Wood-fired heating

Is it relevant in the age of climate change?

BY ALAN BURDON

Do you want a wood burning heater? Many people who would say 'Yes' emotionally, then shy away because of their reputation for being polluting, dirty and hard work to operate and maintain.

But what about a wood burning heater that: leaves little ash, releases few emissions, doesn't need constant refuelling, you can lean against while it is burning, doesn't clog up your flue with deposits, gives up to 24 hours of heating from a two hour burn and is a beautiful and unique feature of your home?

A masonry heater ticks all these boxes – and more! So what exactly are they?

Origins

In 16th century central Europe, there was a fuel crisis. We tend to see this as a modern phenomenon but back then the only fuel generally available was wood; as the cities grew, it became increasingly difficult to source enough wood to keep the open fires burning. A more efficient system was needed so the powers-that-be set their technicians to work.

The result was the masonry heater, which in the centuries has since evolved into many different forms across all parts of the Northern Hemisphere where heating is needed.

Working principles

The principles upon which a masonry heater works are those of thermal mass and combustion efficiency; any heated material will retain heat for a time. Dense masonry materials can store heat for long periods, thus a sun-warmed rock will still be warm far into the cold of night.

Unfortunately many solid-fuel home heaters lack any thermal mass apart from a firebrick lining, so as long as fuel is burning they will emit heat but when the fire is out the heat is gone. Furthermore, the surface temperature of a 'steel box' heater can be high enough

to create an unpleasant atmosphere as air and dust particles are 'burned' when they come into contact with it. These heaters can also overheat a room unless combustion is stifled, by reducing the air available; in which case creosote and other deposits are either left in the flue or exit to pollute the neighbourhood. Finally, even when burned fully, their internal burning temperatures rarely reach the level needed to combust the gases given off from burning wood, leaving a third or more of the energy value of the wood you have cut, spilt and carried to go to waste.

A masonry heater operates in a different way. The firebox is filled with fuel and the fire allowed to burn with full intensity. After a couple of hours the fire is burned out and won't need relighting for 12 to 24 hours. The hot gases are channelled through a labyrinth within the mass of the heater and release their heat to the masonry. This then steadily radiates into the room.

Wood burns at about 250°C but the gases given off need a much higher temperature to burn. The fire of a masonry heater is not immediately losing heat through a thin skin. With maximum air supply, which is pre-warmed as it enters the fire, it burns at the highest possible temperature leaving very little ash. A secondary combustion chamber completes the 600°C+ burning of the gases with the result that very little pollution leaves the heater. The air remains clean and flues do not need annual sweeping. Doors do not need to be opened for refuelling while a fire is burning (letting smoke into the house) and as logs are not being thrown into the firebox the structure can last a lifetime.

Various styles

Over time the pattern of these heaters has varied in different parts of the world. The popular Finnish contra-flow heater uses vertical channels down each side of the firebox. Swedish designs have a number of horizontal channels within the flue. In the old houses of Europe the tiled facings of kachelöfen were works of art.

Heated benches may be formed in the system. Russian farmers would put their children to bed on top of the heater, as it was the warmest place in the house. This made use of another feature of the masonry heater; that it never gets too hot to touch. Sitting with ones back against a heater, even when it is firing — just like against that sun-warmed rock — is a pleasant experience.

A masonry heater is unlikely to overheat a room. The lower surface temperature of a masonry heater puts heat into a room at a slower rate but for much longer time, so that it is still warm to the touch after 24 hours.

Emissions

There is a common misconception that wood heating is a significant contributor to atmospheric greenhouse gas emissions. Figures issued by the CSIRO in Australia (2003) show that wood is less polluting than any of the major sources of home heating apart from hydro-electricity. If plantation timber is used with its higher take-up of CO_2 then actual carbon sequestration can be achieved.

The figures used were for conventional wood heaters, which at best are 65% efficient. Masonry heaters can show 95% combustion efficiency and when that is also translated into the effort of cutting, splitting and carrying wood to the fire there is a considerable saving in both fuel and human labour.

Incorrect fire lighting procedures are also a cause of much of the pollution associated with wood burning. Masonry heaters are particularly well configured for the 'top down fire,' in which the largest pieces are placed at the bottom

and subsequent layers reduced in size with a kindling pile at the top. This fire is slower to start, but as the heavier pieces heat up, the gases released from them are consumed by the small hot fire at the top. Because there is no need to restoke the fire, there are none of the unburned gases that are given off when new logs are added to conventional heaters.

Construction and availability

Construction of masonry heaters has traditionally been carried out by skilled artisans who work with firebrick to create the core and then face it with a variety of masonry materials, such as brick, stone, slate or render.

That artistry is continued in many beautifully sculpted modern masonry heaters. In recent times the construction of masonry heaters has been made easier and less expensive by the introduction of precast refractory components that are assembled as a kit and then faced with masonry. Even with this prescribed design pattern, a great variety of forms can be achieved. With kits, there is also the option of a bake-oven; as soon as the fire is out, the pizzas can go in!

In an age of climate change and the pressures to find cleaner, greener ways of doing things it is comforting to find that a five-hundred-year-old technology, brought into the modern age, can show us a way forward. ◆

Alan Burdon is an owner builder who included a masonry heater in his own build (see **TOB 177 June/July 2013** *and* **TOB 181 February/March 2014***). He now operates* **Heavenly Heat***, through which he imports and sells* **Temp-Cast** *fully modular masonry heaters.*

Links & resources

◆ **CSIRO Report**
Life Cycle Assessment of Greenhouse Gas Emissions from Domestic Woodheating (September 2003) by CSIRO Forestry and Forest Products.
publications.csiro.au

◆ **Heavenly Heat**
Highly efficient wood burning masonry heaters.
02 6493 6080,
www.heavenlyheat.com.au

◆ **Temp-Cast**
Fully modular wood-fired masonry heaters.
www.tempcast.com