



## Solar Power Based Water Purifier

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# SOLAR POWER BASED WATER PURIFIER

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## ABSTRACT

Impact of polluted water on humans, as well as the problem of water supply and water supply in many developing countries. Although water is the world's most important and basic human need, wastewater can spread disease. Most of the world does not have safe drinking water, which is very annoying. As a result, water treatment is becoming increasingly popular. Demand for water is growing exponentially every day. The world's water crisis is far greater than any that has ever existed before. Life on this planet would be impossible without clean water. Salt water, drinking water, and glaciers are the most common sources of water. A small brackish water purification system supported by solar photovoltaic (PV) as a renewable energy source has been launched to help rural or remote communities meet their need for clean drinking water. Solar PV has been found to be the cheapest way to generate small amounts of electricity in rural or isolated areas, and receding osmosis is an inexpensive way to purify brackish water.

**Key Words:** *Solar Still, Distillation, Evaporation, Condensation, Purification, Distilled Water, Solar Energy*

## INTRODUCTION

Water is a primary human requirement. Every character on this planet calls for at the least 20 to 50 litres of smooth, secure water every day for ingesting, cooking, and retaining smooth. Water that has been infected isn't always handiest filthy, however additionally dangerous. Waterborne infections which includes cholera, diarrhoea, typhoid, and viral hepatitis killed 2439 people in 2018. Over 1.three crore humans had been identified with this condition. Because of the 11768 humans who've died because of those sicknesses withinside the closing 5 years, it's miles important to create a gadget that gives us with natural, smooth water this is mineralized[1]. Water reassets are commonly brackish, together with dangerous germs which includes bacteria, rendering the water risky to drink. ninety seven percentage of all available water on Earth is saltwater, whilst the final three percentage is freshwater, that is

inconsistently unfold over the globe withinside the shape of rivers, streams, glaciers, and different our bodies of water, and has alas been over-polluted with the aid of using human interest in a few areas[2]. Solar water distillation makes smooth, natural ingesting water with the aid of using condensing natural water vapour and settling out dangerous factors in a sun nevertheless. This approach is utilised whilst the water is brackish and includes dangerous microorganisms, or whilst heavy metals want to be settled out, or whilst sea water desires to be desalinated. Solar distillation has tested to be a cost-powerful and environmentally pleasant approach, mainly in rural areas. To address the trouble of reduced distillate output in passive sun stills, many energetic distillation strategies had been created. The sun nevertheless is a on hand tool for distilling brackish water for ingesting. Distillation is certainly considered one among diverse techniques for purifying water, and daylight is certainly considered one among numerous reassets of thermal strength that may be used to energy it. It is the maximum cost-powerful manner of purifying maximum types of infected water to 99.9% purity, specially in growing international locations in which gasoline is scarce or prohibitively expensive. Solar distillation is a fairly smooth approach of treating brackish (salty) water supplies[3]. Solar energy is a low-tech alternative. Water is evaporated on this approach, and the vapour condenses as natural water making use of the sun's strength. Salts and different contaminants are eliminated for the duration of this procedure. Solar water distillation is a centuries-antique process. In 1872, a large-scale sun nevertheless became created to offer ingesting water to a Chilean mining settlement [4]. Solar stills are primary and do now no longer comprise any transferring parts. They're constructed of exquisite substances which can face up to the corrosive outcomes of water and sunshine. The operation is straightforward: water must be fed to the nevertheless's deliver fill port as soon as a day (both manually or automatically). Excess water will drain out of the overflow port, stopping the buildup of salts withinside the basin. The output gathering port is used to gather purified ingesting water.

## **WORKING OPERATION OF SOLAR STILL**

Solar stills are supposed to fulfill unique water needs, which include the ones of a household, a society, or a whole town. A fundamental sun nonetheless can be built the use of some stones, a clean plastic sheet or glass, and a condensate container. Solar strength warms water until evaporation occurs. As water evaporates, water vapour gathers at the inner floor of the glass, ensuing in water this is purifier than rain water. Solar stills can be used to eliminate without a doubt any impurity. A sun nonetheless works on the premise of clinical principles: evaporation and condensation. To begin, the water to be filtered is gathered out of doors the collector. The sun nonetheless is then uncovered to the solar, permitting it to gather the solar's brief wave strength. When the solar shines on it, the water absorbs the sun strength and starts to warmth up. As the temperature rises over time, the liquid water becomes steam and evaporates closer to the glass ceiling, leaving all different contaminants withinside the trough below. Condensation is the second one clinical idea on which a sun nonetheless operates, after evaporation. When evaporated water moves the glass ceiling, it lightly condenses, ensuing in natural water droplets. Because the glass is tilted down closer to the second one trough, the water droplets roll down and the easy water flows into it. Most opportunity strategies of water filtration encompass boiling the water, which reasons the pH stage to decrease, ensuing in flat-tasting water. The water is clearly filtered via way of means of a sun nonetheless, permitting the pH tiers to stay balanced.

