

Solar Hot Water with Wood Heater Boosting

Just what are the options available for boosting your hot water system from a wood heater?

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Solar hot water and wood heaters make a perfect combination. With a correctly sized solar hot water system, the sun will provide at least 70% of a household's hot water needs. However, in the colder months solar hot water systems need boosting, and this is precisely the time of year when households with wood heaters will be using them to keep warm. Why not tap some of the heat going up the flue to heat the water? Where houses are off the reticulated gas grid then wood heating is more appropriate and common in Australia's cooler states. In these circumstances, it makes good sense to use wood heaters or stoves fitted with water jackets, otherwise known as 'wet-backs', to provide hot water boosting.

Water jackets come in two types: -

1. A water jacket within the firebox - preferred because of the more efficient heat transfer to the water. The ideal is to have these fitted in the factory at the time of purchase. This is possible with stoves, ovens and furnaces and a small number of ordinary wood fires. Wetbacks should not exceed 5 kW in size if they are being used only for hot water, and not also for central heating purposes.
2. A flue water jacket, that replaces the first section of flue, is a way of converting an existing fire that has an accessible flue (i.e. not in a chimney) to a water heater. These are generally made of stainless steel and can fit a variety of flue sizes.

Whilst solar hot water retailers commonly have systems available that use either electricity or gas for boosting, few retailers have any knowledge of how to integrate wood heaters for boosting, so finding out how to do this is not always straightforward. In this article, we will try to give you a clear explanation of how to safely and easily use wood heaters to do this.

Why boost at all?

Wherever you live in Australia, solar hot water systems will perform well and provide at least 70% of a household's hot water needs year round. An appropriately sized system will provide all of a household's hot water needs in the summer and most of the needs in the autumn and spring, but will still require some form of supplementary heating, particularly in winter in the southern regions. Health codes require that all solar hot water systems be installed with an additional heat source as an integral part of the system, in order to guarantee that the temperature rises to at least 60°C to ensure that no dangerous bacteria breed in the hot water system. So the booster not only guarantees the water is hot enough during extended cloudy periods or in the winter time, it also ensures your hot water is safe to use all year round.

Most people who install wetback boosters will also have an electric element or gas booster connected. This means that if they have not lit the fire on days of low sun radiation, or they have an unusually high hot water demand, they can simply switch on the booster element.

No Explosions Please!

Electric and gas boosters have thermostats to switch them off when the hot water systems storage tank reaches a predetermined temperature, normally 65°C. Wood heaters, on the other hand, are an 'uncontrolled heat source'. This means that the input of heat from the firebox to the hot water storage tank cannot be easily and quickly switched on or off; wetbacks will just keep on adding heat whilst the fire is going. We recommend that you never cut off the water flow to the wetback, as this can cause a potentially explosive build-up of steam! Running the fire with an empty wetback can cause it to burn out very quickly, dramatically reducing its lifespan.

There are two options for dealing with this concern safely. Both options require the hot water storage tank to be located above the wood heater and sufficiently high so as to ensure the wetback always has water in it. The systems thermosiphon* heat transfer must not be impeded by any

constrictions. As the water heats up, it is critical that the flow of hot water up to the storage tank and the return of cooler water back down to the wetback is not impeded.

Option 1: Connecting wet-backs to mains pressure storage tanks

Using wood fires to boost mains pressure solar hot water systems works best with the traditional roof mounted 'close-coupled' solar tanks, because the solar tank is located above the level of fire. Most solar hot water storage tanks are at mains pressure and therefore need to use a heat exchanger, which is normally installed in the roof space just below the level of the solar hot water storage tank.

In principle, this is a simple device with one pipe inside another, larger pipe. The outside pipe usually has the water from the wetback flowing through it and is 'open vented' at low pressure, whilst the inner pipe transfers heat from the outer pipe into the solar storage tank at mains pressure. The outer pipe has an extension rising up to a small open vented make-up or header tank situated just above the centreline of the main storage tank. Any water lost due to the wetback reaching boiling point is replenished from this header tank. Heat exchangers and their header tanks are available through solar hot water specialists.

Many solar roof tanks in Australia's cooler states have glycol (a frost resistant heat transfer fluid) going through the solar collector panels and a separate heat exchanger within the solar tank. In these types of systems it is this fluid, glycol, that the water from the wetback heats in the heat exchanger suspended in the roof space below the solar unit.

Option 2: Connecting wet-backs to low pressure storage tanks

Some solar hot water systems have the storage tanks 'open vented' so that the main body of stored hot water is not under mains pressure. These systems either rely on gravity feed to supply the hot water to the house or they have their own internal heat exchanger coil inside the tank, with the water inside the heat exchanger supplying the house at mains pressure. Wetbacks can be safely connected directly into the low-pressure open vented part of these tanks, so with these systems a separate heat exchanger is not required.

Using a wood fire on a winter's day to keep warm, while at the same time boosting the solar hot water system, allows households with this set-up to enjoy virtually free hot water all year round. Well-maintained wood fires burn so efficiently that they create relatively small quantities of greenhouse gases, using the renewable resource of wood. In fact, they emit less than 20% of the greenhouse gases emitted from open fireplaces! Wood is not a fossil fuel and can be harvested from timber planted for wood and firewood.

