



Energy Efficiency & Environmental News: Staying Warm this Winter Without Spending a Fortune¹

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STAYING WARM THIS WINTER-WITHOUT SPENDING A FORTUNE

Winter will soon be with us and many of us in northern and central Florida will find our energy budget increasing dramatically. Even in south Florida there are a number of chilly days which must be addressed with some form of heating. In many homes this is in the form of electric resistance heat which causes great consternation to the electric utilities. There are a few things we can do to minimize the effect of winter cold on our comfort, our pocketbook and the environment.

Tighten Up Building Envelope - Caulking, Weatherstripping, Attic Insulation

Now is the time to reduce drafts and unwanted air infiltration and to add insulation to the attic, if needed. Air leaks and cracks increase both heating and cooling costs. They allow moisture to enter the home which can promote mildew growth and create air quality problems. Two ways to address air infiltration are to caulk and weatherstrip.

Caulking is used to seal cracks between stationary building components such as a window frame with a wall. One should also seal areas where pipes, drains and dryer vents exit through the walls in the house. Caulking is normally applied with a hand-held squeeze gun. Some people prefer press-on rolls as being easier to install. It can be used in both the interior and exterior of the home. Caulking is inexpensive, easy to apply and very effective in sealing air leaks.

Most hardware stores and building supply houses have informative guides showing the proper technique for caulking. There are several types of caulk available to the consumer. A person should select one that is long-lasting, flexible and resists hardening. Caulks with a silicone or silicone-latex base are quite effective.

Weatherstripping is used to seal moving parts, such as exterior doors, attic accesses, window and sliding glass doors. Weatherstripping comes in a variety of materials such as metal, vinyl, felt, rubber or foam. It can be purchased by the linear foot or in kit form. Two exterior doors with only a quarter-inch opening at the bottom can allow as much air as a 4 x 5" hole in the wall. Weatherstripping can cost-effectively reduce the impact of these leaks.

Adding insulation to your attic is usually another money saving method of reducing heating and cooling costs, especially if the current insulation level is below R-19 (less than six inches thick). Now that the mornings and evenings are fairly cool, adding insulation won't be the sweaty, nasty chore it would have been a few months ago. A cost effective insulation material for do-it-yourselfers is treated cellulose. Cellulose is normally made from recycled paper which has been treated with boron and boric acid to make it fire retardant and bug resistant. It is a very effective insulation, averaging R-3 to R-3.5 per inch of thickness. If the average thickness of the current insulation in the attic is less than six inches, adding insulation so that the full depth is between eight and nine inches is usually an effective way to hold the heat in your house in the winter and

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keep the heat out in the summer. In addition to being cost competitive, cellulose insulation is environmentally benign and easy to apply and can be added over existing insulation by either pouring or blowing.

Fiberglass and rock wool insulation can also be poured or blown but it is nasty to work with and should be installed by professionals who have the proper protective covering and respirators needed.

Repair Ducts

While you're in the attic, check the air ducts to see if the joints are well sealed and intact. This should be done with the blower fan on. In many cases, tape used to seal the joining portions of ductwork may have come loose. Air can be felt leaking from these areas. If this is the case, these duct joints should be sealed with a good mastic-type compound which sticks to most metal and fiberglass parts. This can be purchased through air conditioning or building supply stores.

Some utilities are now offering blower door testing and rebates or subsidies for repairing ducts and leaks in a home. A blower door is used to pressurize the house and can very accurately determine where and how much leakage occurs through the building envelope. Past experience shows that over 60% of the homes have serious duct leakage problems. Consider taking advantage of your utility's blower door test, especially if rebates and subsidies are offered as part of the test package.

Tuning Up the Heating System

Proper servicing and repair of the heating system is normally beyond the capability of most homeowners and a professional should be called. This person will thoroughly inspect and service your heating system including checking and cleaning the combustion vents or chimney, inspecting and cleaning the heating surfaces, changing the filter, inspecting and lubricating the blower motor and checking the blower belts for tightness or wear.

Selecting a New or Replacing a Heating System

Before selecting or replacing your heating system, you should consider several factors. The information below is intended to provide a very general overview on how various heating systems compare with one another. Space limits detailed discussion of all heating types, but does provide enough information so you'll be in a better

position to talk with an air conditioning and heating contractor and make more informed decisions.

There are basically two general types of heating equipment: one is combustion equipment, such as gas and wood heat; the other is electrical equipment, such as electric resistance and heat pumps. These can be further broken down into central and large package heating equipment, and portable heating equipment.

