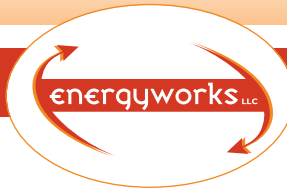


WOOD BOILER NEWS

A publication of Energyworks, LLC



Fall 2007



OUTDOOR WOOD BOILERS RESTRICTED BY STATE LEGISLATURE

Outdoor wood boilers recently had restrictions placed on their sale and operation by the Maine State Legislature. These boilers, which are currently unregulated by state or federal agencies, have been negatively impacting neighbors by emitting large quantities of thick smoke. In emotional testimony, one Mainer complained that her son had to be rushed to the emergency room because an outdoor wood boiler had been installed near his school, triggering repeated asthma attacks. The legislation, recently enacted by the state legislature, will establish regulations on future emission levels, site requirements and provide for a mechanism for the forced removal of nuisance boilers. Under the new legislation, outdoor wood boilers cannot be installed within 200 feet of the nearest property line and will need to have a minimum 10-foot chimney. Starting in April of 2008, all outdoor wood boilers installed in the state will have to meet minimum emission standards of .6 pounds per Million Btu of heat input. Starting in April of 2010, all outdoor wood boilers installed in the state will have to meet an emission standard of .32 pounds per Million Btu of heat input.

While boilers like the H.S. Tarm have emissions of less than .03 pounds per Million Btu, many outdoor wood boilers will not be able to compete with the new standard. Industry watchers predict that many outdoor wood boiler companies will go out of business rather than invest the research and development money required to produce cleaner, more efficient boilers.

The problem with outdoor wood boilers lies in their design. In order to burn wood efficiently, the temperature of the firebox must achieve temperatures in excess of 1000 degrees. Many of the constituent parts of wood smoke do not combust below 1000 degrees. Outdoor wood boilers are simply a drum inside a drum, where the inner drum of the fire box is surrounded by the relatively cool drum of water. The water is constantly cooling the drum, keeping temperatures, and combustion efficiency low.

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THE LOGIC OF BURNING WOOD

There are lots of good reasons to burn wood, from personal reasons to political, environmental and economic. For most people it's more than just trying to save a buck, but that helps too.

ENVIRONMENTAL

Heating Maine homes with oil boilers is one of the largest contributors of greenhouse gas emissions in the state. Nationwide, Maine ranks highest in per capita greenhouse gas production, largely due to our cold winters, older housing stock and the aging oil boilers that heat them. Global warming is caused by burning fossil fuels, which emits CO₂ into the atmosphere. While it is true that burning firewood emits CO₂ into the atmosphere, it is also true that the remaining trees in a woodlot absorb CO₂ from the atmosphere.

An acre of woodlands in Maine produces between 1/2 to 1 cord of new wood annually, depending mostly on the soil type of the forest. Trees in the forest absorb carbon from the atmosphere through photosynthesis and there-



fore each tree contains a given amount of Carbon. If we cut more trees than grow in any year, then we've contributed to global warming because there are not enough remaining trees to offset the CO₂ that will be emitted by burning what is harvested. If we only harvest the same amount of wood that grows annually in a woodlot, then selectively cutting wood does not contribute to greenhouse gas production. Burning trees (at greater than 1000 degrees F) that need thinning in a sustainably managed forest contributes nothing to global warming, and adds value to our forests. If you have a well insulated house, it can heat itself forever with as little as 3 acres of wood lot—with a net zero carbon impact on the environment.

A well managed wood lot shows that there is no conflict between the environment and wood heat.

