About the House
Heating Systems Part II

by Henri de Marne

Last month we took a look at the state of the art—past and present—in gas, oil and hydronic space-heating systems, focusing on the practical applications of each.

With this issue, we delve into the second and final part of this heating overview with a discussion of electric, solar and solid-fuel systems.

Electric Heating Systems

Electric heating systems come in several forms. The most common is electric baseboard resistance. In spite of the inherent inefficiency of electric heat, all things considered, electric baseboard makes sense as a back-up system in energy-efficient, tight houses—primarily those heated with solid fuel.

In addition to its low initial cost, it is very flexible, allowing easy use in individual rooms without expensive zone valves, circulators or dampers. And when it is centrally controlled by a smart box (which can be done for $50), it can kick on only during off-peak times, thus overcoming the objections of power suppliers.

Radiant electric heat has also been around a long time. Its gentle, draft- free warmth made it popular a number of years ago, but the cost of installation and the problems inherent to some systems seem to have put a damper on its use. It's most often found nowadays in surface-mounted auxiliary glass panels that don't win any prizes from interior decorators.

Electric storage systems became available a few years ago, but their cost has cooled their popularity. Although attracted to the principle at first, I became disenchanted with them upon investigation because their very principle is not compatible with a passive-solar, energy-efficient, tight house: They simply do not respond logically to the fast fluctuation of circumstances to which such houses are subjected day to day.

Consider such a house during one of our coldest winter spells. Night temperatures drop to -30 F; the sky is clear, and the sensors on the heaters call for a full charge. By next morning, it's one of our famous New England winter days, and the sun is bright as crystal. When the sun pours through the south-facing windows, the house will overheat—a waste of the stored electric heat—because its controls cannot predict the amount of heat the sun will provide.

Considering how expensive a storage-heat system is to install, there are much better alternatives, such as oil or gas-fired systems—if what you want is single thermostatic control.

The gamut of electric-heat choices includes heat pumps. The most familiar type is the air-to-air heat pump—not too satisfactory in much of New England, because straight electric resistance takes over when the temperature drops below the ability of the pump to extract heat from the outside air efficiently.

Earth-Coupled Heat Pumps

A more recent development of a long-known technology is the earth- coupled heat pump. There are basically two types: one consists of long loops of plastic pipe installed horizontally below the frost line. Heat is extracted from the ground in contact with the hundreds of feet of pipe in winter; the process is reversed in summer when air conditioning is needed.

However, in most areas of New England, where the cooling load is light but the heating load is considerable, the earth may never be able to recover from the loss of heat removed, and eventually permanent ice lenses may form around the pipe. In these locations, a solar collector may be needed to recharge the soil's batteries during spring, summer and fall.

The other type of earth-coupled heat pump uses vertical wells as collectors. Shallow wells may be satisfactory in warmer latitudes, but deep wells extending below the water table perform better because of the greater heat- storage and exchange characteristics of ground water, according to one authority.

In closed-loop systems, water is not drawn out of the well and wasted; rather, a liquid is circulated through the closed loop and draws or discharges heat from the well, depending on the season.

These systems may be reasonably efficient now—and further developments in technology may render them even more so in the future—but we should not lose sight of the initial and maintenance costs in relation to the benefits derived. Undoubtedly such technology will become more useable and desirable as natural fossil fuels dwindle, but I personally find it hard to justify earth coupled heat pumps for residential use in New England.

To illustrate, compare an earth-coupled system with horizontal ground coils costing $10,000 to a more conventional hydronic heating system costing $4,000. Wouldn't that $6,000 difference earning 10 percent interest somewhere cover the additional fuel costs? In the case of a well-insulated house, it certainly would—and if the house were not insulated, the money would be better spent improving its thermal performance.

Moreover, if you had to borrow the $6,000 at 14 percent or so to finance the difference, the equation looks even worse, since many houses today can be heated for $200 to $300 a season with standard heating systems in our coldest regions.

Solar, Wood and Coal

The same can be said of active solar-heating systems, whose initial costs are in the same range as those of earth-coupled heat pumps—and which may require expensive maintenance to boot.

On the other hand, certain passive-solar strategies make all the sense in the world when designing and building new houses. But the same reasoning applied earlier to money better spent retrofitting a house in need of thermal improvements is valid when compared to the cost of building a sunspace. The only reason for building a sunspace is that you want it and can afford it; no savings of fuel costs can legitimately be used to warrant its construction.

The use of solid-fuel heating appliances makes little sense in urban areas, where the cost and storage of wood or coal—plus hassle of handling it and the cost of buying, installing and maintaining the appliance in the first place — makes oil or gas look awfully good.

But it makes very good sense to the rural folks of New England. Our winters are long and cold, and our forests abundant. For those who gather their own wood or can procure it at relatively competitive prices, wood stoves are probably the most sensible and inexpensive sources of heat.

The new generation of highly efficient catalytic-combustor stoves has rendered wood heating safer by greatly reducing the formation of creosote. Catalytic-combustor add-ons are available for existing stoves but do not offer the same degree of efficiency.

The cost of replacing a standard stove with a new one equipped with this latest technology is very high and is hard to justify in spite of the considerable fuel savings it offers. A much cheaper alternative is the regular use of a catalytic spray, ACS, now widely available through responsible chimney sweeps who have recognized its safety value (not to mention the fact that it makes their job of cleaning chimneys much easier).

Wood chips and pellets are still in the development stages, and they revive the old "cart before the horse" or "chicken before the egg" issue. Before you buy a wood-chip or pellet stove, you'd better be sure that you can get an ample supply of fuel at a reasonable cost. In rural areas, it's hard to find suppliers, because there seldom are enough stoves in the locality to make it worth their while.

The options available for heating our homes have changed considerably in the past decade—and for the better. To a large extent, we owe our good fortunes the energy crisis of the 70s. For only when a dire emergency arises do we seem to exercise our full quotient of inventiveness to meet—and sometimes even exceed—the need. •

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