

Water Doesn't Burn, Does It?

Keeping wood dry will make your fires much more efficient

BY BEN
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NOT UNLESS YOU BREAK H_2O down into H and O, both of which are highly flammable, and that doesn't happen in your stove or furnace. Most folks agree that water doesn't burn, but I know a lot of wood burners who try their best to burn it anyway. Sixty percent of the weight of green wood may be water, and unless you dry it for a year or two, you end up making steam. The more steam, the less heat because so much of the fire energy is needed to drive out the water (steam). And steam cools your fire.

Wood structure resembles a bundle of soda straws surrounded by a rather impermeable sheath (bark). Most drying takes place through the ends as moisture moves from center to end, and very little escapes through the bark. The shorter the piece, the faster it dries, so the secret to drying wood is to cut it into stove/furnace lengths as soon as possible after falling the tree. If you buy tree-length wood, it does not

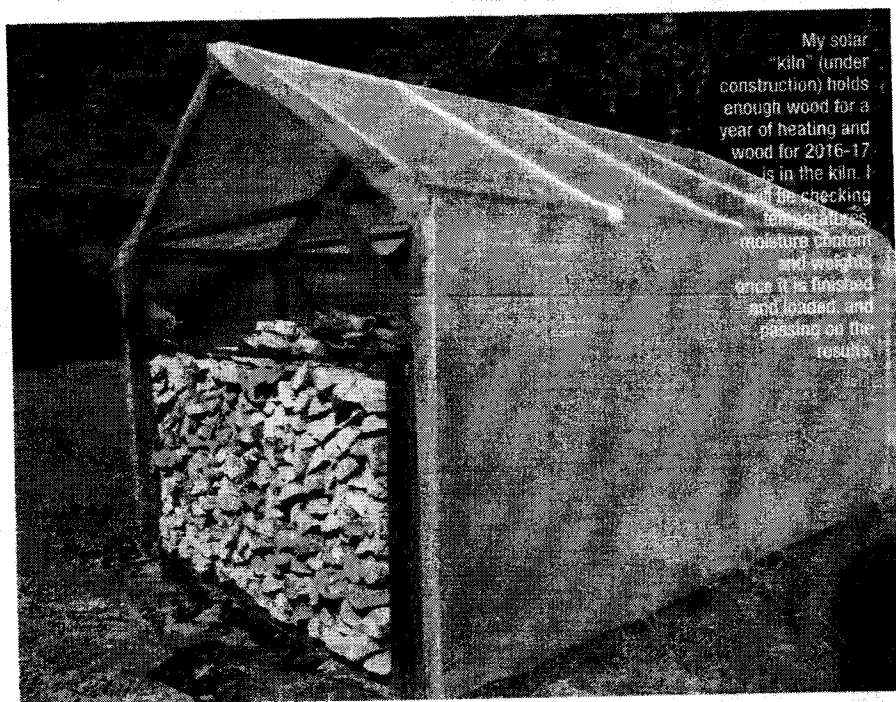
begin drying until you buck it and in fact will begin to deteriorate and lose some of its BTU value. So buck it as soon as possible.

The more water in the wood, the more wood must be burned to evaporate the water. Ten cords of green wood may produce four cords worth of steam and creosote up the chimney and six cords of heat. The drier the wood, the more efficient the burn.

With free solar energy available, it is worthwhile to dry wood for a year or two. If you cut your own wood, think how much cutting, splitting, hauling and stoking you can eliminate.

Air-dried wood will likely reach equilibrium moisture content with the atmosphere at around 15 percent, unless you live in the desert. So if you reach 15 percent, that's about as good as it's going to get. Kiln-dried firewood might be lower than 15 percent but will gradually add atmospheric moisture until it reaches the equilibrium point. So stop making steam and cut your wood consumption nearly in half.

