SOLAR WATER HEATING –

IT'S TIME TO UPSKILL #13: DESIGNING SWH SYSTEMS FOR COMMERCIAL SITUATIONS

By Ian Sumner

Ian Sumner's solar upskilling series continues in this issue. In the previous article, he looked at how to manage overheating. Now, he starts to look at the challenges faced when designing a solar water heating system to serve commercial applications and why an installer should not just install a conventional domestic system without first considering the implications.

The key differences between domestic and commercial applications are that the commercial application:

- requires hot water on demand
- often has periods of relatively low or no hot water demand
- often has periods of relatively high hot water demand
- is often large and has complex hydraulics
- often has significant structural requirements

This article looks at the variable nature of the hot water demand.

Variable hot water demand - The hot water demand in commercial buildings is extremely variable. The designer must determine this likely variability and take this into account when designing a system. This will require research of similar facilities and may require these similar facilities to be monitored and data logged.

Experience is the key to an appropriate and reliable design. The design process requires a logical and methodical approach, often utilising a range of computer simulation packages to support the decisions made. These software packages will predict likely energy savings to be made and will highlight system temperatures etc.

Many commercial buildings are vacant during the peak summer months, such as an office building being closed for two weeks or so over Christmas, or a school being closed for the summer holidays. An office building will also often have a significant hot water draw off in the early morning, for instance, when the employees arrive. Some will want to take a shower after having cycled or run to work. There are many patterns of hot water demand and the system must be able to adequately and reliably manage these periods of either low or no demand or a significant draw off.

Hot water 'on demand' – In most domestic systems, the backup heating is left switched off for most of the day then is either automatically or manually switched on towards the end of the day. Although this maximises the energy savings, the hot water within the cylinder is often below the required temperature until there has been sufficient solar gain to heat the water. If an occupant wants hot water they may have to boost the water temperature. Whilst this is generally acceptable for domestic environments, it is not acceptable in a commercial one.

The solar preheated system ensures that there is hot water on demand. The temperature of the hot water drawn off at the taps is not dependent on the amount of solar gain available. In this type of system, the customers see a seamless supply of hot water delivered to the points of use.

The solar preheated water can be supplied to the following boosting systems:

1. *An instantaneous gas water heater* as shown in *Figure 1 below*. If the water being heated by the solar system is up to temperature, the bypass valve in the hot water supply diverts the water around the instantaneous gas heater. If the water is not up to temperature the bypass valve directs the water through the instantaneous heater to be heated.

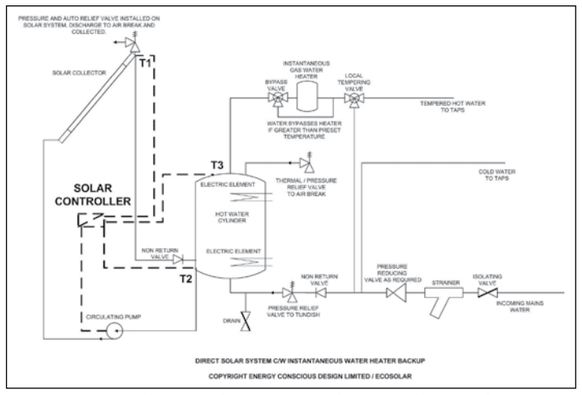
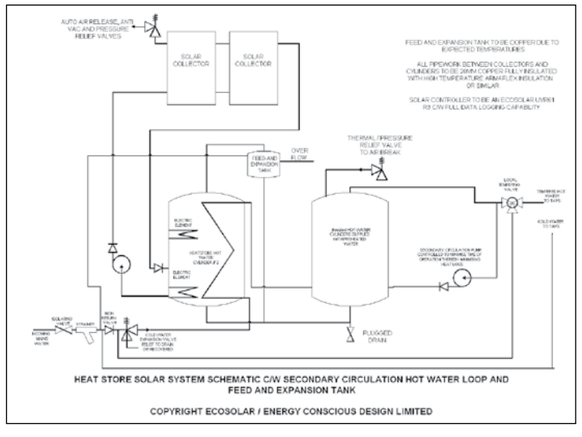


Figure 1: Direct solar water heating system being used as a preheater to an instantaneous gas heater

2. *A backup heated cylinder* as shown in *Figure 2 below.* The solar heated water is supplied from the preheat cylinder to the boosting cylinder as its cold water supply. The boosting cylinder may be heated by electric elements, gas boiler or another heat source. Figure 2 shows an EcoSolar heatstore being used as the preheater cylinder.



