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Solar Distillation

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The supply of freshwater is a key element for a society. Ground water and rainfall are not always sufficiently available in India, so alternative sources to provide fresh water are gaining importance these days. India being a tropical country has solar radiation of 4-7 kW/hr for 300 sunny days which can be utilized to provide alternative source for distillation technologies.

In the couple of decades, the traditional solar desalination processes such as Reverse osmosis (RO), Multi stage flash (MSF), Multi effect distillation (MED) and Electro-dialysis (ED) have been evolved to a wider extent. This paper reviews various active and passive solar distillation/desalination research activities that have been developed in India.

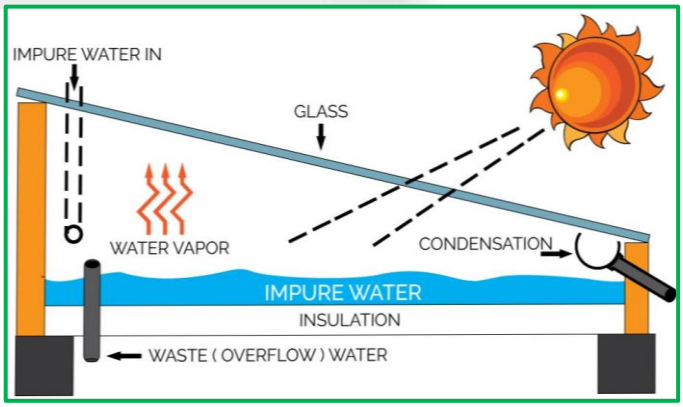
What is solar distillation? Solar distillation is a process that uses solar energy to purify water. It is a simple and effective method that can be used to provide clean drinking water in areas where access to clean water is limited or where traditional water treatment methods are not available.

Working of Sloar Still: Solar stills are called stills because they distill, or purify water. A solar still operates on the same principle as rainwater: evaporation and condensation. The water from the oceans evaporates, only to cool, condense, and return to earth as rain. When the water evaporates, it removes only pure water and leaves all contaminants behind.

Design of Solar Still: Different designs of solar still have emerged. The single effect solar still is a relatively simple device to construct and operate. However, the low productivity of the Solar still triggered the initiatives to look for ways to improve its productivity and Efficiency. These may be classified into passive and active methods.

Passive methods include the use of dye or charcoal to increase the solar absorptivity of water, applying good insulation, lowering the water depth in the basin to lower its thermal capacity, ensuring vapor tightness, using black gravel and rubber, using floating perforated black plate, and using reflective side walls.

Active methods include the use of solar collector or waste heat to heat the basin water, the use of internal and external condensers or applying vacuum inside the solar still to enhance the evaporation/condensation processes, and cooling the glass cover to increase the temperature difference between the glass and the water in the basin and hence increases the rate of evaporation.



Water Purification: It is the process of removing undesirable chemicals, biological contaminants, suspended solids and gases from contaminated water.

Options for water purification: There are four possible ways of purifying water for drinking purpose:

1. Distillation
2. Filtration
3. Chemical treatment
4. Irradiative treatment

Environmental Benefits: This method offers a way to diversify the existing sources of fresh water so that the stress on local sources of supply is reduced.
Solar is a renewable and free source of energy hence this method is a less energy intensive process.
Socioeconomic Benefits: The operational energy costs and installation is very low. Provides safe drinking water hence alleviating water supply stress and health risks from contaminated drinking water.

Disadvantages

- Solar stills or distillers do not heat the collected water to its boiling point.
- The distillation rate in the solar stills is very slow with conventional solar energy.
- The productivity of the distillation units will not satisfy greater demands for drinking water.