For more information, contact Energyworks at (207) 589-4171 or e-mail Pat Coon at pat@energyworkslc.com

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ECONOMIC

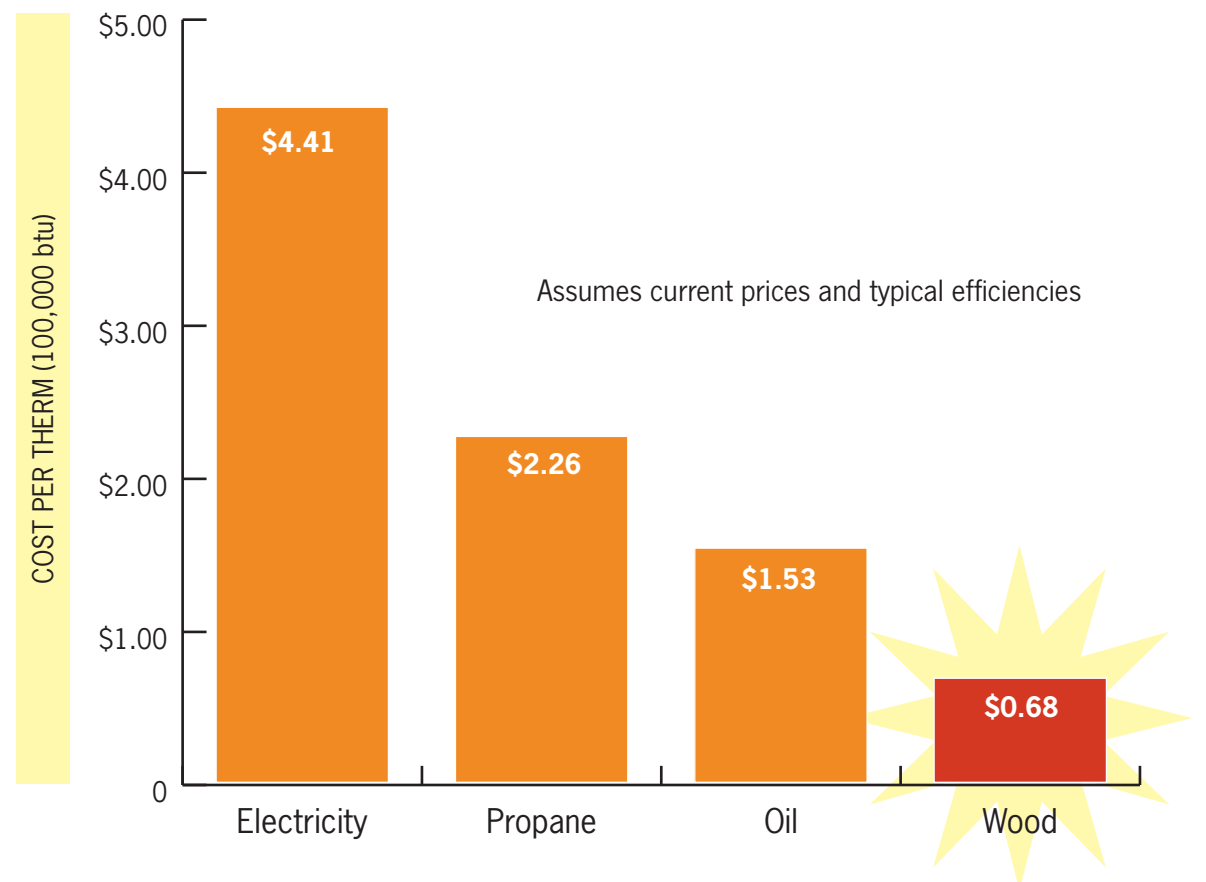
If you burn wood efficiently, each cord of wood produces the heat equivalent of about \$427 of oil (at today's price of \$2.85 per gallon). If you harvest your own firewood from your own land, then each cord that you burn is putting \$427 in your pocket. If you pay someone to provide you with firewood at the average price of \$200 per cord, then each cord of wood you burn puts \$227 into your pocket and \$200 into the local economy. Economists measure the multiplier effect of money spent locally. For each dollar spent locally, \$6 gets spent eventually as the wood harvester buys all of the things that he or she needs to live. You won't get rich burning wood, but it definitely helps you personally and it benefits the community you live in.

