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## **Perform Analysis of Inclined Solar Still with Step Absorber Corrugated Surface and Evacuated Tube**

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### **ABSTRACT**

Solar distillation<sup>7</sup> is a technology for producing potable water from brackish and underground water of low-quality at low cost. It can reduce water-scarcity problems together with other water purification technologies. Solar distillation is analogous to natural hydrological cycle. It uses an apparatus called a solar still in which water is evaporated using solar energy, a form of renewable energy, and collected as distillate after condensation of the vapor. It effectively produces distilled water after removal of impurities. The major advantage of this is the use of solar energy instead of electrical energy generated from conventional fuels. This helps in producing potable water without degrading our environment. Over time, researchers have studied several designs of solar stills to evaluate its performance for different climatic, operational, and design parameters. In this chapter, many aspects of this technology are being covered. Among those, the working principle explains the production of distilled water through evaporation and condensation process inside the solar still, including its advantages and drawbacks. The evolution of the solar still is discussed under the historical background section and classified as passive or active solar stills.

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Keywords: Water-Scarcity, Impurities, Climatic, Evaporation

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### **1. Introduction**

More than two third part of the earth is covered with water. Among this, 97% is salty and only 2.6 % water is in fresh form. According to World Health Organization (WHO), the permissible limit for salinity of water is around 500 ppm while most of water on the earth has salinity of nearly 10,000-30,000 ppm. Excess salinity may cause health problems to human being such as stomach problems, laxative effects etc. The demand of fresh water is increasing day by day due to increasing population and industrialization in the world. But the availability of fresh water is fixed, so it becomes important to discover methods of converting brackish water into pure water. Several desalination methods for water purification employed are reverse osmosis, electro dialysis, vapor compression, multistage flash distillation, multiple- effect distillation and solar distillation etc. Among all above desalination methods, solar distillation is economical, requires low maintenance and easy to operate technique. The solar still consists of number of components. The main components of solar still are transparent cover, absorber plate, collection trough. Solar radiations are transmitted to basin surface through a transparent cover which is provided at the top of solar still. After transmission, these are absorbed by a certain depth of water which is placed on the absorber surface. Absorber surface is generally made of galvanized iron, cement or concrete. The absorber plate is blackened to enhance its absorptivity. An inlet is provided for putting the impure water into the still. The water absorbs heat from sun rays and starts to evaporate.

The above-mentioned technique is broadly classified on the management of solar energy. Hence, it is widely dissolved into two main categories:

- a) Direct: The absorption process and desalination take place in the same apparatus.
  - b) Indirect: Both absorption of solar energy and desalination are done through different processes and systems.
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### **2. Methodology**

First, we serving our society what kind of a problem facing people in daily life then we observe that the impure water is one of the biggest problems for our society and animal. Then we thought how to reduce the impurities from water. Then we collect the information about solar still and its utilization in some good things for that we downloaded research paper about water purification by solar energy. Then we finalized the title which is related to purification of water by solar energy. Then we are making model on three of each component and find the specification of each component which is we are going to use. Collect the entire component which we required in the project. Then we can build our model at different parts and assemble the machine

with collected compounds. Testing of model if there is any fault, we modify the model. After completing all these things, we make report on it and submitted.

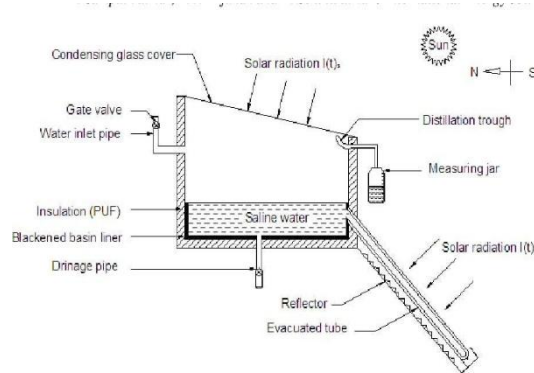


Fig. 1–Schematic Representation of Solar Still

### 3. Working of Solar Distillation

Solar water distillation is the process of using energy from the sunlight to separate freshwater from salts or other contaminants. The untreated water absorbs heat, slowly reaching high temperatures. The heat causes the water to evaporate, cool, and condense into vapour, leaving the contaminants behind. Solar stills can be used for low capacity and self-reliant water supplying systems. Solar water distillers or solar stills are usually used in remote areas where there is limited access to freshwater. The basic principles of solar water distillation are simple, yet effective, as distillation replicates the way nature makes rain. A solar still works on two scientific principles: evaporation and condensation. The salts and minerals do not evaporate with the water. For example, table salt does not turn into vapor until it gets to a temperature over 1400°C. However, it still does take a certain amount of energy for water to turn into water vapor. While a certain amount of energy is needed to raise the 19 temperature of a kilogram of water from 0°C to 100°C, it takes five and one-half times that much to change it from water at 100°C to water vapor at 100°C. Practically all this energy, however, is given back when the water vapour condenses. Most stills are simple black bottomed vessels filled with water and topped with clear glass or plastic. Sunlight that is absorbed by the black material speeds the rate of evaporation. The evaporation is then trapped by the clear topping and funneled away. Most pollutants do not evaporate, so they are left behind. Most stills need to be about six square meters in size to produce enough water for a single person for a day. Multiple solar distillation systems are required to produce a large quantity of distilled water.

### 4. Materials Required with Specifications

Table No. : 01 : Materials required

Sr no.	COMPONENTS	SPECIFICATION	Material
1	Total Outer Body	20mm	Plywood
2	Inner Body	1 mm	Aluminium
3	Insulating Material	4 mm	Puff
4	Evacuated Tubes	Length:- 1800 mm Outer Diameter:-58 mm Inner Diameter:-47 mm	Solar tube (glass)
5	Glass Frame	4 mm	Glass
6	Water Inlet Chamber	2500 ml	Fibre
7	Stand	Square Rod	Iron (Adjustable)

### 5. Conclusion

The present research has done the experimental study on two different inclined solar still and following observations are recorded:

- The 0.6 Kg/m<sup>2</sup> on 03rd February 2022 at 2.00 pm maximum hourly fresh output is obtained from inclined solar still having stepped absorber with corrugated fins integrated with evacuated tube respectively.

- The 2.62 Kg/m<sup>2</sup> / day on 06th February 2022 maximum cumulative fresh output is obtained from inclined solar still having stepped absorber with corrugated fins integrated with evacuated tube respectively.
- The 24.73% of fresh distillate output increases from inclined solar still having stepped absorber with corrugated fins integrated with evacuated as compared to inclined solar still having stepped absorber with corrugated fins.

## 6. Future Scope

Due to Global warming is increasing day by day, it is going difficult to get safe plenty of water. The distillation using solar energy has used potential incoming future various areas in India's like Rajasthan and Gujarat where there is plenty of solar radiation can be used for solar distillation. Based on upon review and discussion it is important to pay attention to the environment mainly to produce fresh and clean water without causing harm to the environment. Solar energy can be used to provide sustainable solution for fresh water supply. We had put a step forward for this major issue; in this project we will solve the problem of water scarcity by solar water distillation. We will try to solve the problem of water scarcity by preparing this project.

Also: -

- We can implement this in Desert Areas.
- Due to Global warming water is an ongoing crisis, so to overcome this we have to implement this project in rural areas.
- we can use this project in industries on large scale to reuse the water of industry means recycling of water

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