

by James E. Houck and Paul Tiegs

Yes, the addition of a room heater such as a wood, pellet or gas stove does save energy and money.

Three States

Three Stories

It is generally accepted that the addition of a room heater (also referred to as zone heater or stove, e.g., wood stove and gas stove) to a home that has a centralized furnace or boiler saves energy and heating costs.

Most homes in the United States have older, centralized furnaces or boilers that are inefficient.

Natural gas, heating oil and electricity costs have spiraled, and many predict the worse is yet to come. Wood, pellet, natural gas, LP, coal, and oil room heaters all can reduce heating costs significantly¹.

While geographic areas with high heating demands are certainly areas where cost savings via the use of a room heater can be realized easily, the amount of savings associated with the addition of a room heater to a given home is not necessarily directly related to climate. To understand this, one needs to consider the facts that a typical central furnace or boiler has a heat output in the range of 75,000 Btus/hr, is not designed for “spot” heating such as is

appropriate for a main living area, and usually operates intermittently.

Most room heaters, on the other hand, continuously operate when in use, their heat output is in the 35,000 Btu/hr range or higher, and they are generally operated only when they are needed. In some homes, depending on the design and size, all the space heating requirements can be met with one well-positioned room heater, whereas, in others, while still significant, perhaps only a third of the heating needs may be met with them. The situation for most homes falls somewhere between these two extremes.

Two other facts need to be emphasized in considering cost savings achievable with room heaters and the market opportunity for the sale of new room heaters. These are: (1) virtually all homes in the United States, except in Hawaii, require space heating, and (2) the makeup of existing space heating equipment types varies from region to region. Consequently, the number of households, not the number of heating degree

days (HDD), is the primary driver behind room heater sales, and the regionality of heating practices impacts the energy and cost savings potential derived from their installation.

Household Heating Practices

As most in the hearth industry know, fuel oil, natural gas and electricity are the main heating fuels in the United States. Data gathered in 1997 by the U.S. Department of Energy’s Energy Information Administration show the following:

- In the Northeast, fuel oil and natural gas are the two main heating fuels.

¹ As noted, room heaters are also referred to as zone heaters or stoves, e.g., wood stoves and gas stoves. The term “room” is somewhat of a misnomer as room heaters heat more than just a room. The term is more reflective of the fact that they are permanently located in a lived-in room in the home. For the purposes of this review, the term room heater does not include portable units such as small kerosene appliances.



technical

- In the Midwest, natural gas is by far the most widely used fuel.
- In the South and West, both natural gas and electricity are the most common fuels, with electricity being used more widely in Southern States than in the West.

In all regions, centralized units (furnaces and boilers) make up the majority of the main heating equipment.

Households in the three states of New York, California and Texas were selected for detailed review here. They are the three most populous states and, together, households in these three states represent 25 percent of the total households in the U.S. In addition, heating practices in these three states illustrate the characteristically different northeastern, southern and western heating equipment mix.

The main heating fuels used in New York are natural gas (49.8 percent of households) and fuel oil (39.6 percent of households). The main heating fuels in Texas and California are natural gas and electricity. Natural gas is used as the main heating fuel in 68.2 percent of households in California and 54.1 percent of households in Texas. Electricity is used

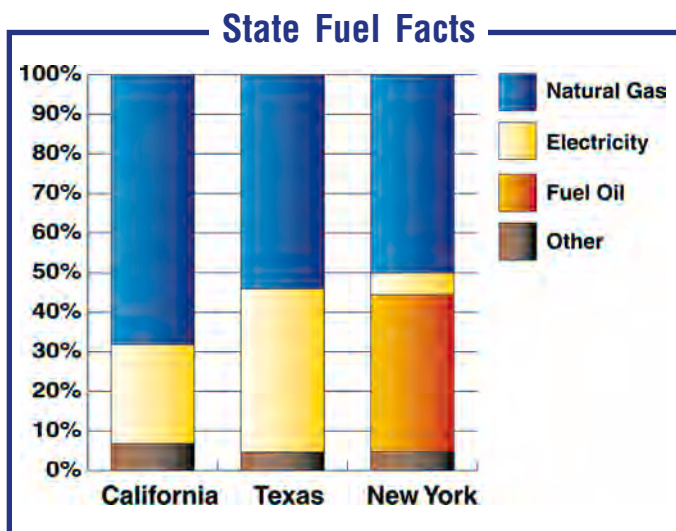
heating equipment used in New York is a fuel oil central steam or hot water boiler; 31.2 percent of households are

tion of a room heater is highest in colder climates, but energy savings still can be achieved in homes in all parts of the nation due to the ubiquitous need for at least some wintertime space heating everywhere in the continental U.S.