## **DESIGN GOAL FOR A SOLAR STILL**

- The following are the layout dreams for an green sun nevertheless:

For most efficiency, the sun panel need to nevertheless have a excessive feed (undistilled) water temperature. a sizeable temperature distinction among the enter water and the condensing floor.

There is little vapour leakage.

- It is feasible to generate a excessive feed water temperature because:-

A massive fraction of incoming radiation is absorbed through the feed water as heal. As a result, low absorption glass and a very good radiation soaking up floor are vital to maintain warmth losses from the ground and partitions to a minimum. Because the water is shallow, there isn't always plenty to warmth.

- It is feasible to gain a sizable temperature differential if the condensing floor absorbs little or not one of the incoming radiation. When water condenses at night, it dissipates warmth that ought to be speedy evacuated from the condensing floor through, for example, a 2nd glide of water or air.

## DESIGN TYPES

**Single-basin stills** were considerably researched, and their behaviour is nicely understood. Typical efficiencies are withinside the variety of 25%. The every day output as a characteristic of solar irradiation is best withinside the early evening, while the feed water continues to be warm however the outdoor temperature is dropping.

### Multiple-effect basin still

There are nonetheless or greater booths in multiple-impact basins. The higher compartment's ground is the lowest compartment's condensing surface. The warmth emitted via way of means of the condensing vapour components the strength required to evaporate the deliver water above. The performance is as a result large than that of a unmarried basin, which remains commonly 35 percentage or higher, however the price and complexity are proportionally higher.

### Wick still

The feed water in a wick nevertheless lightly passes thru a porous, radiation-soaking up pad (the wick). There are blessings to the use of basin stills. To begin, the wick may be slanted in order that the feed water is at a higher attitude to the sun (decreasing mirrored image and supplying a larger powerful area). Second, due to the fact there may be much less feed water withinside the nevertheless at any given time, the water is heated extra quick and to a better temperature. Simple wick stills are extra green than basin stills, and sure designs are stated to be much less pricey than a basin nevertheless with the equal output.

### Emergency still

A quite simple nevertheless may be constructed to offer emergency consuming water on land. It takes use of the earth's moisture. A plastic cover, a bowl or bucket, and a pebble are all this is required.

## Hybrid designs

Solar stills can be integrated with another function of technology in a variety of ways. Three instances are provided:

a) Rainwater harvesting:

-By incorporating an exterior gutter, the still cover can be utilised to collect rainwater to enhance the solar still production.

b) Greenhouse-solar still.-A greenhouse's roof can be employed as a still's cover.

## LITERATURE REVIEW

1. Prof. Alpesh Mehta, Arjun Vyas, Nitin Bodar, and Dharmesh Lathiya carried out studies at the layout of a sun distillation system[5]. They measured the maximum evaporation among 11:15 a.m. and 1:30 p.m. At 1:30 p.m., they reached a excessive temperature of 530 C, after which the temperature commenced to fall. By including 14 litres of brackish water to their sun distiller, they filtered 1.5 litres of water. They acquired filtered water with a TDS stage of eighty one PPM.
2. Ravi Gugulothu, Naga Sarada Somanchi, K. Vijaya Kumar Reddy, and Davender Gantha from the branch of mechanical engineering, JNTUH university of engineering, Kukapally, Hyderabad[6] performed a assessment on sun water distillation using realistic and latent warmness. They used thermal electricity garage to reinforce their sun electricity performance and production. They experimented with a sun monitoring machine together with PCM, dyes, sponges, and nanomaterials. They verified that latent warmness garage (LHS) is one of the handiest strategies of storing thermal electricity. It has a better garage density and a decrease temperature differential among storing and liberating electricity.
3. Md. Zargistalukder, Avizitbasak Foisal, Ahmed Siddique, and Dr. Mohd. Rfiqujalambeg performed studies at the layout and overall performance assessment of a sun water distillation plant at Bangladesh University of Engineering and Technology (BUET)[7]. They created a sun distiller with pieces. The top element is fabricated from glass and a copper plate that absorbs heat. Cellulite covers the decrease 1/2 of of the body. Wick is used to make the cellulite box. This wick gathers floor water and transports it to a pitcher box, wherein it evaporates withinside the presence of sun radiation. This system's effectiveness is 2.289 in keeping with m<sup>2</sup> in keeping with day, and its performance is 17.38 percent. The performance turned into accomplished with a median sun depth of 1115 W/m<sup>2</sup>.
4. Suleiman et al examine double solar still by varying the depth of water and conclude that water productivity is dependent on solar radiation intensity[8].