POLITICAL

The vast majority of our Oil comes from overseas. Too much of it comes from the Middle East, where geopolitical conflict over this diminishing resource seems to be a permanent fixture. Most of the countries that are rich in oil are not rich in Democratic Institutions, call it the curse of oil. Where there is oil money there is often corruption and greed. Heating with wood cuts the cord to the Middle East and connects your house to the woodlot.

PERSONAL

Most people who heat with wood like heating with wood. They see the ritual of moving firewood not as a chore that needs to get done any more than they see the ritual



of preparing the evening meal a chore. Cutting, stacking and hauling firewood can be a wholesome and rewarding part of living in a cold climate. People who handle wood tend to like the smell and the feel. They get a good feeling looking at their wood pile, and a good feeling looking at their clean chimney, as long as the wood is burned at high enough temperatures.

HOW TO BURN WOOD EFFICIENTLY

There are two rules for how to burn wood efficiently; burn it hot and burn it dry. Burning hot is a function of the wood burning equipment. Burning dry is a function of how the wood was seasoned. A cord of wood that is burned hot and dry has the same fuel content as 150 gallons of oil. Wet wood, burned in a smoldering wood burning appliance, may only have the fuel content of 60 gallons of oil. The economics of wood only work well when wood is burned hot and dry. If you're buying wood for \$200 a cord, and oil costs \$2.85 a gallon, then that cord of wood has the same heating content as \$427 dollars worth of oil. If you cut the wood yourself, every cord you burn hot and dry saves you \$427 at today's prices.

The key to dry wood is to cut, split and stack your firewood by June of the year you're going to burn it. It should be stacked in a place where it can receive the drying effects of both the sun and the wind. It should also be covered on the top. Wood prepared this way will be sufficiently cured come fall. Leaving it out longer, if it is not covered, does nothing to properly cure the wood and can actually lower its heat energy content.

WOOD CURING

The key to burning wood hot is through wise selection of a wood burning appliance. Most wood burning appliances supply combustion efficiencies at something that is called "steady state efficiency". Steady State Efficiency is the efficiency of the appliance in converting the energy in the wood into heat running full on, not damped down. Old, pre-EPA wood stoves attained steady state combustion efficiencies of less than 50%. Newer, EPA wood stoves, have steady state efficiencies of roughly 65%. Catalytic wood stoves have efficiencies of roughly 75%. High Efficiency wood boilers like the



Tarm and the Greenwood have steady state efficiencies of 85%. Outdoor wood boilers vary between 40-50%. A well designed wood heating appliance is designed to run at its' full output on only the coldest days of the year. The rest of the time it is depending on some sort of damper to limit air flow when it doesn't need to run. The colder it is outside, the more efficiently a wood appliance burns. Similarly, the smaller a wood appliance is, the more efficiently it will burn in a given space. An oversized wood appliance will never or rarely get up to steady state efficiency and will run cold and inefficiently and will produce a lot of creosote in the process.

To burn efficiently, make sure your wood is well cured, and make sure you've got a wood burning appliance that is properly sized for your house. When it comes to wood appliances, bigger is not necessarily not better. Wood boilers without large thermal storage systems (650 to 1000 gallons) should not be run except for the months of November, December, January and February. These four months, however, account for more than 75% of the heating season

Wood gasification, burning at 1500 degrees.

HOW TO SITE A WOOD BOILER

Once you've decided you want to heat with wood, the next questions are where and how. Smaller and better insulated houses, those that are 1500-2000 square feet, are often better served with a wood stove.

Wood Stoves are much less expensive than wood boilers to install and have the benefit and potential drawback of being in the living space.

While they produce ambience that is pleasant to many, they also dry the air and add moderate indoor air pollutants. Wood boilers, by comparison, are not in the living space, so no one snuggles up around the wood boiler, but they heat the whole house, and the hot water too without drying the air.