A selling point for the addition of room heaters in milder climates is that there is a bigger opportunity for supplying all the space heating needs of the home with a properly sized and located room heater, replacing the need for a centralized unit completely. Similarly, the ability to provide all or a large portion of the heating needs of a home with a room heater is greater for smaller sized homes and

greater for multiple story homes for a given square footage quite simply because heat rises.

Reviewing the information for New York, Texas and California, both average heating demand and heated square footage decrease in the order 1) New York, 2) Texas, 3) California. This makes the potential cost savings on average greatest for New York homes, whereas the potential for meeting all space heating needs with a room heater



so equipped. The single most common type of heating equipment used in both Texas and California is a natural gas central warm-air furnace; 32.8 percent of households in Texas and 41.3 percent of households in California are equipped with these units. Both the centralized fuel oil boilers and natural gas furnaces have overall efficiencies in the 30 to 40 percent range. The overall efficiency estimates take into account losses in the air duct work or water distribu-

State Heating Facts

| State | Most Common Heating Equipment Setup | Percent of Homes with Most Common Heating Equipment Setup | Jan./Feb. 2001 Fuel Costs (w/o taxes) |
|------------|--|---|---------------------------------------|
| California | Natural Gas - Central Warm-Air Furnace | 41.30 | \$13.72/tcf |
| Texas | Natural Gas - Central Warm-Air Furnace | 32.80 | \$9.48/tcf |
| New York | Fuel Oil - Central Steam or Hot Water | 31.20 | 148.6¢/Gallon |

as the main heating fuel in 25.5 percent of households in California and 41.3 percent of households in Texas.

While heating characteristics of New York, Texas and California are qualitatively representative of the Northeast, South and West census regions, there are differences between states within the regions. For example, fuel oil usage is higher than natural gas in some New England states, and electricity usage is higher than natural gas in some Southern States. It is also worth noting that in some Midwest States more than 78 percent of households use natural gas as their main heating fuel.

The single most common type of

tion systems, high air exchange rates induced in the homes by draft vents, the inherent efficiency of the furnace or boiler units themselves and, in the case of natural gas units, energy loss due to pilot lights. (It needs to be noted that newer furnaces and boilers in new, well-designed homes can perform at much higher efficiencies).

Room Heater Additions

While each region of the country has a different climate, housing characteristics and energy mix, the addition of a room heater seems to make sense for most homes. Not surprisingly, the potential for energy savings with the addi-

tion is the greatest in California, with homes in Texas falling in between. However, there is a dramatically higher percentage of two- and three-story single family homes in the Northeast than in the West or South and, as noted, multiple story construction tends to facilitate heat transfer from room heaters in the older two- and three-story homes.

A number of statistics demonstrate that the opportunity for room heater sales is large. On a national basis about one quarter of homes have heating equipment older than 20 years. The older the existing heating equipment, the more likely it has a lower efficiency, which makes the home a better candidate for

State Facts Related to Room Heater Additions

| State | Avg. Heating Degree Days per Household | Avg. Heating Square Feet per Household | % of Single Family Households that are 2 or 3 Stories | % Households with Heating Equipment older than 20 years. |
|------------|--|--|---|--|
| California | 1,870 | 1,381 | 29 | 40 |
| Texas | 2,422 | 1,492 | 21 | 14 |
| New York | 5,579 | 1,628 | 74 | 34 |

a room heater. The typical age of existing heating equipment varies regionally primarily with the age distribution of homes.

For example, 34 percent of the heating equipment in homes in New York is older than 20 years. In contrast, while still substantial, only 14 percent of the homes in Texas have heating equipment older than 20 years, which to a large part reflects the recent high growth rate in the South and Southwest. Interestingly, 40 percent of the homes in California have heating equipment older than 20 years. It is speculated that this may in part be due to the mild climate requiring/initiating less frequent replacement of home heating equipment.

