

Homeowners: Solar Water Heating Tanks

From RVR

Solar Panels

The water heating tank is a very important component of any solar system. It makes use of the energy collected from the sun by heating and storing hot water.

The size of the water heating tank is very important. Too small and you won't be able to store all the energy the solar panels collect. Too large and the panels won't be able to provide enough energy to heat the water in the tank.

A typical older home in Ireland has a water heating tank which is often 30 gallons. This is the equivalent of just over 110 litres. However, because this is attached to a powerful boiler or electric immersion, it is possible to heat more water very rapidly once the stored hot water is used.

With a solar heating system, the tank needs to be much larger. This is because the panels can not provide instant heating. Instead, they collect the sun's rays during the course of the whole day. This needs a large tank to store all the collected energy, so that it can be used later when needed.

The water heating tank in a solar heating system is typically 2-300 litres and this would suffice for up to 4 or 5 people living in a house. The tank size and number of panels can then be increased to cater for more people living in the house.

The most common option for a solar heating system is a Twin Coil Water Heating Tank. However there are several options available when considering a solar tank.



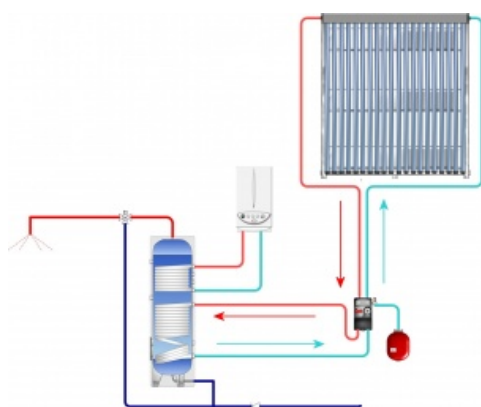
Water Heating Tanks

Twin Coil Water Heating Tanks

Most Solar water heating systems in Ireland use a twin coil water heating tank. This is because solar is at its' best in summer time and the best use for solar during these months is for water heating.

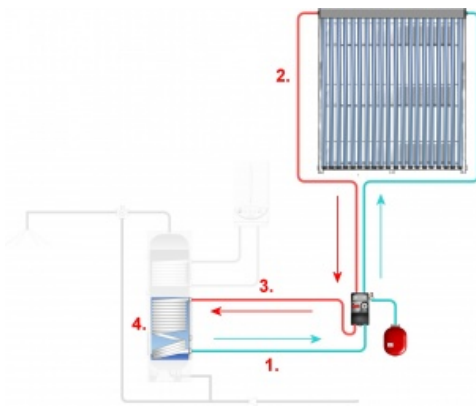
With a twin coil water heater, a boiler or other heat source must always be connected along with the solar loop. This is because while solar provides enough heat in summertime to provide all the water heating, in wintertime days are shorter and there is much less sun. As a result, solar MUST have a back up heat source which can supplement it.

Twin Coil Water Heater - Schematic



This is a schematic of a typical solar heating system. It has one or more solar panels, a twin coil water heating tank, all the additional necessary controls as well as a supplementary heat source. In the schematic above it is a gas boiler, however it could also be an oil boiler, wood pellet boiler, heat pump or other heat source.

The Solar Loop

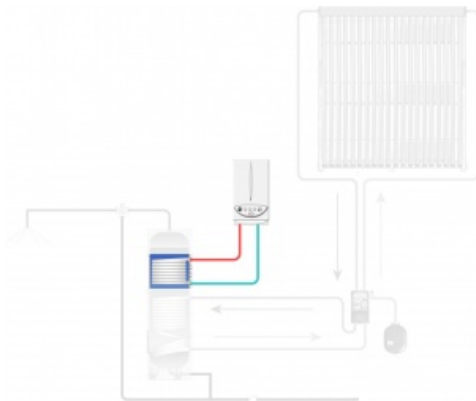


Here we have highlighted the "solar loop". The coil in the bottom of the twin coil water heater is connected up to the collectors via a pipe run. The return pipe is connected back down into the same coil.

1. The cool fluid in the solar loop is pumped up, through a pump station, to the panels.
2. The panels heat the fluid
3. The heated fluid continues back down the pipework into the coil in the tank.
4. The fluid is not in contact with the water in the water heating tank. Instead it heats it indirectly through the coil. The coil has a very high surface area, which means the heated fluid warms the surrounding water very quickly. The cooled fluid repeats this process from step #1.

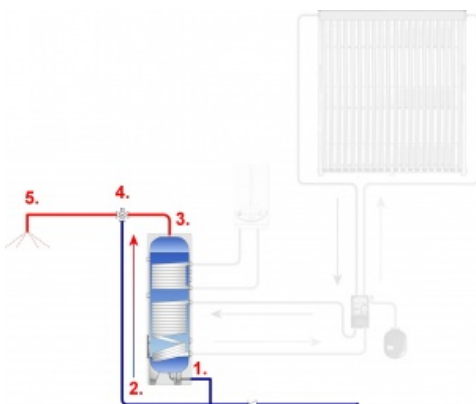
It is important that the solar loop is always connected to the bottom coil. This is because hot water rises and cold water drops. By having the solar connected to the coolest bottom part of the tank, the efficiency of the solar system will be much better and little energy will be wasted.