Wood boilers require a dedicated chimney not shared by an oil burner, or even a wood stove. Wood boilers need to have convenient access to wood; either from a bulkhead in a basement, or a shed or a garage on ground level. Wood boilers can also be placed outside if provisions are made to keep them from freezing. Tubing can be run underground. Which solution works best for you depends on the costs associated with each option for your particular application and how you like to use your space.

INSTALL A WOOD ADD-ON BOILER TO THE EXISTING OIL BOILER IN THE BASEMENT OR GARAGE

These are, by far, the simplest systems to install and require a spare flue in the basement. They require the wood boiler to be plumbed directly to the existing oil boiler. As long as the wood boiler is kept hot, the oil will never come on, as soon as the wood goes out, the oil comes on. These typically start around \$10,000 installed for a high quality, super efficient Tarm.

If you don't have a spare flue in the basement, but you have a garage, you can use that too. The Maine Oil and Solid Fuels board wants to see a space that can not directly access the parking area of the garage from the wood boiler. You can access the wood boiler from the house directly. You can also lose one of the bays of the garage and dedicate it to the wood boiler as long as you can no longer walk directly from the one to the other. Garage installations make wood delivery and storage

easier, and it is usually easy to add a chimney through a single story garage. The piping run becomes a little more complicated, as you have to get from the wood boiler to the oil boiler. You also lose some of the space in the garage.

WOOD BOILER AND GAS BOILER COMBO

If you've only got one flue in the basement, you can install a wood boiler in the basement into the existing chimney, then provide backup with a direct vent gas boiler such as the Baxi Luna. Here you are buying two boilers, which gets expensive unless the existing oil boiler was on it's way out anyway, necessitating a heating appliance investment. The good news for this approach is that it makes the most out of each boiler. The big problem with oil boilers is that they are high mass boilers and, thus, are very inefficient when running at the low end of their duty cycle, such as in the summer months and in the spring and fall. Propane boilers, while burning a more expensive fuel, burn it much more efficiently at low outputs. The gas boiler vents out the side wall and provides heat in the spring and fall and when you go away on vacation in the winter. These systems install for roughly \$15-18,000.

INSTALL A WOOD-OIL COMBI BOILER IN THE BASEMENT

Tarm is one of the few brands that offers a wood oil boiler that is UL listed and approved for one flue. These boilers are relatively easy to install, but not inexpensive, with installations running around \$18,000.

RUN A METAL BESTOS CHIMNEY FROM THE BASEMENT

Depending on the layout of the house, this can be a great option. Metal chimneys are not inexpensive, but if you want the boiler in the basement and you have only one flue, it can work. These chimneys can be on the outside of the building or they can run through the building. They need to terminate so that they are above any roof within 10 feet of the chimney.

