SOLAR PASSIVE HEATING

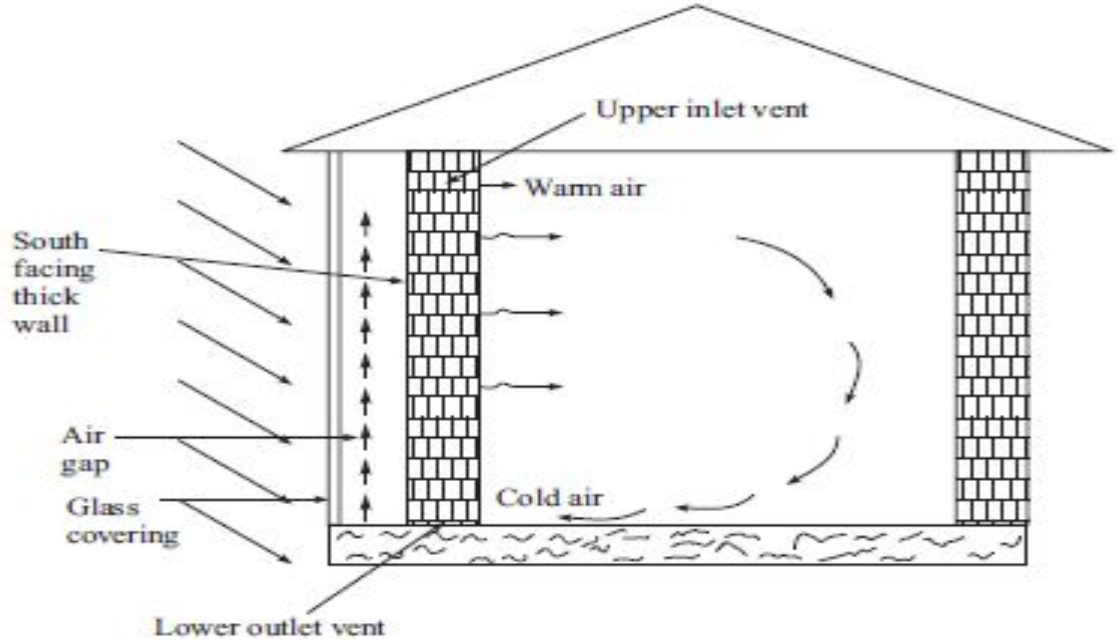


Figure Solar passive space heating.

There is another method to provide solar passive space heating, which is shown in Figure In this method, a flat plate collector is provided to face south. The collector is provided with rock bed type storage system. During sunshine hours, the collector transfers and stores heat energy from incident solar radiation into the rock bed storage system. The available stored energy in the rock bed is used later at night when air is passed through the rock bed, and so warm air enters into the space to be heated.

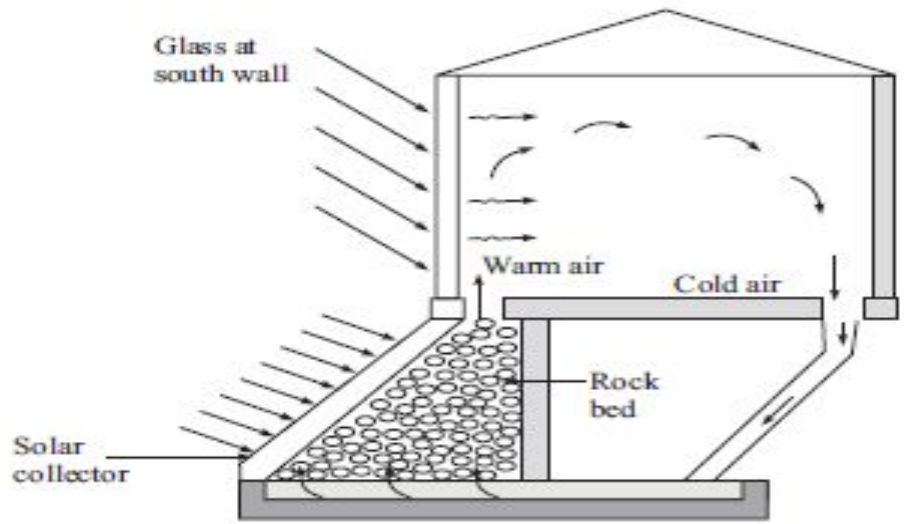


Figure Passive solar heating using solar collector.

