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# SOLAR WATER HEATING SYSTEM (SWHS)

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**ABSTRACT:**
Now a day, need of hot water is much for domestic use and for industrial use. There are various resources i.e. coal, diesel, gas etc, which are used to heat water and sometimes for steam production. Solar energy is a renewable source of energy which is pollutant free. Available sources of energy produce many pollutants and are limited. Hot water is produced in the presence of sun light using the solar water heating system. According to Renewable Energy Policy Network data [2011], more than 85 million people feel the necessity for daily use of hot water. Solar water heater is not only eco-friendly but it requires low operating cost and maintenance cost as compared with any other devices. Generally, solar water heaters are of two types, active solar water heater and passive solar water heater. This review describe about the researches conducted on solar water heater by various researchers.

**KEY WORDS:** solar energy collector, storage tank, active & passive solar water heater system, heat transfer fluid.

**INTODUCTION:**
The solar water heating system is a device which is used for production of hot water by the use of solar energy. Solar energy is absolutely free of cost and eco-friendly. The supply of solar energy is continuous and unlimited in the day when sunlight is available. During the use of solar energy, it does not produce any pollutant. So it is an environment friendly source of energy. A large amount of energy is required for heating water and space heating. Hot water is used for bathing, for washing, utensils, other domestic purpose and as well as for industries. The solar water consists of many components as absorber plate, casing, pipes, storage tank etc.

Fig.1. Solar water Heater

## SOLAR WATER HEATER SYSTEMS:

There are many advantages of solar water heating system, includes it does not require any cost of electricity. The running cost and maintenance cost of the system is comparatively low. There are mainly two types of solar water heating system as Active solar water heating system and passive solar water heating system. In passive solar water heating system water heats up naturally but in Active solar water heating system, some mechanical force is required to increase the temperature of water.

## PASSIVE SOLAR WATER HEATER:

In case of passive systems, heat transfer fluid circulate by natural convection between a collector and an elevated storage tank. The phenomenon is simple, as the fluid heats up its density decreases and the fluid becomes lighter and rises to the top of the collector where it is drawn to the storage tank. The fluid which has cooled down at the foot of the storage tank then flows back to the collector. Passive systems may less expensive comparatively active systems, but they are a less efficient. Thermo siphon system is one of the best example of passive systems.

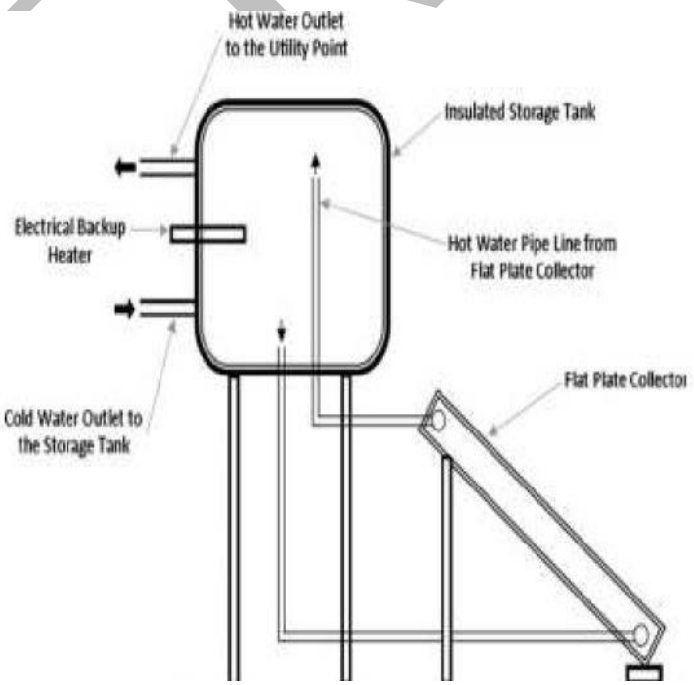


Fig.2. Passive solar water Heater

## ACTIVE SOLAR WATER HEATER:

Unlike passive system, active systems use electric pumps to circulate water or other heat-transfer fluids through the collectors. So, the Active systems are also called forced circulation systems and can be direct or indirect. The active system is further divided into two categories:

• Open-loop (Direct) Active System

• Closed-loop (Indirect) Active System

(a) Open-Loop Active Systems

Open-loop active systems use pumps to circulate water through the collectors. This design is efficient and lowers operating costs but is not appropriate if the water is hard or acidic. These open-loop systems are popular in non-freezing climates.

(b) Closed-loop active system:

This system pump heat-transfer fluids (usually a glycol-water antifreeze mixture) through collectors. Heat exchangers transfer the heat from the fluid to the household water stored in the tanks. Closed-loop glycol systems are popular in areas subject to extended freezing temperatures because they offer good freeze protection.