The Supplementary Heat Source



Above we have highlighted the supplementary heat source. It is connected to a coil in the top of the Water Heating Tank. This is because when a tap is opened, the hot water is taken from the top of the tank. By having the supplementary heat source connected to the top coil, it can operate and boost the temperature of the top of the tank without affecting the operation of the solar system.

How the Water Heater works and is connected to your plumbing



The schematic above shows how the water heater works and how it is connected to the taps and showers etc.

1. Cold water is brought into the tank as hot water is used.
2. As the cold water is heated by either the solar loop or supplementary heat source it rises up to the top of the tank
3. The hot water is drawn from the top of the tank

4. A special "Mixing / Blending Valve" is used to make sure that water is never delivered to taps or showers at temperatures over 50°C. It does this by mixing the hot water with cold water before it reaches the taps or showers. This safety feature prevents scalds or burns and is an essential part of every solar system.
5. Hot water comes out of your showers or taps.

Different Types of Twin Coil Water Heaters

Twin coil water heaters can be manufactured from a number of different materials. However three types of materials are most common in Ireland.

Copper Water Heaters

Traditionally, copper was used in the manufacture of water heaters. However as modern water heaters are usually installed in a pressurised system where a pump pressurises the water coming from the tanks, these are becoming much less common. Existing copper tanks are usually not strong enough to be pressurised, and the high cost of manufacturing a copper water heater of sufficient size and able to withstand high pressures means they are not generally used in modern houses.

Older copper water heaters had poor or no insulation and needed "lagging jackets". newer copper water heaters generally have a hard foam insulation.

RVR no longer supply any copper Water Heaters.

Stainless Steel Water Heaters

Stainless steel water heating tanks provide the highest level of quality.

There are different grades of stainless steel used in the manufacture of twin coil water heating tanks. These different grades offer varying levels of protection against corrosion from lime and deposits in the water. RVR recommend the use of 316 grade Stainless Steel water heating tanks as they offer the best form of protection against corrosion which is encountered in many areas of Ireland.

Many manufacturers sell products as "Stainless steel water heaters" but it important to check that these are not 304 grade or duplex stainless steel as these do not offer the same protection against corrosion and will have a much shorter lifespan. There is little price difference between newer 316 grade and other grade tanks.

Stainless steel tanks often use copper coils as this provides a better heat exchange within the tank.

These tanks usually have 40mm or more insulation as this helps to retain heat for longer.

RVR supply a range of stainless steel water heaters under the RVR Solar brand and from TML. Please see the Stainless Steel Water Heaters (http://www.rvr.ie/default.aspx?subj=catalog/ProductsList&catIdPath=0_42_120_51) product group for more information. All these products use 316 grade stainless steel.

Enamelled Steel Water Heaters

Enamelled steel tanks are made by firing a powdered glass at temperatures over 850°C in order to fuse it to the surface of a form of mild carbon steel as used in older radiators.

This is a very low cost type of steel and by adding an enamelled coating to the inside makes it more resistant to lime and deposits in the water. However, these products must also include a sacrificial anode which further reduces the risk of corrosion. This must be checked annually and replaced if worn.

This form of manufacture offers a very low cost water heating tank but it does require an annual check to ensure good operation.

RVR supply a range of enamelled steel water heaters from Calpak and TiSun which offer good savings in larger systems. Please see the Enamelled Steel Water Heaters (http://www.rvr.ie/default.aspx?subj=catalog/ProductsList&catIdPath=0_42_120_107) product group for more information. Enamelled steel tanks are also used in TiSun solar heating kits.

Heat Exchanger Kits

With a heat exchanger kit, it is possible to use an existing single coil water heater with a solar heating system. The water heater must already be of a large enough size to store the solar energy that is collected. For example, a 30 gallon / 110 litre tank would not be a good choice for using a heat exchanger. However a 200 litre or 300 litre or larger water heater would.

In this situation the coil in the water heater remains connected to the existing heat source. A heat exchanger kit is added which allows the solar fluid to indirectly heat the water from the water heater.



A copper water heater



A Stainless Steel Tank



An Enamelled Steel Tank



1. The cooled solar fluid is pumped up around the panels, where it is heated and returned down to the heat exchanger
2. Cold water is drawn from the bottom of the tank and pumped through the heat exchanger.
3. The now warm fluid in the heat exchanger transfers its' heat into the cold water. The heated water is returned back to the top of the tank. The solar fluid repeats the process from step #1.

There are several reasons this may be used instead of a twin coil tank.

- A single coil water heater of sufficient size is already installed
- A twin coil water heater is already installed but both coils are already used
- Minimises disruption if the water heater is large enough to accommodate solar

Further Reading

For further information on the different aspects of solar heating, please read the associated pages in the "Information for Visitors" menu at the top left of the site.

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