

SOLAR COOKER

Solar cooker is a device for the preparation of food by concentrating solar radiation on the food to be cooked.

It consists of a box made of non-conducting materials like plastics, fiber glass or wood. The walls of the box are made thick so as to minimize loss of heat due to radiation.

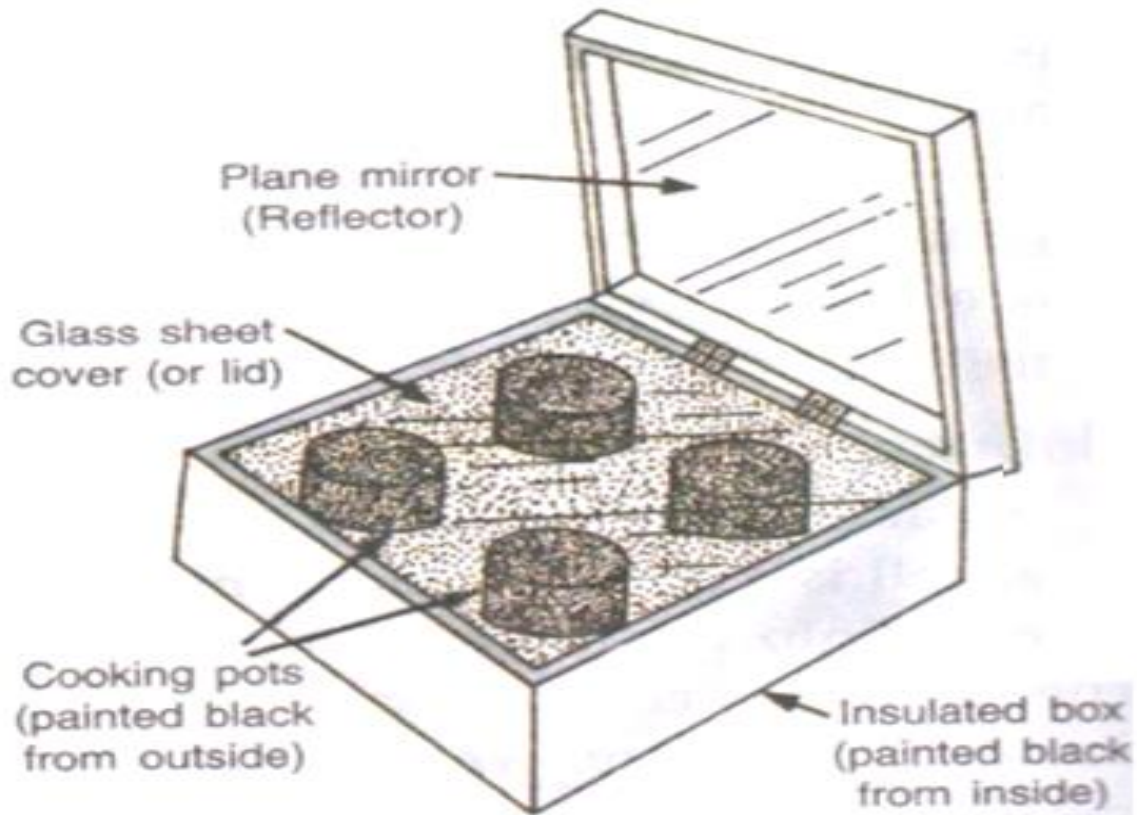
It is painted all black from inside. The box is covered with a thick glass sheet, G. A plane mirror reflector, R is attached in the inside cover of the box. The food to be cooked is kept in a container which is painted black from outside.

The container is kept in the box and it is then covered with glass sheet. In order to cook the food, the assembly is kept in the sunlight and the reflector R is adjusted in such a way that a strong beam of light falls on the cooker top after reflecting from the mirror.

The sun rays after passing through the glass sheet are absorbed by the black surface of the box. Once the heat rays enter the box, glass sheet does not allow these to escape.

In this way more and more heat gets trapped in the box and a temperature of 100°C-140°C can be reached in two to three hours which is sufficient to cook the food like rice, dhal and some vegetables kept in the black containers.

Thus, these cookers can be used to cook food items that require slow heating and not for frying etc.