SOLAR PASSIVE SPACE COOLING

The heat tends to enter a building in the following ways:

(i) Direct sunlight heat which can be reduced by using shading and providing venetian blinds to glass windows and doors.
(ii) Conduction of heat through walls, roof and floor. It can be reduced by providing insulation. Maximum heat is conducted through the exposed roof which has to be provided a false ceiling with a good insulating materials to reduce the conduction of heat from it.
(iii) Infiltration of outside hot air. It can be reduced by proper sealing of the space and reducing the openings of doors and windows.

The methods to reduce or prevent heating of the space are as follows:

(i) Shading of glass area and the walls
(ii) Providing air circulation or ventilation so that warm air is driven out and cool air from outside is sucked into the space using chimney effect as shown in a Figure 3.24
(iii) Providing a pond on the roof to reduce radiation heating and achieve cooling below the pond
(iv) Providing black plastic bags on a metallic roof which helps in radiating out the heat from the space during night-time
(v) Providing ground coupling or basement construction to maintain temperature of the space close to ground temperature.

The ground temperature is always lower than surrounding atmospheric temperature

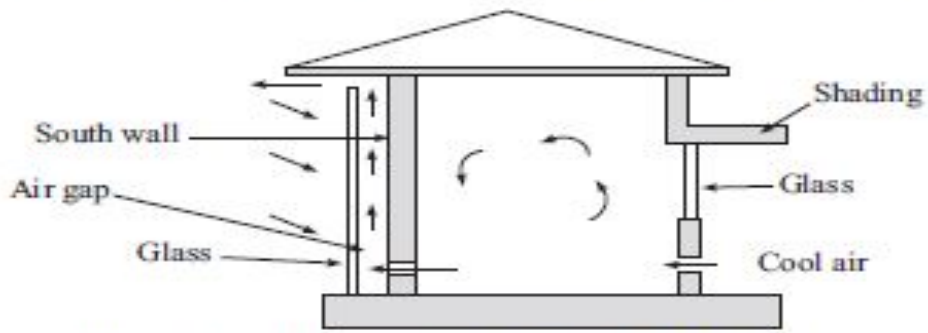


Figure Solar passive cooling through ventilation.

SOLAR DISTILLATION

The process to convert saline water into pure water using solar radiation is called solar distillation. A solar device used for this purpose is called solar still. A solar still consists of a shallow blackened basin filled with saline or brackish water to be distilled. It is covered with sloping transparent roof as shown in Figure 3.28. The sun rays can pass through transparent roof and these rays are absorbed by the blackened surface of the basin, thereby increasing