In making comparisons of various heating systems, such things as initial equipment cost, fuel costs and efficiency, environmental impacts and heating response or recovery need to be considered (Table 1). Equipment costs not only vary between heating system types, but can also vary significantly within the same type of equipment depending on the size and efficiency. In many cases, the extra money paid for a more efficient model can be recovered in three to five years of operation due to energy savings (see fuel costs and efficiency column). Most experts recommend that an investment in energy efficiency should be recovered within seven years. This means that if you pay an extra \$500 for a more efficient model, you should save \$500 in energy costs within seven years to make it worthwhile economically. This equates to about a 14% simple return on your investment. As utility costs increase, so does the return on your investment. In north and central Florida, energy savings often pay for substantial investment in higher energy efficiency. This may not always be the case in milder south Florida.

Fuel costs (fuel efficiency) of the equipment is probably the main characteristic one should examine. The Florida Energy Efficiency Code rates efficiencies of heating equipment by various methods such as Coefficient of Performance (COP), Heating System Performance Factor (HSPF) and Annual Fuel Utilization Efficiency (AFUE) or Thermal Efficiency/Combustion Efficiency Factor (E/E.). In all cases, the higher the rating number, the more

Table 1. Rating of Various Heating Systems#.

Heating System	Equipment Cost	Fuel Cost/ Efficiency	Environmental Impact	Heat Response	Overall Rank
Central					
Natural Gas	4*	1-3	2	1	1
Heat Pump (Air to Air)	7*	2-4	4	9	2
Heat Pump (Water Source, Geothermal)	10*	1-3	4	6	3
Heating Oil	5	2-5	5	1	4
LPG (Propane/Butane)	4*	8	4	1	5
Wood Stoves	4-8	2-6	2-4	4	6
Wood Fireplaces	7	5-10	6-10	5-8	7
Electric Resistance (Strip)	3	10	10	3	8
Portable					
Kerosene/Propane	2	3	4	2	1
Electric	1	5	5	3	2
# Rating Scale: 1 = best value or condition; 10 = poorest value or condition					
* Utility rebates/loans may be available					
In determining the overall rank of various systems, the author placed more importance on the fuel costs/efficiency factor than equipment costs, environmental impact and heat response factors.					

efficient the unit. For air-to-air heat pumps (the heat exchanger is cooled or heated by air), a COP of 3.2 is considered good. For water-source heat pumps (the heat exchanger is heated or cooled by water), a COP of 3.8 is considered good. If rated by the HSPF method, 6.8 or better is considered good for heat pumps. For combustion furnaces such as gas or oil, an AFUE or E_c/E_c rating of 8.1 or higher is considered good. Since the techniques used to rate the efficiency of these units may be somewhat confusing, more information may be obtained by contacting your air conditioning dealer, county code official or the Florida Department of Community Affairs Code Division.

Some gas and electric utilities offer rebates or low interest loans if certain systems are installed. Electric utilities prefer high efficiency heat pumps using heat recovery units to supplement water heating. Gas utilities prefer efficient combinations of gas space and water heating systems, and cooking equipment. Rebates or

low interest loans can favorably affect the equipment's cost rating.

In evaluating the environmental impact factor, such things as air pollution, greenhouse gases, acid rain and ozone depletion, plus the best use of U.S. energy resources were considered. For example, one kilowatt hour generated in a coal-fired plant will burn one pound of coal, producing three pounds of carbon dioxide (a greenhouse gas) and four ounces of sulfur dioxide (contributes to acid rain). Other fuels when burned also produce various amounts of pollutants.

The heat response factor considers how quick the unit supplies heat to a cold room or house. Some people turn their heating unit off when leaving for work in order to save energy. Gas and oil systems heat the house relatively quickly and efficiently compared to other systems, so their heat response is considered excellent.

The following is a very general overall ranking made by the author:

- Natural gas heating systems rank number one overall. It generally has high efficiency and low fuel costs, favorable environmental impact, quick heat response and moderate equipment costs. Natural gas is relatively safe; more efficient models have electronic ignition as opposed to pilot lights.
- Second in terms of overall ranking is the air to air heat pump system which is relatively cost effective and efficient to operate. Although the initial equipment cost is higher, it has a moderate environmental impact but a generally slow heat response. They can be used with a heat recovery unit to improve water heating performance.
- Ranked third is a water source or geothermal heat pump system. This system uses a heat exchanger to recover heat from or release heat to groundwater or earth. Systems using pumped well water may not be allowed in some water districts and may have scaling problems. The cost of these systems is generally highest compared to the other options listed, but comparable to natural gas in terms of energy efficiency and cost effectiveness. Environmental impact is moderate; heat response is usually better than air to air heat pumps.
- Heating oil systems are ranked fourth. They have moderately high efficiencies, moderate initial costs and moderate environmental impact. They have very high heat response.
- Boilers and circulating water systems are not commonly used in Florida. However, natural gas and LPG recirculating hot water systems are becoming more popular. These systems circulate hot water through a heat exchanger, providing quick and efficient heating. Generally, circulating water systems rank between natural gas and liquid petroleum gas systems, depending on the fuel used.
- Liquid petroleum gas systems such as propane and butane are ranked fifth. They have a

moderately low initial cost, a relatively high fuel cost, moderate environmental impact and a high heat response. While all current heating equipment has built-in safety features and is installed to rigid code requirements, LPG systems are somewhat less safe than others because this fuel is heavier than air and has more fire hazard potential.

