

# Solar Water Heater

A solar water heater consists of a collector to collect solar energy and an insulated storage tank to store hot water. The solar energy incident on the absorber panel coated with selected coating transfers the heat to the riser pipes underneath the absorber panel. The water passing through the risers get heated up and is delivered to the storage tank. The re-circulation of the same water through absorber panel in the collector raises the temperature to 80 C (Maximum) in a good sunny day. The total system with solar collector, storage tank and pipelines is called solar hot water system.

Broadly, the solar water heating systems are of two categories. They are : closed loop system and open loop system. In the first one, heat exchangers are installed to protect the system from hard water obtained from borewells or from freezing temperatures in the cold regions. In the other type, either thermosyphon or forced circulation system, the water in the system is open to the atmosphere at one point or other. The thermosyphon systems are simple and relatively inexpensive. They are suitable for domestic and small institutional systems, provided the water is treated and potable in quality. The forced circulation systems employ electrical pumps to circulate the water through collectors and storage tanks.

The choice of system depends on heat requirement, weather conditions, heat transfer fluid quality, space availability, annual solar radiation, etc. The SHW systems are economical, pollution free and easy for operation in warm countries like ours.

Based on the collector system, solar water heaters can be of two types.

## **Flat Plate Collectors (FPC) based Solar Water Heaters**

The solar radiation is absorbed by Flat Plate Collectors which consist of an insulated outer metallic box covered on the top with glass sheet. Inside there are blackened metallic absorber (selectively coated) sheets with built in channels or riser tubes to carry water. The absorber absorbs the solar radiation and transfers the heat to the flowing water. There are 60 BIS approved manufacturers of Solar Flat Plate Collectors.

**Evacuated tube collectors.** Flat plate collector (FPC) based systems are of metallic type and have longer life as compared to Evacuated tube collector (ETC) based system because ETCs are made of glass which are of fragile in nature.

Both these systems are available with and without heat exchanger. They can also work with and without pump. Systems without pump are known as thermosyphon systems and those with pump are known as forced circulation systems.

ETC based systems are cheaper than FPC based system. They perform better in colder regions and avoid freezing problem during sub-zero temperature. FPC based systems also perform good with anti-freeze solution at sub zero temperature but their cost increases. In other regions, both perform equally good. Systems working on thermosyphon principle are simple and relatively inexpensive. They are suitable for domestic and small institutional applications, provided water quality is good and it

doesn't have large chlorine contents. Forced circulation systems are generally preferred in industries or large establishments.

At places where water is hard and have larger chlorine content, if FPC based system is being installed, it must be with heat exchanger as it will avoid scale deposition in copper tubes of solar collectors which can block the flow of water as well reduce its thermal performance. ETC based systems will not block the flow of water but its performance may go down due to deposition of salt contents on inner surface of glass tubes, which could be cleaned easily once in a year or so.

### **Salient Features of Solar Water Heating System**

Solar Hot Water System turns cold water into hot water with the help of sun's rays.

- Around 60 deg. – 80 deg. C temperature can be attained depending on solar radiation, weather conditions and solar collector system efficiency
- Hot water for homes, hostels, hotels, hospitals, restaurants, dairies, industries etc.
- Can be installed on roof-tops, building terrace and open ground where there is no shading, south orientation of collectors and over-head tank above SWH system
- SWH system generates hot water on clear sunny days (maximum), partially clouded (moderate) but not in rainy or heavy overcast day
- Only soft and potable water can be used
- Stainless Steel is used for small tanks whereas Mild Steel tanks with anti-corrosion coating inside are used for large tanks
- Solar water heaters (SWHs) of 100-300 litres capacity are suited for domestic application.
- Larger systems can be used in restaurants, guest houses, hotels, hospitals, industries etc.