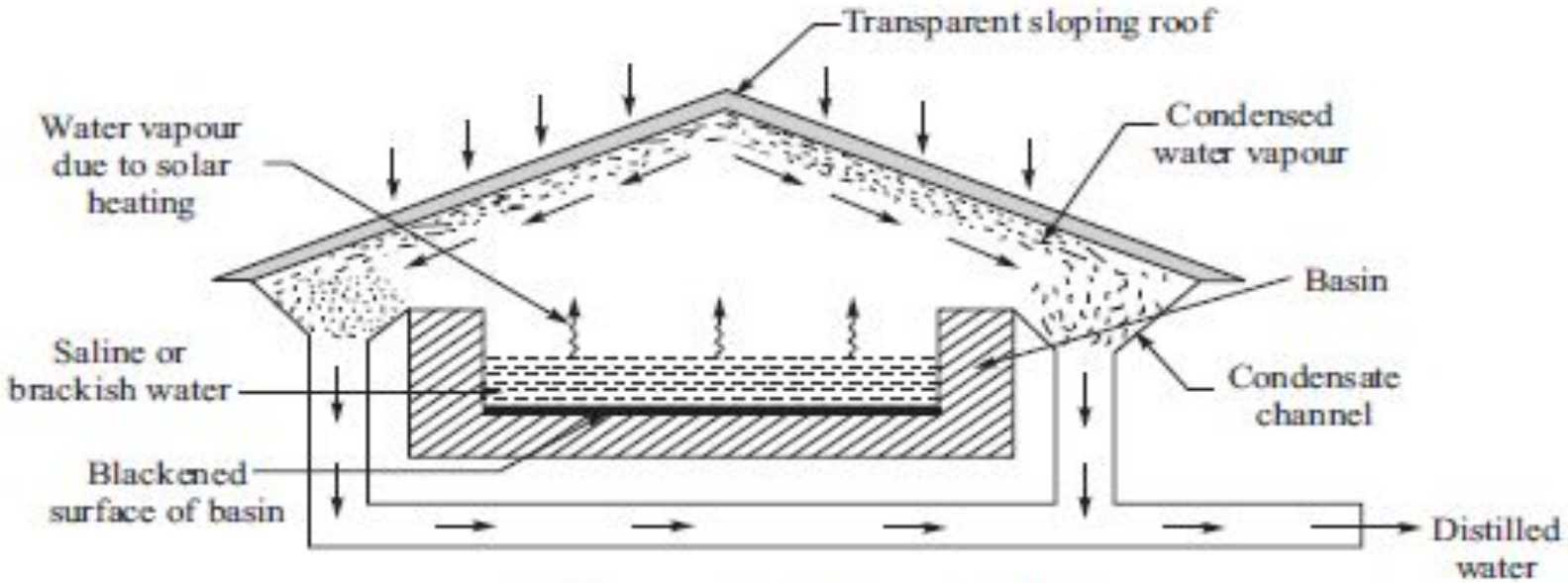


Figure Working of a solar still.

the temperature of water. The water in basin evaporates due to solar heat and rises to the roof. The water vapour cools down and condenses at the undersurface of the roof. The water drops or condensed water slip down along the sloping roof. The condensed water is collected by the condensate channel and drained out from the solar still.

SOLAR COOKERS

A solar cooker consists of (i) an insulated box of blackened aluminium in which utensils with food materials can be kept, (ii) reflector mirror hinged to one side of the box so that the angle of reflector can be adjusted and (iii) a glass cover consisting of two layers of clear window glass sheets which also serves as the box door as shown in Figure

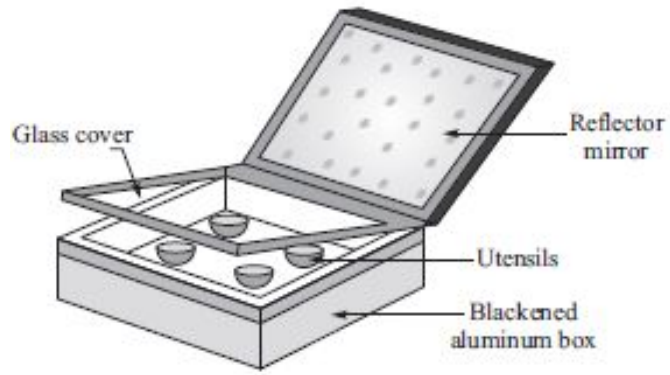


Figure Solar cooker.

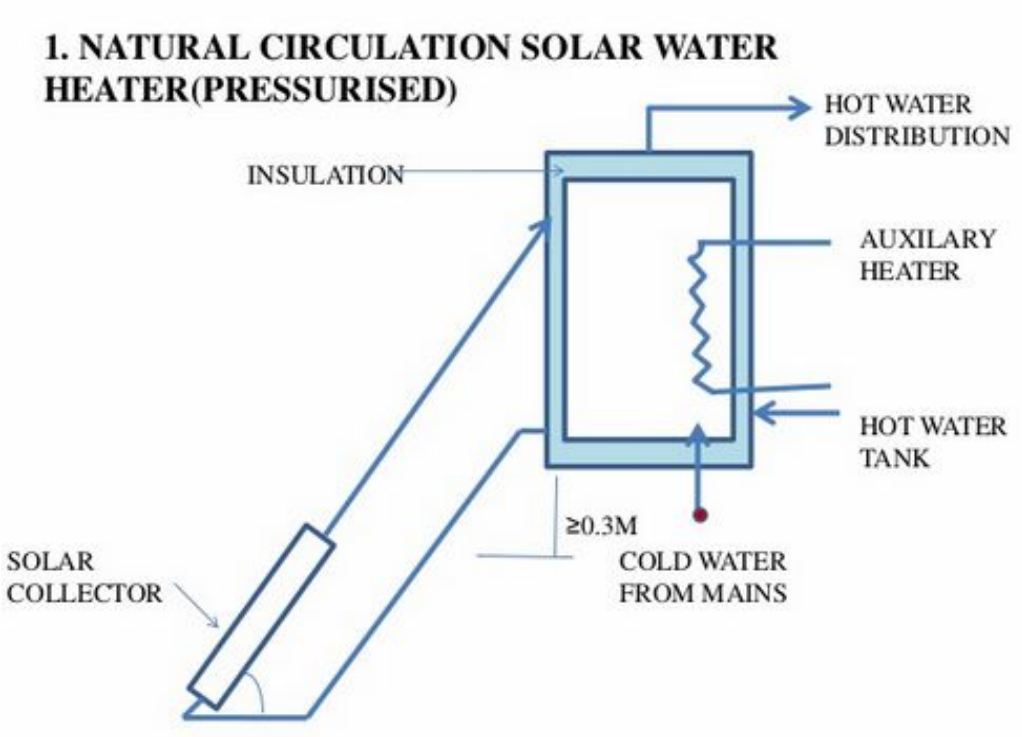
Solar water heaters

The solar radiation,which is incident on the earth surface, can be utilized for the benefit of the society. One of the popular devices that utilizes the solar energy is Solar Water Heating System