TECHNICAL

> "HOT WATER DEMAND IN COMMERCIAL BUILDINGS IS EXTREMELY VARIABLE"

Managing periods of low demand – Many types of solar water heating system would not satisfactorily manage the overheating resulting from significant periods of no hot water demand and would result in additional maintenance or early failure.

In previous articles, we have highlighted various methods of dealing with the risk of overheating and this needs to be an intrinsic part of the system design. We summarise these again below:

1. Using a drainback system
2. Utilising heat dump and heat exchange circuits
3. Automated shades
4. Tracking sytems

Options 3 and 4 are often the most expensive and are rarely utilised especially in the aggressive New Zealand environment. So a designer needs to be fully conversant with the first two options, which were described in more detail in previous articles. At Energy Conscious Design, we most often use the drainback system, but each option has its applications.

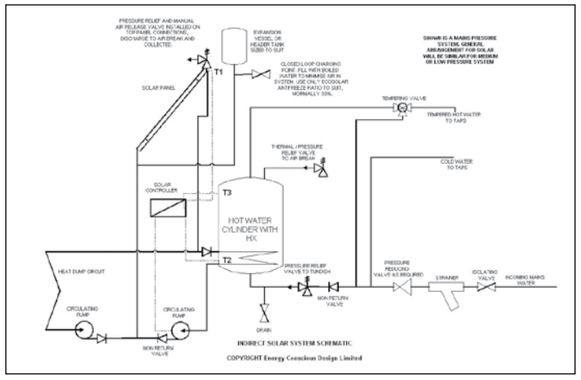


Figure 3: Mains pressure indirect solar system c/w heat dump circuit. Once the cylinder is up to temperature, excess heat is dumped to another heat sink. This may be to a swimming pool, or, with external heat exchangers, to the environment.

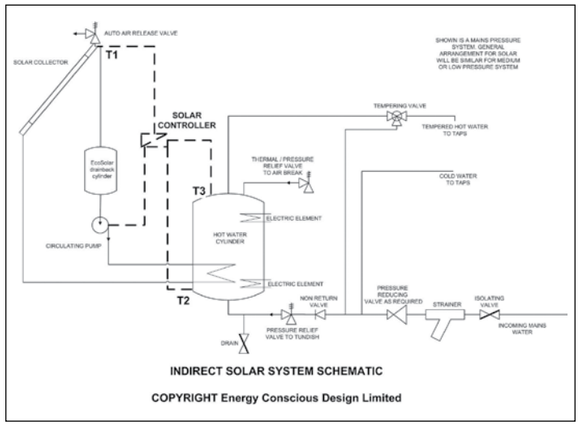


Figure 4: *Indirect drainback system utilising a special receiver in the solar circuit.* Once the cylinder is up to temperature the pump is turned off and water drains from the collectors.

Solar water heating training sessions to tour New Zealand

Energy Conscious Design and EcoSolar, in conjunction with several trade and professional industry associations, are in the final stages of preparing training sessions that will tour New Zealand. These training sessions are suitable for both specifiers, designers and installers. Please contact Energy Conscious Design for dates and seminar locations.

For more detailed information please request a free copy of the latest EcoSolar Solar Hot Water Installation Guide or send any questions or requests for topics to be covered to Ian Sumner. Email on ian@ecosolar.co.nz or call 0800 ECOSOLAR (0800 32676527).

About the author: Ian Sumner of Energy Conscious Design Ltd and EcoSolar previously worked as a plumber. He subsequently completed a degree in building services design and has completed a thesis on trying to get solar hot water to be cost effective in the UK. He has local experience in solar system design and installation and is currently the only solar water heating system engineer accredited by the Solar Industries Association in New Zealand. Ian says, "This series of articles is intended to be an introduction to solar water heating only and I do not intend to provide specific design advice."

This article is available for download at the Energy Efficiency Interest Group in the members' area of www.masterplumbers.org.nz or from EcoSolar.