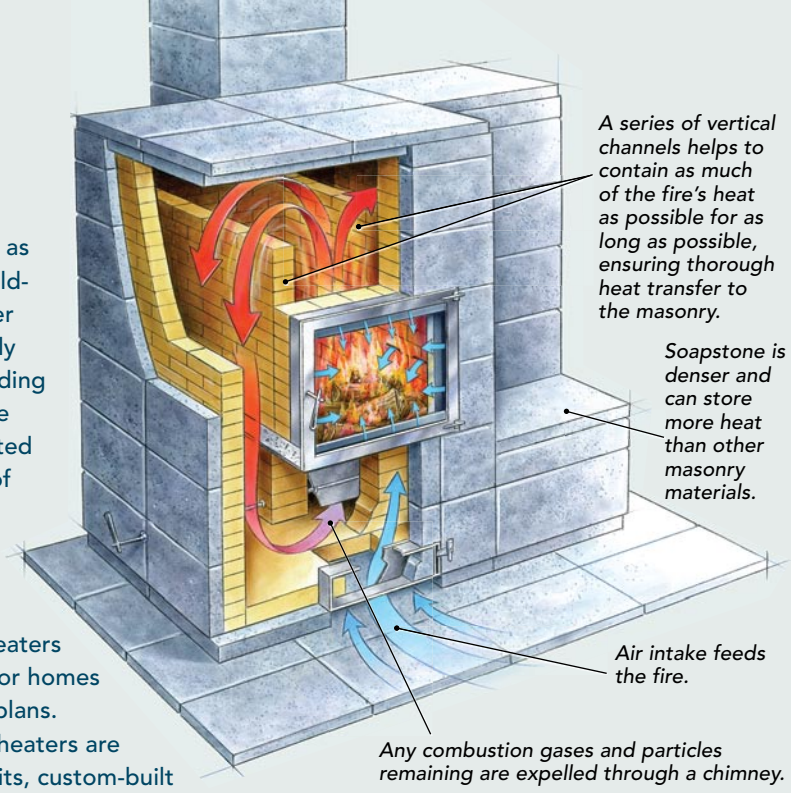
View a complete list of EPA-certified woodstoves, inserts, and pellet stoves by visiting the Basic Information section of **www.epa.gov/air/woodstoves**.

Drawings, except where noted: Don Mannes

MASONRY HEATERS ARE THE MOST EFFICIENT WOOD BURNERS

Also known as Russian stoves, Finnish stoves, or European masonry heaters, these stone, brick, stucco, or tile-clad units are designed to burn wood quickly and at temperatures up to 2000°F, which is much higher than the 1100°F temperatures produced in modern woodstoves. Masonry heaters can burn from 15 lb. to 90 lb. of wood in an hour and a half, which could be all that's needed for a day's worth of heat.

The heat from the fire works its way through a series of internal channels that help to transfer the heat to the masonry. The entire stove then slowly radiates heat into the living space over a long period of time—as long as 24 hours. The coldest days of winter could require only two fires, depending on the size of the home being heated and the design of the heater. Like other heating appliances that rely on radiant heat, masonry heaters are best suited for homes with open floor plans.




Tulikivi

Most masonry heaters are one-of-a-kind units, custom-built on site, but manufacturers like Tulikivi (www.tulikivi.com), Temp-Cast (www.tempcast.com), and Gabriel Keramik (www.gabriel-keramik.se) offer prefab units. Check to see how much installation of these prefab heaters costs, though. It's often less expensive to hire a qualified builder to assemble one from scratch.

You'll likely pay a premium for a masonry heater, which usually costs more than $10,000, but in terms of efficiency and emissions, you'll be hard-pressed to find a better wood-heat source. With a masonry heater, you can expect to heat a well-designed 3000-sq.-ft. home with as little as five cords of wood for an entire heating season. They typically burn at around 95% efficiency and have low emissions—around 1 g to 2 g of particulate per hour when burned properly.

Masonry heaters are often the focal point of a room and emit a sense of artistry along with warmth.