THERMAL STORAGE SYSTEMS

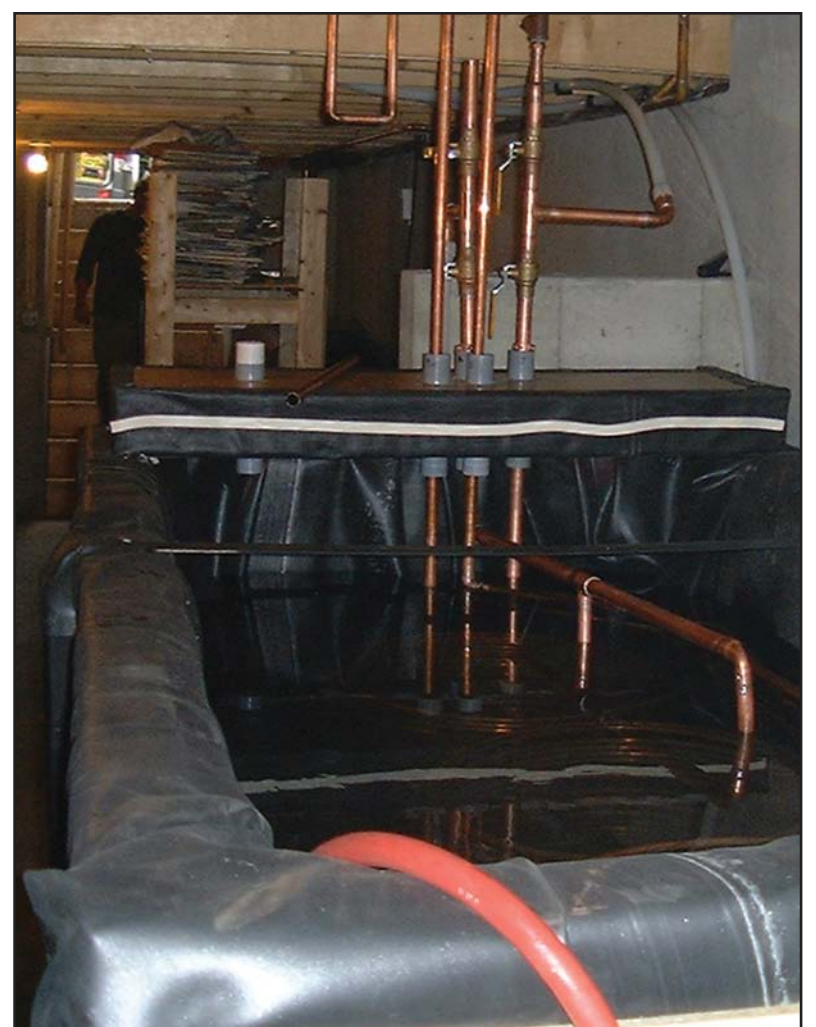
Many of Energyworks' wood boiler clients choose to install thermal storage systems with their wood boilers. A thermal storage system is a custom manufactured 650 to 1100 gallon tank, made with 4" of foam, that is designed to take the heat from one firing of the wood boiler, then release that heat over time.

The benefits of a thermal storage system are many. It allows people to fire their boiler when it meets their schedule, not the house's schedule. It also allows the boiler to run clean and hot, getting the highest efficiency possible from wood; 85%. With a Thermal Storage Tank, you are able to burn wood whenever space heating is necessary, completely eliminating your dependence on fossil fuels.

Wood boilers of any brand should only be run from November to March in Maine. Any more and you reduce your efficiency and create creosote, which is bad for the boiler and creates the risk of chimney fires. Roughly 75% of the heating season occurs in these 5 months, so you can easily offset 60% of your home's fossil fuel needs with a wood boiler without thermal storage, leaving heat in the shoulder seasons and hot water in the summer and the shoulder seasons. Some people switch to a small wood stove in the spring and fall.

The only disadvantage to a thermal storage tank is cost. They add roughly \$8,000 to the price of installation. Not only because of the cost of the copper coils to transfer heat, but also because of the cost of the required boiler control upgrades. Energyworks has perfected the art of thermal storage systems, which is no small feat, as these systems are unlike any other hydronic heating system.

Many of our clients have to choose between upgrading their oil boiler, adding solar hot water, upgrading their insulation, and the thermal storage tank. Deciding where to put your energy efficiency upgrade dollars is a difficult question. We can provide experienced guidance on these sometimes difficult decisions, including whether thermal storage is right for you.



An Energyworks 650 gallon thermal storage tank.

WHY CHOOSE ENERGYWORKS

Once you've decided that you want to install a wood boiler, why should you consider Energyworks? Based on total number of systems installed annually in Maine, Energyworks is, by far, the state's leading renewable energy contractor.



From branches in Portland and Liberty, Energyworks installs wood boilers, solar hot water systems, solar electric systems and wind energy systems. Our leadership team includes an engineer from MIT, another from Brown University and a master electrician with more than 10 years' experience in the designing, installation and service of renewable energy

systems. We don't hire subs because we are specialists, doing dozens of wood boilers every year, where local contractors might do one or two a year.