My wood gasification furnace is very sensitive to wood moisture content and 15 to 25 percent is optimum—no smoke from the chimney! To some extent I can compensate for excess moisture by adjusting airflow to the firebox and gasification chamber and burn wood up to 30 percent moisture. But at 30 percent, efficiency goes down and steam exits the



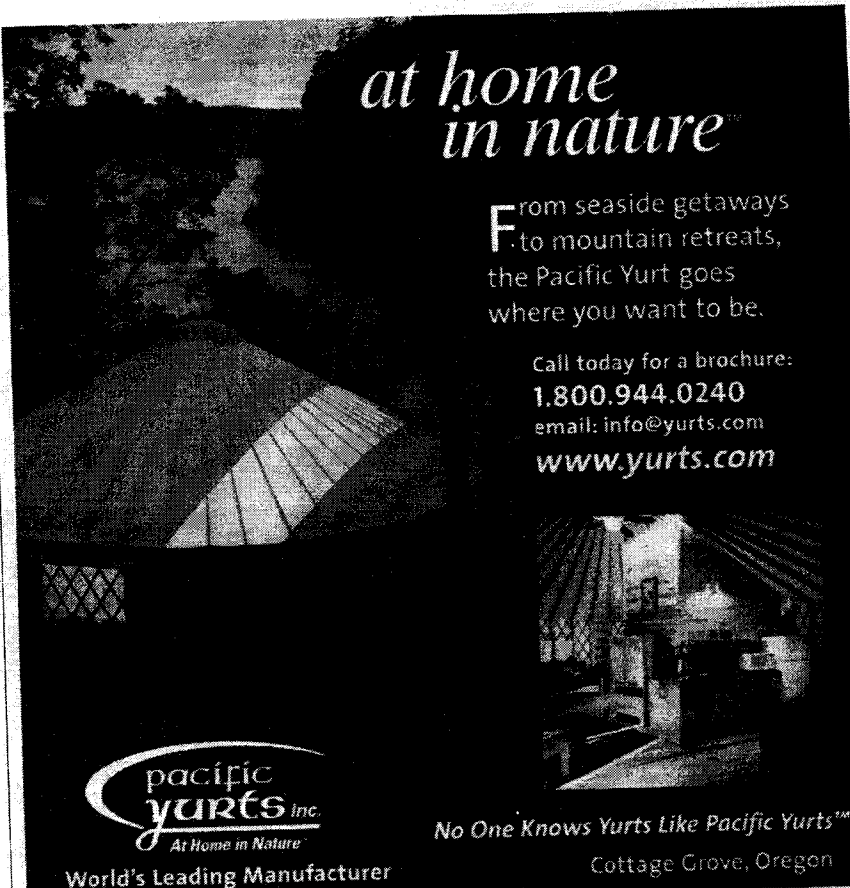
My solar "kiln" (under construction) holds enough wood for a year of heating and wood for 2016-17. It is in the kiln. I will be checking temperatures, moisture content and weight once it is finished and loaded, and posting on the results.

chimney. So I check moisture with a moisture meter used for lumber, but it only measures the outer 1/4-inch. And firewood may be four or more inches thick.

For kicks, I measured moisture in some dry, split wood. A four-inch piece measured 15 percent on the outer surface, but when split again, moisture in the middle was 27 percent. So I bought some 1-1/2 inch pins for my meter to get moisture readings inside the wood. You can't drive pins that deep into hardwood, so I drilled a one-inch diameter hole, and checked moisture content about 1-1/2 inches deep. Surprise! The outside moisture reading was 15 percent; the inside was more than 30 percent.

Wood can be used in stoves, furnaces, outdoor wood boilers and biomass boilers. Of the four, biomass boilers are the most efficient, ranging from 70 to 90 percent, depending on dryness of the fuel. They burn wood in a firebox, then burn the smoke and gasses in a ceramic combustion chamber at 1,800°F to 2,000°F. If wood is properly dried, there is no smoke from the chimney; if not, steam exhausts from the chimney. Some very efficient wood stoves and furnaces on the market will give 60 percent or more efficiency if fueling is done properly.