For more information

To locate a custom masonry-heater fabricator, visit the Masonry Heater Association's Web site at **www.mha-net.org** or the Alliance for Masonry Heater and Oven Professionals at **www.masonryheaters.org**.

and our present one, wood-burning technology made a number of great advances.

Modern stoves burn better

Improved technology combined with a spike in environmental interest has resulted in wood-heat appliances that burn at higher temperatures than they did 30 years ago. When wood reaches temperatures above the boiling point of water, it creates smoke—due to moisture in the wood—that traditionally makes its way into the chimney, leaving creosote deposits and polluting the air. But if the temperature in the appliance reaches roughly 1000°F and the air in the firebox is oxygenated, the smoke itself burns, removing a lot of the gases before they escape into the atmosphere. Complete combustion (100%) is still not possible with wood heat, but manufacturers have never been closer to producing an ideal system.

Most modern appliances now come with emission ratings printed on an EPA-certification label. But simply buying an EPA-certified appliance doesn't guarantee an efficient or clean burn. "Don't get too caught up with the exact rating on the sticker, 3.5 versus 4.2, for example," says John Crouch, director of public affairs for the Hearth, Patio & Barbecue Association (HPBA). He says that the way the fire burns is a much more important consideration.

John Gulland, a wood-heat consultant who has worked in the industry for years, agrees. "There's no way to reduce wood-burning to simple numbers. There are just too many variables: the loading process, the moisture content of the wood. Wood combustion is random anyway." But, he adds, "Don't buy anything that is not EPA-certified, because you'll always get higher efficiency and lower emissions than with conventional equipment."

Emission ratings should not be confused with efficiency. Emission standards tell you how much air pollution the appliance creates. A unit's efficiency refers to how well the appliance burns, retains, and distributes heat to a living space. Efficiency depends on the size of the appliance, the materials used to construct it, and its design. EPA-

