
Andy Pearson

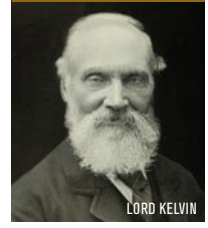
Home Is Where the Heat Is

BY ANDY PEARSON, PH.D., C.ENG., MEMBER ASHRAE

There are lots of things that can be used to heat our homes. Open fires or log-burning stoves give a fantastic sense of homeliness and for me always take me straight back to holidays in the north of Scotland where a roaring fire was very welcome, even on a summer evening. Nowadays, it would be called a biomass thermal processor; back in the day we just knew that if we chopped enough logs through the day the reward would be to sit in front of a roaring fire watching the flames dance and hearing the distinctive crackle of burning pine.

Other options, for those who don't like to get their hands dirty, whether before or after combustion, vary widely from country to country. In the United States ducted air systems are very common, with a furnace in the basement providing warm air throughout the home. In Europe, particularly Northern Europe, furnaces are also common, although usually called boilers, and the heat is distributed round the house by pumping water through small diameter distribution pipes laid below the floor and behind the skirting boards. Each room is fitted with a radiator—a metal heat exchanger fixed to the wall that warms the air and allows it to circulate round the room.

Make mine a heat pump.


LORD KELVIN

It is interesting to note that the "boiler" doesn't actually boil the water and the "radiator" works primarily by convection, not radiation, but in both cases the names have stuck and are here to stay. In some more modern houses the heating is partly or wholly through a grid of pipes laid into the floor. This is cheap to do during construction, but it is an expensive retrofit. It also requires the water temperature to be lower than for a radiator—typically about 95°F (35°C) for underfloor heating whereas up to 180°F (82°C) is required for radiators. In Japan, where space is often even more at a premium than in Europe, split air-conditioners with a heat pump function are very common. Heating is provided by switching the function of the indoor and outdoor units so that outdoor air is cooled in winter to provide room heating. This is particularly effective when the ambient is merely cool but not so good in much colder climates. This is the Achilles heel of domestic heat pumps: they are least efficient when you need them most. "Just as the price of eggs goes up, the hens go off the lay" as my Dad used to say (quoting from Para Handy, I think).

The challenges facing the growth of the domestic heat pump market vary widely from country to country. What seems sensible, logical and even intuitive in one market makes no sense at all in another context. However, systems with apparently contradictory requirements, such as ducted air versus pumped hot water, share some common features. Operating the system at as low a temperature as possible is irrelevant for traditional combustion-based heating but is crucially important for the economy of heat pump systems. Achieving this change of habit requires modification of the basic design of our homes with greater emphasis on techniques such as underfloor heating, which have not been so important since the days of ancient Rome.

When Lord Kelvin was engaged in the development of the hydroelectric power plant at Niagara, as President of the International Niagara Commission, he wrote, with reference to the use of heat pumps, "When Niagara is set to work for the benefit of North America through electric conductors, it will no doubt be largely employed for the warming of houses over a considerable part of Canada and the United States." Kelvin was infamous in his latter years for making dogmatic statements that proved to be wrong, such as "X-rays will prove to be a hoax;" "Radio has no future;" and perhaps most famously "Heavier than air flying machines are impossible." However, in the case of Niagara and heat pumps the verdict seems to be "not yet." ■

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