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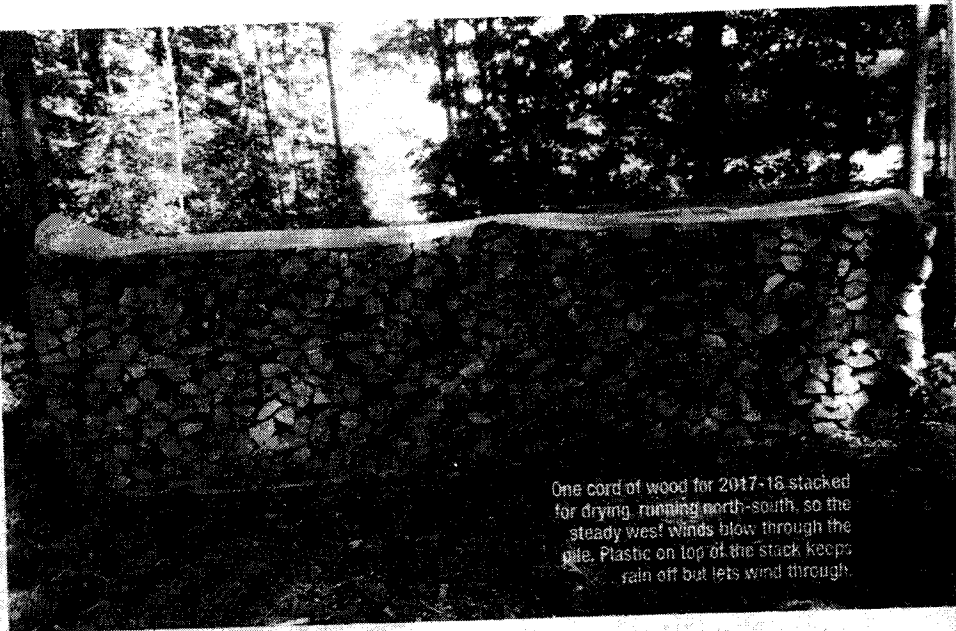
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Wood is the green fuel for rural heating

BUT DON'T BURN IT GREEN!
Considering all of the factors involved in heating, especially in rural areas, wood can be the perfect solution.

- Firewood harvests are a chance to improve forest stands by removing dead, dying, diseased and malformed trees.
- Improved forest health means faster tree growth that produces oxygen and consumes CO₂ greenhouse gasses.
- Processing firewood takes less energy/fossil fuel consumption and transport than pelletizing or torrefying, and far less than coal, propane or fuel oil.
- Buying from local loggers minimizes consumption of motor fuels.
- Buying local wood boosts rural employment and keeps money in the local economy.
- Wood ash adds calcium, potassium, carbon and other nutrients to garden and ag soils.

— Ben Hoffman



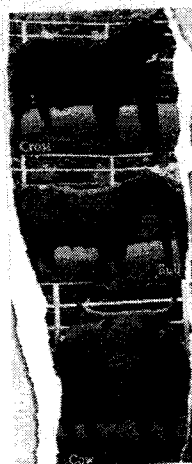
One cord of wood for 2017-18 stacked for drying, running north-south, so the steady west winds blow through the pile. Plastic on top of the stack keeps rain off but lets wind through.

A hot fire is the key to efficiency, and filling the firebox full for a long burn cools the fire and reduces efficiency. Filling the firebox about 1/3 full and maintaining a hot fire cuts wood consumption. This is especially important with outdoor wood boilers because their fireboxes are surrounded by water that cools the fire. Most outdoor wood boilers run 30 to 50 percent efficiency, largely because of poor fuel and firing practices.

To improve performance of any wood boiler, add a 500 to 1,000 gallon water storage tank to the system and maintain a hot fire to heat the water. Circulate the stored hot water, as needed, to heat living spaces and domestic hot water. Just adding a tank to may improve efficiency as much as 40 percent. If you have access to the internet, go to

caleffi.com and read their edition of IDRONICS dealing with wood heat.

For woodlot owners, cutting their own trees is a terrific economic benefit, saving money and improving the forest. Winter cut wood is drier than that cut in spring and summer, and you don't have to fight chiggers, ticks or black flies. If a tree is felled with leaves on, let it lie until the leaves draw moisture from the wood and fall off. The wood will be somewhat dryer but will dry even faster when cut into stove lengths. Porous woods such as ash and oak dry faster than birches and maples. Splitting also fosters drying, as there is some moisture loss through the exposed sides, plus it makes more manageable pieces to handle. Wood heat is green heat, as long as the wood itself is not green! ☺



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