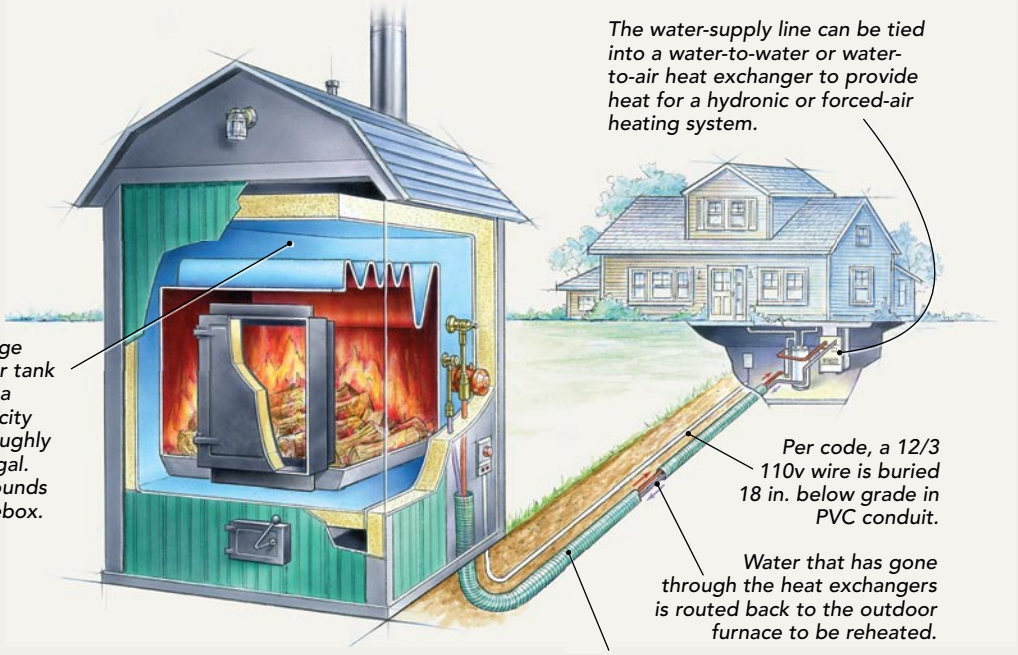
WOOD FURNACES AND BOILERS ARE NOT DESIGNED FOR LOOKS

Outdoor boilers—also called outdoor hydronic wood furnaces—didn't make a real dent in the wood-heat market until the mid-'90s. When they did, complaints ensued. Once the water in the boiler of older models reached roughly 165°F to 180°F, air pumped into the furnace to keep the fire burning shut down, and the fire was reduced to a low, inefficient burn. As the fire smoldered, smoke condensed, creosote became a problem, and emissions were released into the atmosphere.

Greenwood Technologies

Short smokestacks also meant that emissions were released close to ground level, where they easily affected people. Manufacturers now stipulate that their smoke stacks be positioned above the peak of the nearest roof, and improved boilers with redesigned fireboxes now burn at much-higher temperatures, much the same way that noncatalytic woodstoves do.

Some manufacturers have even partnered with the EPA to create boilers that meet particular program test methods.



Insulated tubing carries heated water to the house via an electric pump.

These boilers, which have an orange EPA label on them, have efficiencies ranging from 28% to 65% and an annual emissions output roughly 70% cleaner than the original models.

Indoor boilers work in very much the same way as outdoor boilers. The boilers made by Tarm USA (www.woodboilers.com), which are the industry benchmark, claim to release less than 1 g of particulate per hour.

Although experts agree that these boilers are very clean-burning, they are wary of such a number because lab tests haven't been verified. Expect to pay between $4500 and $12,000 for an indoor or outdoor wood-fired boiler.

For more information

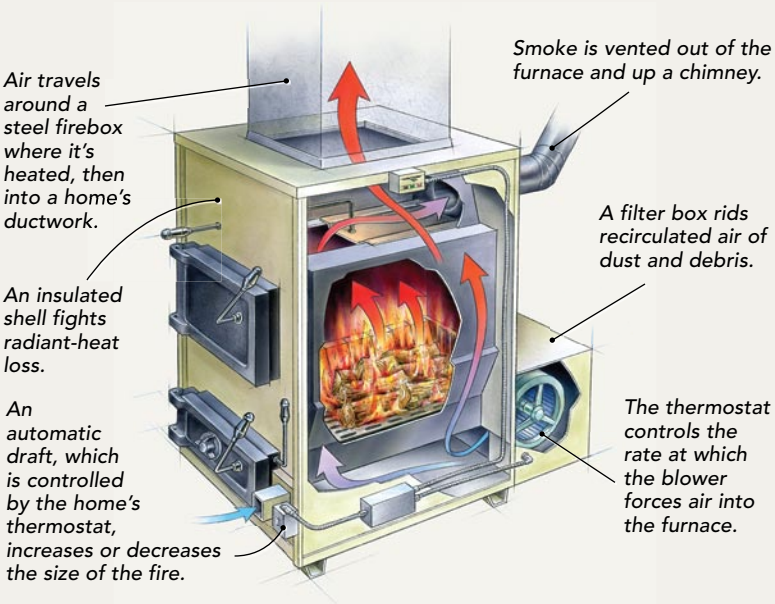
View a list of cleaner outdoor wood boilers by visiting **www.epa.gov/owhh.**

Few forced-air indoor furnaces are EPA-certified

The size of the fireboxes on many forced-air indoor furnaces makes them exempt from EPA-testing. Only a couple of forced-air units, which are made by PSG Distribution, are EPA-certified.

Forced-air wood furnaces are loaded and fired like woodstoves, usually twice a day in most climates. A home's thermostat controls the heat output of the furnace by controlling the amount of air that is fed to the appliance through an air intake and a blower. More oxygen being fed in and around the fire chamber means a larger, hotter fire that heats a greater volume of air. The efficiency of these units can vary greatly, but typically falls between 65% and 72%. Wood-fired furnaces cost between $2500 and $5000.