SOLAR COOKER DIAGRAM

a. Advantages of using solar cooker -

- i. It saves precious fuels like coal, kerosene etc.
- ii. It does not produce any smoke or ash.
- iii. The food cooked in a solar cooker has all its nutrients intact.

b. Disadvantages of using solar cooker -

- i. Solar cooker cannot be used during night time.
- ii. If the day-sky is covered with clouds, it will not be possible to cook the food using solar cooker.
- iii. Direction of reflector has to be changed from time to time to keep it facing the sun.

SOLAR WATER HEATER

Solar water heating system is a device that uses solar energy to heat water for domestic, commercial, and industrial needs. Heating of water is the most common application of solar energy in the world. A typical solar water heating system can save up to 1500 units of electricity every year, for every 100 litres per day of solar water heating capacity.

Working of Solar Water heater –

1. Light is absorbed by solar collector

The solar water heater absorbs light by means of a collector placed on the roof and converts it into heat.

2. Heat transferred to water tank

The heat is then passed to a water tank by means of a circulating pump. This exchange is triggered by the thermal regulator, but exclusively when the collector is hotter than the water in the tank. This not only prevents the circulating pumps from needlessly using electricity but conversely, also avoids overheating.

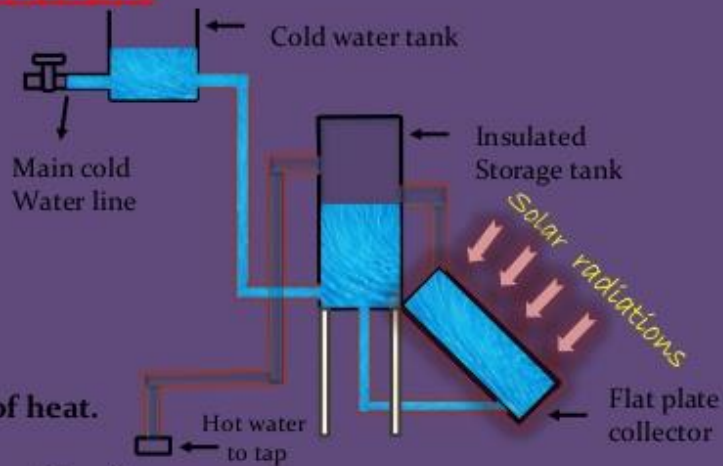
3. Insufficient sunlight? Back-up heating system

When there is insufficient sunlight, the water is preheated and a back-up system takes over to bring the water to the required temperature. This system can therefore be used at a constant temperature throughout the year.

SOLAR WATER HEATER

CONSTRUCTION :

- ❑ Flat plate collector.
- ❑ Insulated storage tank.
- ❑ Copper pipes - coils - outer surface - black.
- ❑ Coils - bending provides more area for absorption of heat.
- ❑ All connecting pipes - copper (good conductor of heat).



WORKING :

- ❑ Cold water from tank - Insulated storage tank with pressure.
- ❑ From insulated storage tank - Flat plate collector.
- ❑ Solar radiations , water - Hot - Lighter - goes up - Enters into tank.
- ❑ Hot water being lighter remains at the top.
- ❑ Hot water from tank, through copper pipes - connected to hot water tap.

• Advantages of solar water heater –

1. Solar Water Heaters can be used at homes for producing hot water that can be used for bathing, cleaning, and washing. Solar water heaters (SWHs) of 100-300 litres capacity are suited for domestic application. Larger systems can also be used for a variety of industrial applications. Hot water at 60-80°C could be obtained through use of solar water heaters.
2. Fuel Savings: A 100 litres capacity SWH can replace an electric geyser for residential use and saves 1500 units of electricity annually.
3. Saves cost on power generation - The use of 1000 SWHs of 100 litres capacity each can contribute to a peak load saving of 1 MW.
4. Environmental benefits - A SWH of 100 litres capacity can prevent emission of 1.5 tonnes of carbon-dioxide per year.

5. Pay back period - SWHs have a life span of 15-20 years. The pay back period is about 3-4 years when electricity is replaced, 4-5 years when furnace oil is replaced and 6-7 years when coal is replaced.

- **Disadvantages of solar water heater –**

1. Relatively high upfront costs.
2. Used only in Sunny days.
3. In most areas they will require electrical or gas or other fuel backup during the winter period.
4. Payback times can vary greatly mostly due to regional sun (the more insolation, the shorter payback period).
5. Relatively low efficiency of passive solar water heating systems.
6. They require excellent overheating and freeze protection.