Other data also show the efficacy of a room heater addition. For example, marketing studies have demonstrated that elective changes to a household infrastructure, such as a change in heating equipment, is most likely to occur with owner occupied detached single family units. Nationally, more than one half of the total number of households are owner occupied single family units (New York 41%, Texas, 58%, California 45%).

Natural gas room heaters traditionally have been the most widely used type of room heater. To interest a consumer in a natural gas unit and to facilitate the installation of natural gas room heaters, an existing natural gas hook up is desirable. Nationally, more than 60 percent of households are hooked up to natural gas (New York 75%, Texas, 67%, California 84%).

Finally, fireplace inserts are a popular type of room heater because no major home remodeling is required. Nationally, it is estimated there are more than 29.4 million homes with wood-burning fireplaces without existing inserts (New York 1.2 million, Texas, 1.4 million, California 3.1 million).

Cost Savings for Three Scenarios

Energy cost savings were calculated for three room heater addition scenarios for the 2001/2002 heating season. The calculations were done for one room heater addition scenarios in each of the three study states. Fuel oil and natural gas cost estimates used in the calculations were based on January/February 2001 costs increased by 30 percent. State, local and federal taxes were not included in the cost estimates. It was assumed that 70 percent of the home heating demands would be fulfilled by the room heater. Typical home heating requirements and the most common existing equipment setup for each state were used for the calculations. Three types of room heaters were selected for the three example scenarios. These were a natural gas room heater, an EPA-certified wood stove and an EPA-certified pellet stove. These three types were selected since, combined, they represent the overwhelming majority of room heaters available; natural gas-fueled heaters, certified wood stoves and certified pellet stoves are also the most environmentally sound options.

The three scenarios with associated cost savings are as follows:

Scenario 1: New York – A certified wood stove added to a home with an older centralized fuel oil boiler will save, on average, \$445 during the 2001/2002 heating season.

Scenario 2: Texas – A gas room heater added to a home with an older centralized natural gas warm-air furnace will save, on average, \$217 during the 2001/2002 heating season.

Scenario 3: California – A certified pellet stove added to a home with an older centralized natural gas warm-air furnace will save, on average, \$270 during the 2001/2002 heating season.

The conclusion reached in the review

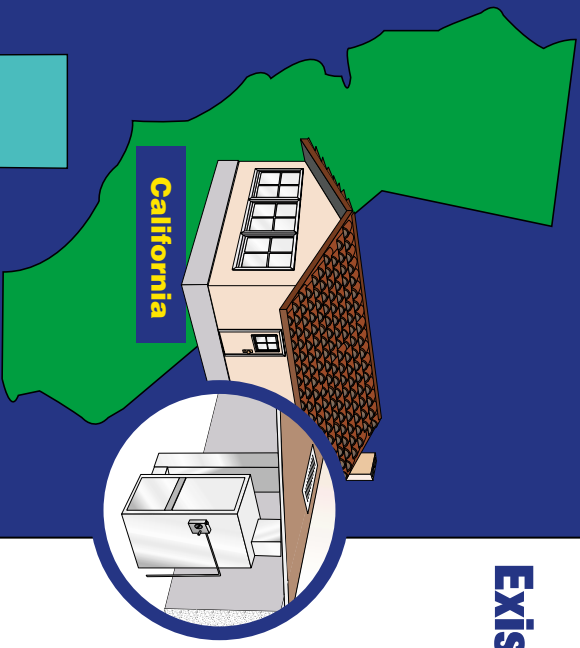
of energy statistics, energy costs, heating practices and the characteristics of room heaters is that energy costs can be saved by the addition of a room heater to most homes in the United States. The exact amount saved annually will depend on home characteristics, the existing heating equipment, regional fuel costs, and climate. In some cases, the cost savings will be significant enough to allow for the payback of the purchase and installation of the room heater over a several year period. In other cases, the cost savings will be more modest; however, these cost savings, when combined with the aesthetics of having a room heater versus a centralized furnace or boiler, will contribute to the marketability of the units.