We have all the equipment in-house that is required for a code-compliant renewable energy installation. Also, we are happy to provide any level of service for you. You can buy the boiler from us, and use us to make sure you get the right boiler for your application, we can get it in the basement and then have a local contractor install it, or we'll install a turn key system for you, or anything between.

If you'd like to learn more about the benefits of a wood boiler, or any other renewable energy technology, please contact Energyworks co-founder Pat Coon at 1-877-ENWORKS or pat@energyworkslc.com.



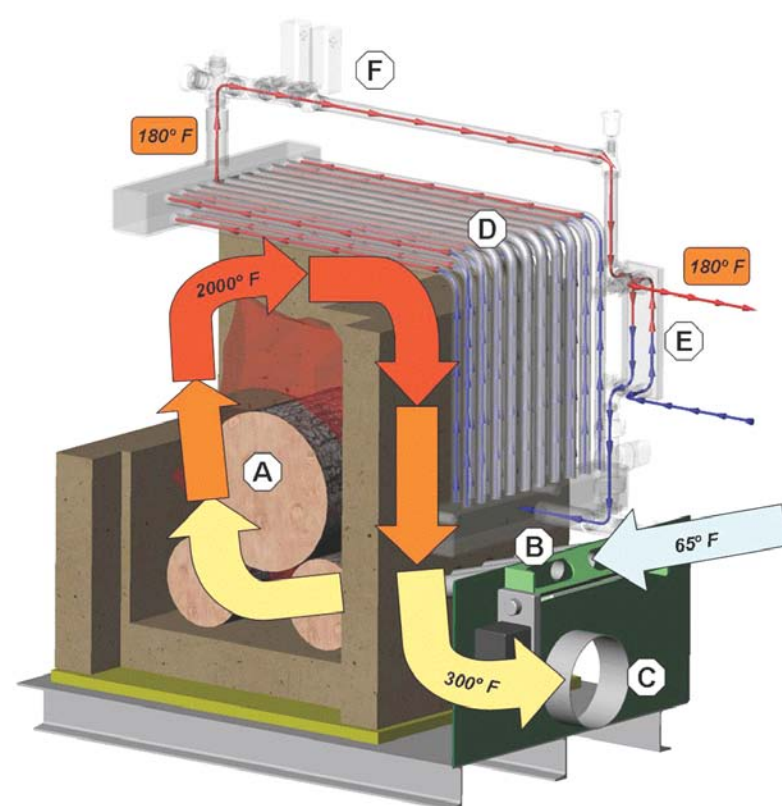
GREENWOOD FURNACE ENTERS THE MARKET

Greenwood, a business in Oregon has entered the wood boiler business with an exciting new product to add to the mix; the greenwood furnace. The greenwood is one of several designs based on the same principal; surround the firebox with a high temperature refractory to allow very high temperature combustion. The greenwood firebox is surrounded with 4" and several thousand pounds of high temperature refractor. Once that mass is brought up to temperature in the fall, it can maintain high temperatures and high efficiencies for long periods. Other high efficiency boilers, such as the Tarm and the New Horizons boiler have relied on three separate combustion chambers to separate gasification from combustion and heat extraction.

The potential benefits of this design are numerous. The cavernous chamber allows for long burn times by allowing large amounts of wood in the firebox. Also, because the design prefers to have less surface area,

unsplit wood is preferred. This will make it harder to cure firewood, but easier by far. The high mass of the refractory allows some amount of storage available without the expense of a full sized storage tank. These will not be as easy, as efficient or as full season as a wood boiler with a full size storage system, but they are moving in the right direction with far less complexity and cost.

One downside to the Greenwood Furnace is the fact that it weighs almost 2400 pounds for the smaller unit, making installation with conventional equipment a challenge. Energyworks recently purchased a boom truck to allow easy delivery into basements. Boilers should install for around \$13,000 for add on boilers.



For more information, contact Energyworks at (207) 589-4171 or e-mail Pat Coon at pat@energyworkslc.com

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