** Thermosiphon is the process of heat rising and in so doing it sucks cooler water into the bottom of the solar collector or water jacket when there is a flow-and-return circuit.*

- ' **'Close-coupled' refers to solar hot water systems where the solar storage tank is on the roof above the solar heat collector panels – the heat is transferred to the water in the tank above by Thermosiphon.*
- ' **'Open-vented' is a term that describes a hot water storage tank that is one that delivers gravity fed water (i.e. water pressure will be governed by the height of the tank above the water outlet). These tanks are ideal for use where an uncontrolled heat source such as fire or solar is used to heat the water. They usually have a header / make-up tank with a ball cock to replenish the water in the main tank as it is being used.*

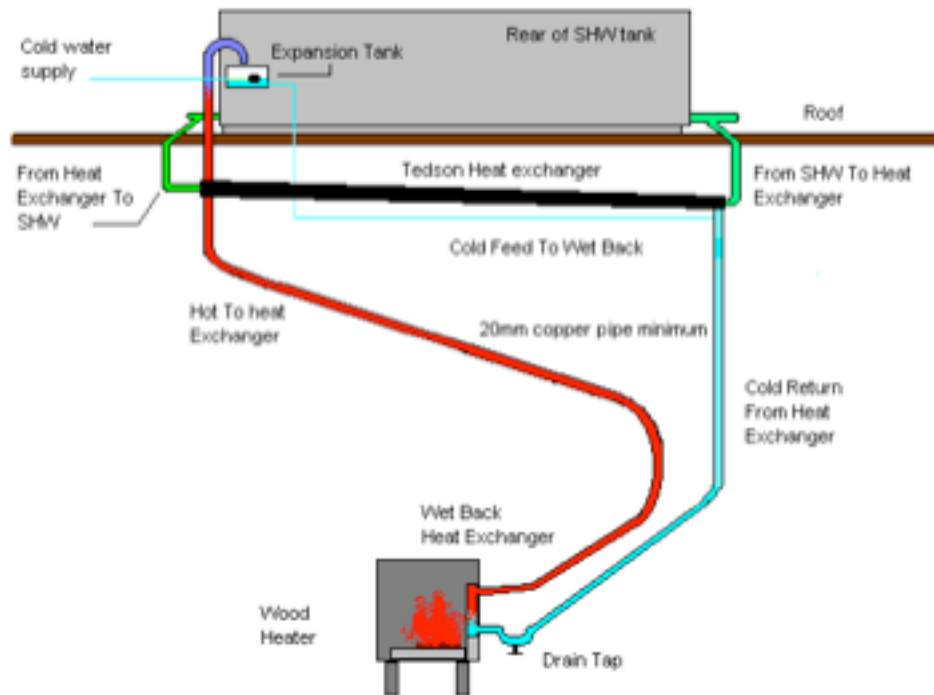
Insolar

Insolar is a solar hot water specialist offering a range of solar hot water technologies and brands and a range of wood fires and stoves, heat exchangers and water jackets. Insolar has a showroom at 441 Flemington Road, North Melbourne VIC 3051.

03 9328 4884, www.insolar.com.au

Heat Exchanger as an Example

Tedson Heat Exchanger



MATERIAL COSTS

| | |
|--|--|
| 305 litre stainless steel roof mounted solar water tank with 2 solar panels and installation kit | |
| Wood Fire suitable for 15 Sq room | |
| Water jacket (4kW) | |
| Flue kit | |
| Heat exchanger with make up tank | |
| Average amount of copper pipe, tempering valve and fittings | |

Recommended Retail Price

| |
|----------|
| \$ 4,065 |
| \$ 1,349 |
| \$ 215 |
| \$ 438 |
| \$ 481 |
| \$ 650 |

\$ 7,198
=====

The installation cost of all the above equipment would be somewhere around \$1,100.

REBATES

The solar component of this system qualifies for a Federal Government Rebate of 21 RECs (Renewable Energy Certificates which fluctuate in value depending on the market for RECs) The value of the REC is \$42 as at the print deadline and so a rebate claim made on this date would result in a rebate of \$882. If the Solar hot water system is replacing an *existing* electric hot water service in an existing (NOT NEW) household where the combined household annual income is less than \$100,000 then there is another \$1,000 rebate available.

COST OF FITTING SOLAR AND WOOD BOOSTING TO AN EXISTING SLOW COMBUSTION FIRE

| | Recommended Retail Price |
|---|-----------------------------|
| 305 litre stainless steel roof mounted solar water tank with 2 solar panels and installation kit | \$ 4,065 |
| FLUE COLLAR Water jacket (2-3 kW) | \$ 499 |
| Heat exchanger with make up tank | \$ 481 |
| Average amount of copper pipe, tempering valve and fittings | \$ 650 |
| | ----- |
| | \$ 5,695 |
| | ===== |

The installation cost of all the above equipment would be somewhere around \$800

REBATES

As above