- Wood stove systems have a wide range of ratings depending on efficiency, and are not widely used in Florida. Catalytic wood stoves with combustion efficiencies near 90% are considerably more expensive than standard wood stoves with combustion efficiencies between 20-40%. The main disadvantages are handling the wood and ash; the initial cost is high; and, with the exception of catalytic stoves, the environmental impact is higher than gas, oil or heat pump heating systems. The heat response of wood stoves is considered moderate.
- Wood burning fireplaces have negative or very poor efficiencies unless they are well designed. Recent studies show that fireplaces are used by only 70% of Florida households and then mainly for aesthetics. Disadvantages include handling of wood and ash, and an increased risk of fire due to sparks and chimney fires.
- Of all the central type or large unit heating systems, the electric resistance is ranked seventh. The initial cost is low, but the operating cost is considered very high. Environmental impact is considered high and heat response is considered moderately high.
- Portable heating units such as kerosene, oil or gas and electric heaters have the advantage of being able to directly heat the area you desire to heat, and they can be moved about the house where needed. Because of this, they are inherently more efficient than large central or package electric resistance units. Most current portable heating models have built-in safety features. However, they are still less safe than central and large package units due to improper fueling or placement.

Finally, dress warm and consider using an electric blanket or heavy comforter.

SIMPLY SAVING

Energy Efficient

Economical

Environmentally Sound

Staying Warm this Winter-Without Spending a Fortune

Winter will soon be with us and many of us in northern and central Florida could find our energy budget increasing dramatically. This cost can be reduced significantly if a few preparations are made.

Maintenance of Existing System

The first thing we can do is tighten up the building envelope by caulking, weatherstripping and adding attic insulation, as appropriate. Air infiltration around cracks increases both heating and cooling costs. Caulking can seal cracks where two stationary surfaces meet, such as a window frame with a wall, or where pipes and drains exit through the wall. A good grade silicone-based or silicone latex-based caulk is best for the long-run. Any building supply house provides instructions on how to use a caulking gun properly.

Weatherstripping is used to seal moving parts, such as exterior doors, attic accesses, window and sliding glass doors. Weatherstripping comes in a variety of materials such as metal, vinyl, felt, rubber or foam and can be purchased by the foot or in a kit.

Adding insulation to your attic can reduce both heating and cooling costs, especially if the insulation level is currently below R-19 or less than six inches thick. Cellulose insulation is one of the better insulations for do-it-yourselfers. It is made from recycled papers treated to make it fire retardant and bug resistant. If insulation is needed, add enough so that the full depth is at least eight or nine inches.

While you're in the attic check air ducts to see if they are well sealed and intact. Many utilities subsidize a blower door test which can pinpoint leakages in the house and ductwork. They also offer

rebates for repairing and sealing the home. Take advantage of these programs; experience shows that over 60% of homes have serious duct leakage or infiltration problems.

Heating systems should also be tuned up annually. It is probably best to get professional assistance. A professional will clean the combustion vents or chimney, inspect and clean the heating surfaces, change the filter, inspect and lubricate the blower motor, and check the belts for tightness or wear.

Purchasing a New System

There are a number of factors that should be considered prior to purchasing a new heating system. In making comparisons of various heating systems, such things as initial equipment cost, fuel costs and efficiency, environmental impacts and heating responses or recovery need to be considered (Table 1). Equipment costs not only vary between heating system types, but can also vary significantly within the same type of heating equipment depending on size and efficiency. In many cases the extra money paid for a more efficient model can be recovered in three to five years through energy savings. Most experts recommend that an investment in energy efficiency be recovered within seven years. This means that if you pay an extra \$500 for a more efficient model, you should save \$500 in energy costs within seven years to make it worthwhile economically. In colder northern and central Florida these savings are possible with many models. However, in milder south Florida, it becomes more difficult. Many utilities offer rebates which makes the purchase of more energy efficient models more attractive.

Remember the table provides a very general comparison and there may be significant differences between models and types. It is suggested you call your heating contractor or other professional prior to actual purchase.

Simply Saving is written to be used by field extension faculty for their education programs such as in a newspaper or newsletter column. The body of E²&E provides more in-depth information on the subject.

