

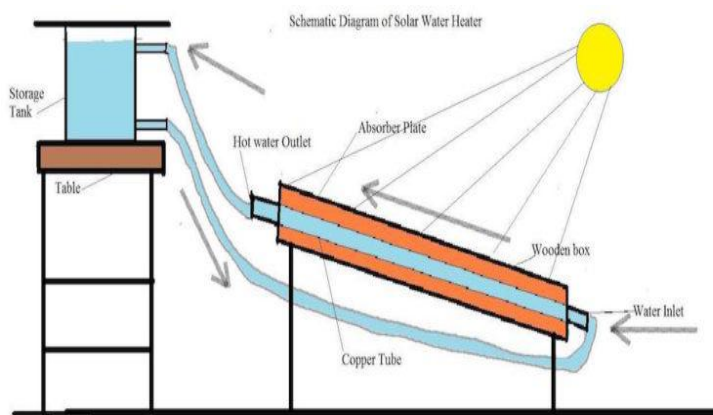
solar water heater working principles

The components of solar water heater

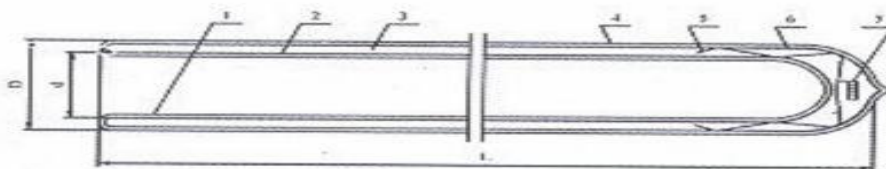
[The solar water heaters](#) have various designs, while they all consist of collector and storage tank. The collector in solar water heater is used to collect the radium from sunlight to heat the water. The storage tank is used to store the water for later use. Solar water heaters are typically described according to the types of collector and the circulation system. Different types of solar water heaters have disparate ways to work.

How solar water heater works?

The solar water heater has an array of solar collectors to collect the energy from sunlight, the collectors are connected to each other. The tank is located on the collectors to store the water. During the day time, the water was heated. Under the principle of gravity (the density of hot water is lower than that of cold water), the cold water is heated circularly. The hot water will go up to tank for later use.



vacuum tube's working principle



1. inner tube
2. selective absorption layer
3. vacuum space
4. outer tube
5. underprop-spring clip
6. inspiratory layer
7. getter

[The vacuum tube](#) is composed of inner tube, outer tube, selective absorption layer, vacuum space, inspiratory layer. We use the inner tube to store water. The outer wall of the inner tube is the selective absorption layer. The space between outer tube and inner tube is the vacuum space. At the bottom of the outer tube, there is an inspiratory layer which can be used to absorb the remnant air.

Selective absorption layer transforms solar energy into heat energy, vacuum space can be considered as the insulation to protect the heat energy from losing. Inspiratory layer can absorb the air which filters from atmosphere into the vacuum tubes.

Different kinds of collectors' working principle

[Solar Flat-plate collector](#)'s working principle

The flat plate collector is usually composed of copper tubes fitted to the flat absorption plate. The most common configuration is a series of parallel pipes connected by two pipes at each end,

inlet and outlet manifolds. The flat panel assembly is contained in the insulated box and covered with toughened glass. The flat plate solar thermal collector is suitable for residential or commercial solar water heating projects. It is one of the lightest flat plate panels on the market, but allowing for the maximum heat transfer. Our Flat Plate Solar Collectors are constructed of durable aluminum so that they can withstand heavy weight and changing environmental conditions. It is also cost efficient and environmentally friendly.

[Solar evacuated tube collector](#)'s working principle

Vacuum tube collector is the most effective collector. In principle, each vacuum tube is similar to a thermos flask. The tubes containing water or heat conducting fluids are surrounded by larger glass tubes. The space between them is vacuum, so the heat loss in the fluid is very small. These collectors can even work well on cloudy days and at temperatures below - 40° F. You only need to replace individual pipes as needed. But vacuum tube collectors cost twice as much as flat plate collectors. Our tubes are made up of stainless, which can protect the solar water heater from damage in rainy days.

Solar batch collector's working principle

Intermittent collectors, also known as integrated collector storage (ICS) systems, heat water in dark water tanks or pipes in insulated box, where stores water until it is drained. If household demand is low, water will stay in the collector for a long time, and be kept hot. The temper valve mixes in cold water to lower the temperature of the water before it is conveyed to the tap. While batch collector is generally not recommended for the areas have cold climate.

Different circulation systems' working principle

Direct systems

The direct system circulates water through a solar collector, which is heated by the sun. Then the heated water is stored in the water tank, sent to the water heater without water tank or used directly. These systems are preferable in less icy climates. Protect it from freeze is necessary in cold climates.

Closed-loop or indirect systems

Closed-loop or indirect systems use non-refrigerated liquids to transfer heat from the sun to water in storage tanks. The energy of the sun heats the fluids in the solar collector. The liquid then passes heat to water through a heat exchanger in the tank. The non-refrigerated liquid is then circulated back to the collector. These systems make sense in cold climates.

Active or forced circulation systems

Active or forced circulation systems use electric pumps, valves and controllers to transport water from collectors to storage tanks. These are common in the United States.

Passive systems

Passive systems do not require pumps. Natural convection heats water from the collector to the storage tank.

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