The example scenarios developed here were only for the addition of one type of room heater to each of the most common existing heating equipment setups in each of the three most populous states. A manual estimating cost savings for all the reasonable permutations of existing heating equipment, energy costs, housing characteristics, room heater types and climates would be useful for the hearth industry. 🏠

About the authors:

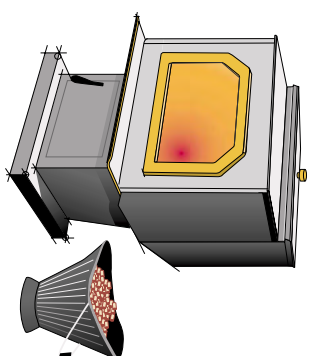
Dr. James E. Houck is president of OMNI Consulting Services and is a research scientist with over 20 years experience. Paul Tiegs is president of OMNI-Test Laboratories and is a professional engineer with over 25 years of experience. OMNI Consulting Services specializes in energy and environmental issues associated with residential heating. OMNI-Test Laboratories specializes in safety, efficiency and environmental testing of home heating appliances and fuels. Information and related studies can be obtained at www.omni-test.com.

Existing Home Heating System + Room Heater = SAVINGS

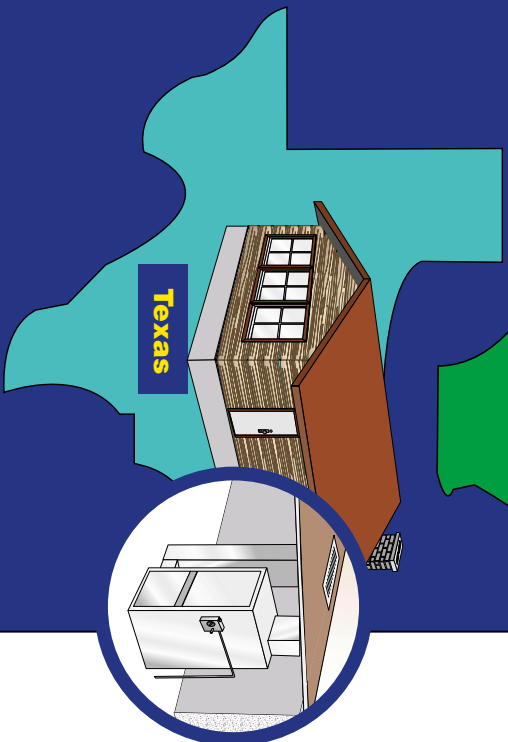


California

Pellet Stove

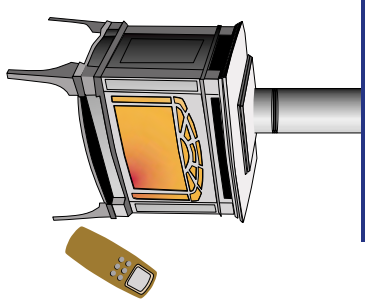


\$270
SAVINGS

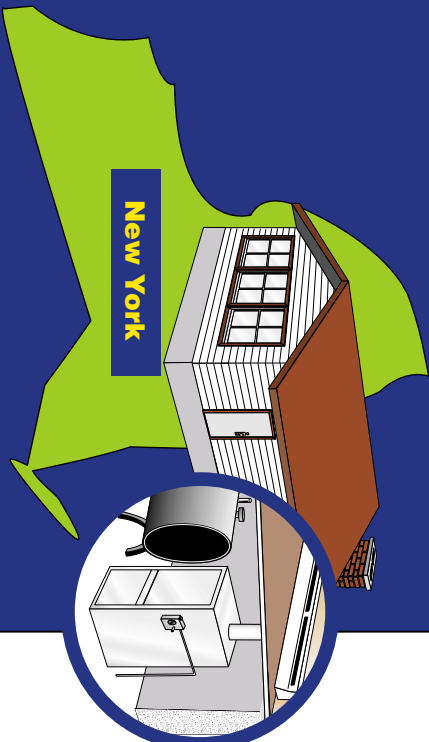


Texas

Gas Room Heater

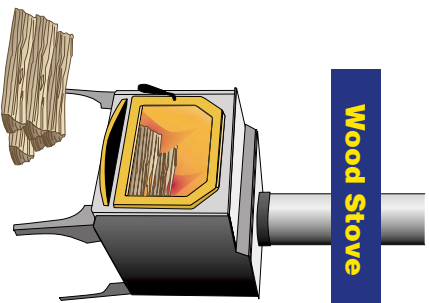


\$217
SAVINGS



New York

Wood Stove



\$445
SAVINGS