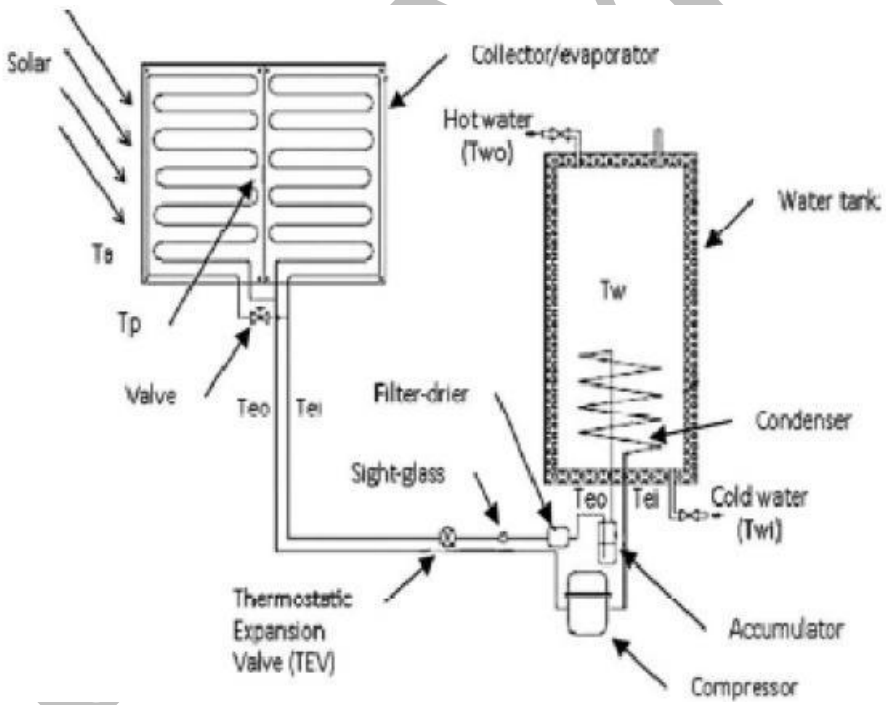


FIG.3. ACTIVE SOLAR WATER HEATER

**COLLECTOR TYPES:**

Design of the collector is also a very important point because, if collector temperature will low then difference between inlet and outlet temperature will also less. Hence, the efficiency will become also less. There are mainly three types of solar collectors like flat plate solar collector, evacuated tube solar collector, concentrated solar collector:

**FLAT PLATE COLLECTOR;**

It is a metal box with a glass or plastic cover (called glazing) on top and a dark-colored absorber plate on the bottom. The sides and bottom of the collector are usually insulated to minimize heat loss.

**EVACUATED GLASS TUBE COLLECTOR:**

Flat plate collectors are almost half less in price than the evacuated tube collector. They are much better for many kinds of uses such as industrial or domestic heating applications. For home purpose hot water heating, flat-plate collectors seems to be much better. It actually performs better when the sun is not at an optimum angle - such as when it is early in the morning or in the late afternoon.

**CONCENTRATING COLLECTORS:**

Concentrating collectors use mirrored surfaces to concentrate the sun's energy on an absorber called a receiver. Concentrating collectors also achieve high temperatures, but unlike evacuated-tube collectors, they can do so only when direct sunlight is available.

**CONCLUSION:**

This technology should be commercialized and developed across the world. Because, there is a large scope for developing the system so that the performance and the efficiency of the system can be increased Lot of designs of solar water heating system have been introduced in the market and these are being utilized in tropical regions of many countries. The basic technology concrete of these systems are studied and it is found that there is a need to work on the install , monitor the solar water heating system as per the availability of solar radiation and local geographical condition.

**REFERENCES:**

1. Brooks FA. Solar energy and its use for heating water in California, Agricultural Bulletin 602. California Agricultural Experiment Station. Berkeley, CA, USA: University of California; 1936. (Bulletin).

2. Burns S, Zeenni E, Guven HM. Stratification and performance of a solar bread box water heater, Proceedings of the American solar energy conference, San Diego, CA, USA 1985 p. 430–435. (Conference Paper).

3. Kaushik SC, Kumar R, Garg HP, Prakash J. Transient analysis of a triangular built-in-storage solar water heater under winter conditions. Heat Recovery Systems and CHP 1994;14:337–41.

4. Wen-Shing Lee ; Bo-Ren Chen Sih-Li Chen. (2006). 'Latent Heat Storage in a Two-Phase Thermosyphon Solar Water heater', International Journal of Solar Energy Engineering, ASME.

5. Davis WD, The climax-cusp solar water heater, Proceedings of second national passive solar conference, Philadelphia, Pennsylvania, USA 1978. (Conference Paper).

6. Yasin Varol. (May 2007). 'Buoyancy induced heat transfer and fluid flow inside a tilted wavy solar collector