Solar Water Heating Systems for Industrial Applications.

A Tata BP Solar Initiative.

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Tata BP Solar's SWHS systems across India.








'A picture says a thousand words' – We at Tata BP Solar let our body of work installed and commissioned under a variety of circumstances speak for itself.

Introduction to Solar Water Heating Systems:

Hot water and steam form an integral part of various industrial and commercial applications and with rising oil prices, there has never been a better time to look at heating water by harnessing energy from the Sun.

Typical 'Solar Water Heating System' (SWHS) components.

Solar Water Heating Systems (SWHS):

The main components of a typical Solar Water Heating System are:

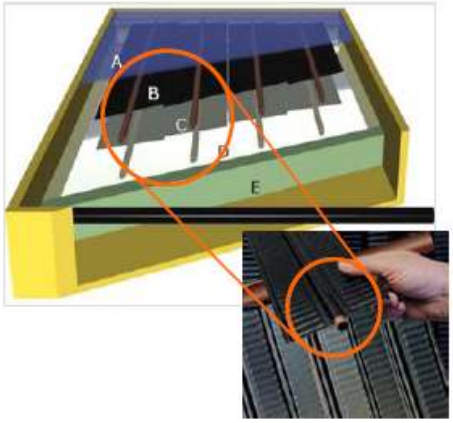
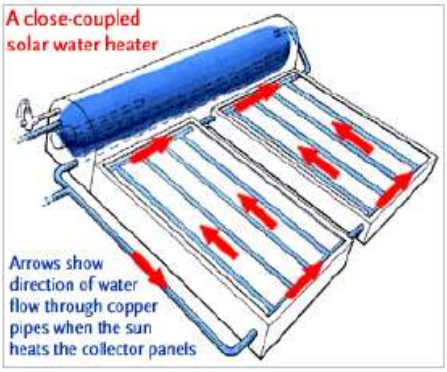
- **Solar Collectors:** functions as the primary heating source.
- **Insulated SS 304 hot water tank:** for storing hot water.
- **Insulated piping:** regulate flow of water between components.
- **Air vent:** to release trapped air from hot water tank.

Special features from Tata BP Solar:

Based on our experience of over a decade designing & installing large capacity systems, Tata BP has developed numerous features that enable us to custom design our system to suit specific site/customer requirements:

- **Heat Exchanger Model:** where water quality is poor (>300ppm) it may cause the system to clog greatly reducing efficiency and increasing maintenance cost. A heat exchanger of HHC model ensures that water to be heated does not pass through our solar collectors ensuring a highly robust solution.
- **Auxiliary tank:** helps regulate and maintain the temperature of water in hot water pipes for a 'ring main system' to minimize losses.

Solar Thermal Technology:

The Solar Collector	Principle of Thermo-siphon Action
	

Solar Collector:

- A collector consists 9 copper tubes (C) with copper fins (B) encased in an aluminium box (usually powder coated in yellow) with a glass top (A).
- The quality of copper used by Tata BP Solar is 99.9% pure electrolytic copper with selective coating using 'Black chrome technology'.
- A reflective surface at the bottom (D) and rock-wool ensures that any energy that passes between the fins gets reflected back onto the copper fins to ensure optimum performance in any condition.
- The collectors measure approximately 2m x 1m and are fixed at an angle (w.r.t to the horizontal equal to the latitude of the site) facing the South sky in a shadow free flat surface area.

Principle of Heating Water thro Solar:

The technology to heat water using solar energy is based on two simple principles:

- **Thermo-siphon action:** Is based on a simple principle that hot water is less dense and hence tends to rise above colder water.
- **Black body absorption:** It is a well known fact that a black body absorbs heat which can be used to heat water.
- The Sun's rays heats the black powder coated copper fins (larger surface area) which in turn heats the cold water in the copper tubes. The heated water slowly rises in the copper pipes thro thermo-siphon action and eventually gets stored in the hot water storage tank.
- This principle ensures that no electricity is used in the entire system.

Applications for SWHS:

- Large scale hot water usage for bathing & laundry applications in hotels, hospitals, hostels and even hi-rise apartment buildings.
- Pre-feed for boilers for steam generation for various industrial applications.
- Milk dairies for applications such as pasteurization, condensation & cleaning.
- Leather processing industry for drying and tanning.
- Metal finishing industry for degreasing and phosphating.
- Resin emulsification in polymer industry.
- Drying & related processes in pharmaceutical industry.
- Solar drying thro air-heating is an area of growing interest.
- Swimming pool heating is a popular concept in India and abroad.

Thumb Rules:

- Surface area of each collector: **2m x 1m**
- Flat / roof area required per collector: **3.5 sqm**

Table to calculate no. of collectors (No. of collectors per 1000 liters):

	Cold climates & N. India	*Rest of India*
For 60 ° C	**10**	**8**
For 70 ° C	**12**	**10**
For 80 ° C	**15**	**12**

TOTAL FLAT/ROOF AREA required for installing SWHS *(in sqm)*:

$$\left(\frac{\text{Total volume of Hot Water required (in litres per day)}}{1000}\right) \times \text{No. of collectors from table above.} \times 3.5\text{sqm}$$

Notes:

- *3.5 sqm assumes area required per collector, interconnecting insulated piping between collectors & hot water storage tank fixed vertically.*
- *1 sqm ~ 10.75 sq ft or 3.5 sqm ~ 37.5 sqft.*

Pollution facts:

- India currently is currently the **5th largest polluter** *(at 3.5% of the world).*
- Tata BP Solar last year manufactured over **52,500** solar collectors.
- Globally SWHS saves equivalent of **80,000+ MW** of energy!
- For every Unit saved, we prevent **1kg of CO2** from being released.