

# WATER HEATING OPTIONS

**Heat pump water heating systems are a relatively new option when looking for an energy-efficient hot water system. Efficiency varies, so it's worthwhile doing your homework to find out if this would work well in a particular situation.**

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**T**here are several different ways of heating water, but not all of them are efficient. Many are improvements on existing methods that tweak the performance of the systems, but don't deliver the large-scale savings desired.

Heat pump water heating systems generally perform well for households that use lots of hot water, but not for households with low hot water use.

**NEED TO USE 140 LITRES A DAY**  
One of the issues seen in the 11 houses was that many of them didn't use much hot water. The performance of a heat pump water heating system declines as the amount of hot water is reduced. For it to perform

reasonably well (with a COP of around 1.5), a household should use at least 140 litres of hot water (60°C) per day.

## HOW MUCH IS 140 LITRES?

Different households vary dramatically in how much hot water they use so it's best to assess an individual situation using the following calculation. To make the calculation straightforward, we consider showering to be the only component.

Because water coming out of a shower is a mix of hot and cold, take the flow rate of your shower (average = 10.5 litres per minute) and reduce it by two-thirds to arrive at the hot water component (average = 7 litres per minute). Multiply by the average length of showers (7 minutes) and then by the number of showers taken within the household per day.

In this average scenario, three occupants would put sufficient hot water through a heat pump water heating system for it to have a reasonable level of performance.

## LOCATION IMPORTANT

Heat pump water heating systems perform better in warmer conditions. Certain models are not recommended for use in the South Island or colder areas of the North Island.

The heat pump unit needs to be located outside to allow it to transfer heat from the outside air to the water inside the hot water cylinder. In an 'integral system', the heat pump unit and hot water cylinder are packaged together and installed outside. In a 'split system', the heat pump unit and hot water cylinder can be separately positioned so the hot water cylinder can be installed inside.

Because the units operate periodically, they need to be positioned carefully to avoid any noise nuisance to occupants or neighbours.

## EASIER INSTALLATION

Heat pump systems are more easily installed than solar systems because there is less pipework and no solar collector. They can provide an efficient means of heating water, especially where solar systems are not an option, and generally perform well for households that use lots of hot water, but not for households with low hot water use. ♦

## Solar water heating

Solar water heating may be the first sustainable option to come to mind but it is not always suitable. For example, a house with no north-facing roof or one subject to lots of shade may not give good energy savings from solar water heating. This applies to many houses in New Zealand. Even in sunny Australia, solar systems may not be suitable for up to half of the existing houses.

So if solar water heating isn't for you, what other options are available and how can you measure the performance of a system?

## You don't always get out what you put in

A good way to view the efficiency of a water heating system is via the coefficient of performance (COP). This is defined as the ratio of the useful heat out of a hot water system (the quantity of hot water) divided by the energy (electricity, gas, wood) put into the system. Higher numbers indicate more efficient systems.

You don't always get out what you put in because energy may be required to keep the water warm within the system. An average electric cylinder may have a COP of 0.7 compared with 0.9 for a system with a well insulated cylinder and pipework.

To achieve a COP beyond 1 requires heat to come from somewhere else. For solar water heating, this heat comes from the sun. A project by Beacon Pathway (see *Build* 115, pages 62–63) showed that a COP of 3 was readily achievable for a solar water heating system.

## Heat pump systems

Another way of going beyond 1 is to use a heat pump cycle to transfer heat from the outside air to the water within a hot water cylinder. Such a process is the basis of air-sourced heat pump water heating systems.

A new BRANZ report in conjunction with EECA found that, for 11 such systems installed in regular houses, COPs of up to 2 could be achieved. However, different systems varied in their performance. It is important that the supplier confirms the level of performance the unit will operate to.