Salient Features:

- Fuel Saving
- Beneficial for Environment
- Total Life- 15 to 20 years approximately.
- Costing
- Payback period

- The Sun rays fall on the Solar Collector. A black absorbing surface (absorber) inside the collector, which absorbs solar radiation and transfers the heat energy to water flowing through it. Heated water is collected in a tank which is insulated to prevent heat loss. Then Circulation of water from the tank through the collector and back to the tank continues automatically.
- A Solar Water Heater consists of a Collector panel to collect solar energy and an Insulated Storage Tank to store hot water.



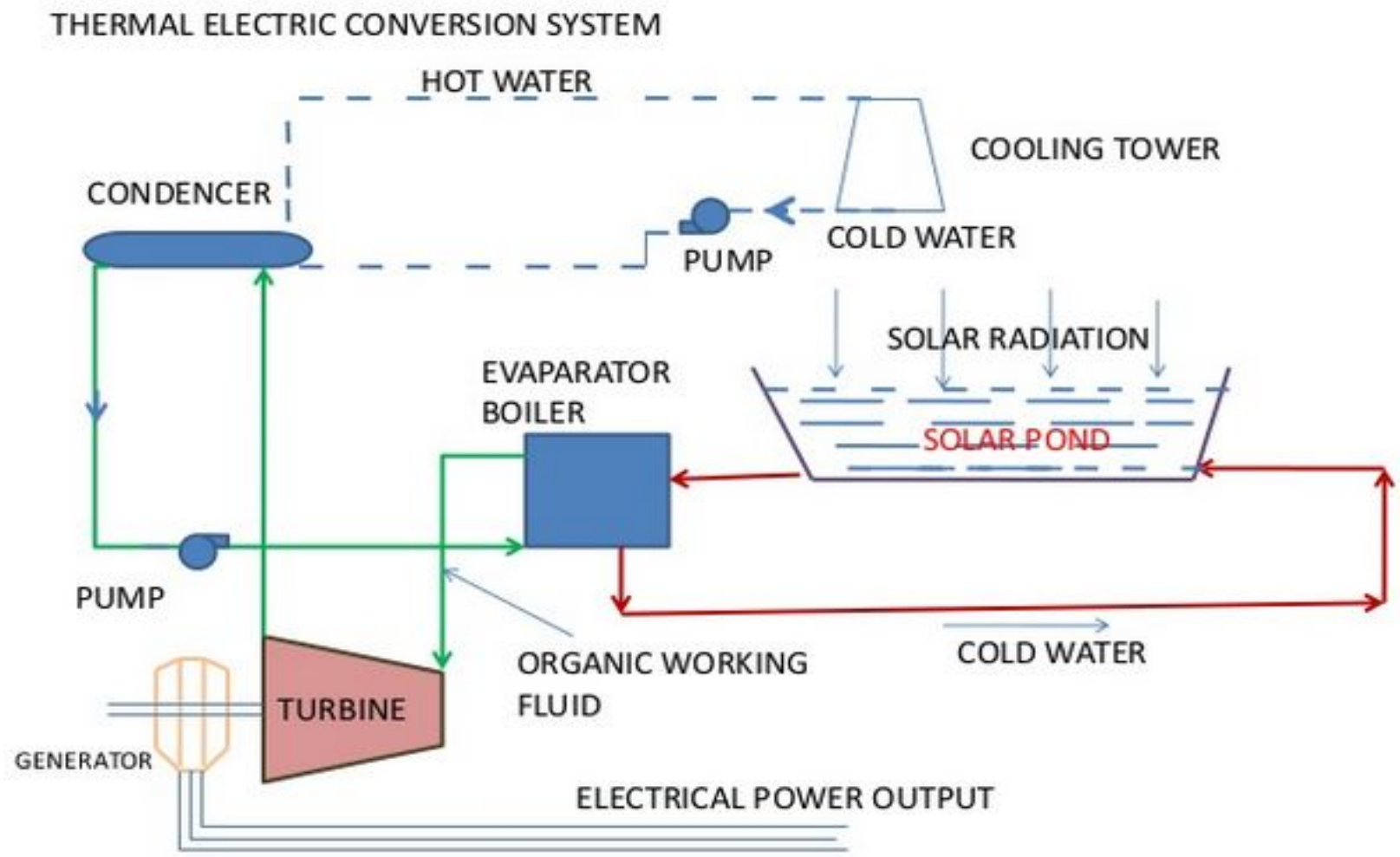
Advantages:

- Simplest form
- Passive systems-do not require mechanical pump.
- Extensively used in rural areas

Disadvantages:

- Reverse flow possible

Thermal energy storage system:



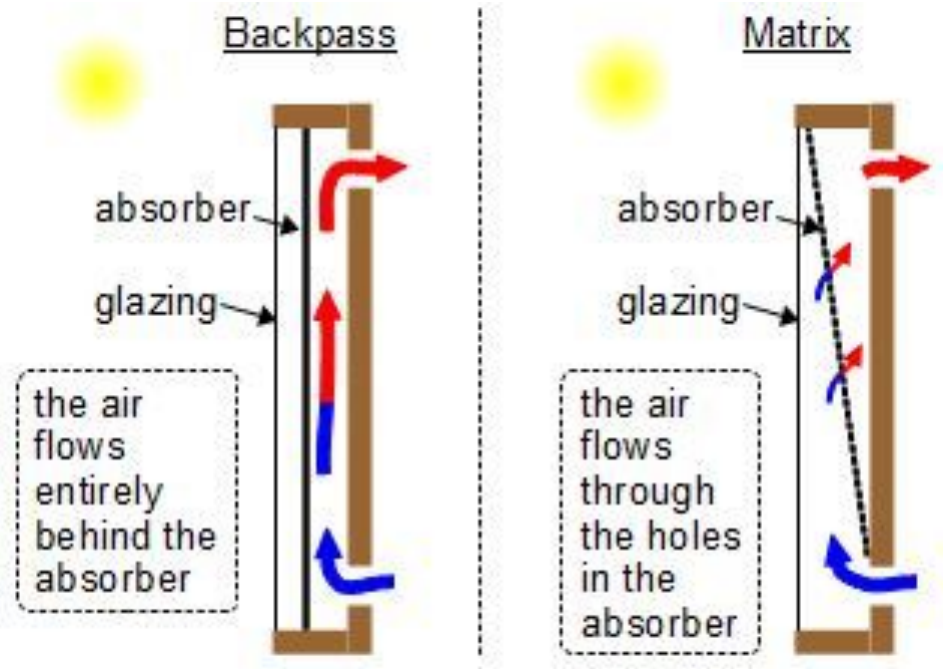
- A solar pond can be used to generate electricity by driving a turbine using an organic fluid.
- Even low temperatures heat that is obtained from solar pond can be converted into electric power.
- The conversion efficiency is limited due to its low operating temperatures (70-100ºC). Because of low temperature, the solar pond power plant requires organic fluid which have low boiling points such as halo-carbons (like Freons) or hydrocarbons (such as propane).
- The heat trapped in solar pond can be used to evaporate organic fluid in evaporator.
- This organic fluid vapour is expanded in turbine, which is coupled with electric generator.
- The organic fluid is condensed in condenser and pumped to evaporator to continue the cycle.

Solar air heater

The most efficient way to utilize a solar air heater is to install it where it can blow or diffuse warm air directly into a room that sees a lot of daytime use. Drawing on the principle that warm air rises and cool air sinks, the solar air heater pulls cooled air from the bottom of a room, circulates it through the solar collector where it picks up heat, then blows the warmed air back into the room. Solar air heaters use roof, wall or window mounted solar collectors to heat the air that passes through them. The solar collector must be mounted on a south-facing roof or wall where it gets full sun exposure that isn't obstructed by trees, tall buildings or other shade producers.

Types:

1. Non-porous or Backpass
2. Porous or Matrix



Solar Air Dryer

The principle of the solar drying technique is to collect solar energy by heating-up the air volume in solar collectors and conduct the hot air from the collector to an attached enclosure, the meat drying chamber. Here the products to be dried are laid out. It is utilized in two ways; i.e. to increase the crop temperature in the form of sensible heat and in removal of moisture. There is no secondary contamination of the products through rain, dust, insects, rodents or birds. The products are dried by hot air only. There is no direct impact of solar radiation (sunshine) on the product. The solar energy produces hot air in the solar collectors. Increasing the temperature in a given volume of air decreases the relative air humidity and increases the water absorption capacity of the air. A steady stream of hot air into the drying chamber circulating through and over results in continuous and efficient dehydration.