5. Masoud Afrand, Amin Behzadmehr, and Arash Karimipour[9] conducted research on a numerical simulation of solar distillation for installation in Chabahar, Iran. They presented a theoretical analysis of solar distillation in a single basin in an open Iranian setting. They set the glass cover at a 25-degree angle. They used a numerical approach to calculate the temperature of the glass cover, seawater contact, moist air, and bottom. Still, they estimate that productivity in July was higher than in December.
6. Anwarul Islam Sifat and Md. Milon Uddin conducted research on water distillation methods utilising solar electricity at the Institute of Energy, University of Dhaka, Bangladesh[10]. They explored the optimization of several distillation process parameters. They created a solar still that focuses on the cost and effectiveness of water purification. They also gave a theoretical analysis of an asymmetrical solar distiller. They predicted the highest output in March and April.
7. Raghendra Singh, Rahul Dev, M. M Hasan, and G.N Tiwari conducted study on the comparative energy and exergy analysis of several passive solar distillation systems[11]. They featured single and double slope solar stills as well as passive solar distillation systems. Consider the following slopes: 15, 30, and 45 degrees. They discovered that the energy, exergy, and embodied energy of a single slope solar still are greater than those of a double slope solar still. They concluded that materials with lower thermal conductivity and embodied energy than FRP, such as concrete, PVC, and wood, can be used in place of FRP to minimise embodied energy while providing comparable performance.
8. The chemical engineering branch on the University of St. La Salle in Bacolod town carried out studies on a sun-powered desalination gadget using a Fresnel lens[12]. Their Fresnel lens changed into composed of acrylic plastic and served as a green sun concentrator. Their nonetheless changed into built of dark-coloured glass bottles that have been precise at soaking up solar energy. Their condenser gadget changed into constructed of polybutylene and polystyrene, and it changed into able to condensing vapour at room temperature. They measured 293 seconds for salt water vaporisation on the gold standard attitude of 36.42°C. The quantity of condensate produced changed into associated with the quantity of salt water gift within the sun nonetheless. The meant setup's maximum suggest performance changed into 34.82%.

## **FUTURE ASPECT**

1. Solar paint may be implemented to stills to maintain the machine heat for numerous hours.
2. Copper sheets can be used to absorb heat.
3. The Mission aspires to construct a governmental and regulatory framework that offers a predictable incentive shape that permits for fast and large-scale capital

funding in sun electricity applications, in addition to fostering technical innovation and, as a result, value reduction. Another untapped route of sun strength utilisation that might be tested beneath this Mission is sun water purification. Solar water purification now lacks marketplace mechanisms to help its increase and spread; however, if its utility makes use of are tested, it might be a great project for sun applications, along sun photovoltaic products.

## **WORK AND PERSPECTIVE**

Till now, we have studied various research papers from different journals. After reviewing these research papers, we came to know about the latest technology, what work has been done in this field, what progress has been made, and the different methods used in solar power water purification. Researchers have devised a solar-powered purifier that could provide a highly efficient and low-cost means to convert contaminated water into drinkable water for personal use. The technology could aid in the alleviation of global drinking water shortages, especially in developing countries and areas afflicted by natural disasters. We are building a solar still that would be great for tiny communities, allowing people to manufacture their own drinking water in the same way that they generate their own power via solar panels on their house roof. Only sunlight is needed to power the purification mechanism. During the design process of the project, many various types of purification methods were investigated. It is critical to leverage reusable resources when designing a system that can be used everywhere in the world. Solar-powered distillation is an unique and promising technique for an energy-efficient, cost-effective, robust, and popular solution when compared to other solar-powered membrane-based water purification technologies. Furthermore, the two largest participants in the water filtration market, Eureka Forbes and Hindustan Unilever Limited, are exploring expanding their product portfolios to include renewable energy-based goods. The Indian market has enormous potential, as seen by the fact that worldwide businesses in the water purifiers area (Solvatten, Mörk Water Solutions, Pentair, WaterHealth) have stepped in and are trying to grow their market share. The key design objective for the solar water purifier was that it worked even under cloudy situations and dispersed sun energy.

### **THE STUDY'S AIMS:**

The project's goals can be stated as follows:

- To expand and construct a solar-powered distillation gadget able to generating consuming water from brackish borehole feed for rural families or small communities.
  - Flooded areas. b) Military applications in isolated locations.
- To educate people about renewable energy resources through the use of solar distillation.
- To choose desalination membranes that will produce the most potable water under the current operating conditions?

## CONCLUSION

Solar stills have established to be pretty powerful at cleansing up water substances that allows you to provide secure ingesting water. Distillation's effectiveness in developing secure ingesting water is widely recognized and recognised. Most business stills and water purification structures are powered via way of means of strength or different fossil fuels. Solar distillation technique promises the equal secure ingesting water as traditional distillation structures; the best distinction is the electricity source: the sun. Depending at the requirements, many improvements may be finished withinside the sun distiller to enhance its efficiency. The essential downside of this system is its terrible production, which may be increased. Other hurdles for researchers consist of lowering time and persevering with this procedure throughout the moist season.

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