Energy King



For more information

The only EPA-certified indoor wood furnaces on the market are the PSG Caddy and Mini Caddy, which can be seen at **www.psg-distribution.com.**

certified appliances typically have efficiencies between 60% and 80%, roughly 30% higher than uncertified units.

Although each classification is important, trying to choose an EPA-certified appliance that is the most efficient is a waste of time, according to Gulland. "To achieve maximum efficiency and effectiveness, burn good-quality seasoned fuel. Trying to pick the most-efficient EPA-certified stove is futile since the type of wood you burn has such a large bearing on overall efficiency and emissions."

Choose the right wood for the best burn

Hardwoods like oak, hickory, and ash are much denser than softwoods, which allows them to burn hotter and last longer. But the species of wood you burn is not nearly as important as its moisture content. For optimal burning, cordwood should have less than 20% moisture content. If you try to burn wet wood, much of the fire's energy is consumed boiling off the water, which results in a fire that creates lots of smoke and pollution, but little heat. Dry wood, which is typically covered and seasoned for six months to a year, is easy to split, burns hot, and gives off very little smoke when burned in an EPA-certified appliance.

Heat your home for less

With the price of heating oil and all fossil fuels on a steep incline, wood heat is once again seen as an economically wise alternative. However, wood combustion is not definitive; neither are the costs associated with it. The HPBA has generalized the cost of certain fuels for comparative purposes. According to the HPBA, the average home uses 100 million Btus annually. To generate that much energy, they say you'd need to burn roughly 721 gal. of fuel oil. At a cost of $4.50 a gallon, you're looking at $3245 a year in heating bills. Using natural gas to heat your home, at $1.55 per therm, would cost about $1550 a year, slightly more than the cost of 6 tons of wood pellets, which is the average amount needed to generate 100 million Btus.

To achieve the average annual heat output with wood, you'd need to burn five cords in a high-efficiency appliance. If you're buying wood instead of harvesting it yourself or acquiring it through other means, you'd pay approximately $190 per cord. For an entire year's heating needs, you'd have to spend only about $950.

Find fuel the ecofriendly way

Burning wood can save money, but indiscriminately cutting down large swaths of trees or buying bundles of wood shipped on trucks from distant places can do serious damage to the environment and local ecosystems.

If you don't have a large stand of trees that you can manage and selectively cut yourself, then look for alternative sources. Buying locally grown cordwood from firewood services that responsibly harvest forests is one option. But savvy homeowners can find even cheaper and greener options. Check with local sawmills, and ask for slab wood, the bark-covered boards left over from the milling process. For a small fee, many will even deliver a load. Getting in touch with local tree services and landscapers also can prove worthwhile. Having felled trees dropped off at your house can supply you with wood for a winter and often saves the landscapers a pricey dumping fee. □

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Harman Stove Company

PELLET STOVES
HAVE LOW EMISSIONS

Wood pellets were first developed in America 30 years ago. Although they were created here, Europe has embraced the fuel technology more than the United States and Canada. Manufacturers, however, report recent growth in domestic sales of pellet stoves and pelletized fuels.

Although a wide variety of pelletized fuels are available, including cherry pits, corn kernels, soybeans, and other agrifuels, experts say that at least 80% of pellet stoves in North America are burning wood pellets, which are compressed sawdust. Wood pellets have a moisture content between 3% and 8%, which is much lower than cordwood, resulting in a cleaner-burning fire.

Pellets also burn cleaner because the fire is fed oxygen at a continuous rate, much the same way a carburetor on a car regulates air intake. The quality of the fire is controlled by the unit, so whatever emission rating the stove has is guaranteed.

The downside to these stoves, however, is that the fire burns like a blowtorch. It's clean, but might not be as efficient as other appliances because heat passes out of the firebox quickly. Some pellet stoves are not EPA-certified because manufacturers take advantage of the fuel-to-air ratio exemption offered for decorative fireplaces. An EPA-certified pellet stove, however, costs between $2000 and $4000 and should be as efficient as an EPA-certified woodstove.