FABRICATION OF SOLAR POWERED WATER PURIFIER

Mohd Afroz Ansari[1], Nihal Mishra[2], Rahul Nishad[3], Sayeed Ahmad[4], [5]Shanawaz Patil

[1,2,3,4] UG Students, School of Mechanical Engineering, REVA University
[5]Assistant Professor School of Mechanical Engineering, REVA University
[1]REVA University, Bengaluru, Karnataka

Abstract: This framework depends on sunlight based fueled water purifier for drinking water. The nature of water courses through the taps for drinking is picking up consideration from open. There are still microbes and minerals that exist in the faucet water that can harm human's wellbeing. Henceforth, the target of this work is to build up an individual, versatile double purposes convenient water channel to give a simpler method to get sheltered, spotless and sound drinking water for human wherever they go. The planned framework can be utilized in sifting water is taken from open water fountains or other open water sources. The work is begun by leading fundamental research. To start with, the imperatives and criteria of the issue are distinguished and examined in detail. Investigation of the system execution is led as contributions for estimation, demonstrating, testing and other manufacture techniques.

Index Terms - Solar Panel, Filters, DC Pump, Lead Acid Battery, etc.

1. INTRODUCTION

Water is the primary segment of our body. A person's body comprises for the most part of water (all things considered about 70%). Individual liver, for instance, is about 90% water, cerebrum 85%, blood 83% and even the bones 35%. In this way, expending enough water in our everyday life is an unquestionable requirement to remain hydrated and solid.

The weight of ailment from insufficient water, sanitation, and cleanliness aggregate 1.8 million passing and the loss of more prominent than 75 million sound life years. It is settled that interests in safe drinking water and improved sanitation demonstrate a nearby correspondence with progress in human wellbeing and monetary profitability.

There are about 26 countries that lack access to pure water resources to sustain economic and agricultural developments, and about one billion people have been deprived of pure drinking water. Middle East, India are Africa are among those regions where fresh water scarcity has severely affected agricultural capability and public life. Moreover, the demand for pure water will dramatically increases according to the world statistics forecasting 40– 50% population growth over the next 50 years [1, 2].

Many researchers have installed experimental facilities to power reverse osmosis plants with solar photovoltaic technology. However, the cost of producing fresh water from seawater by such a process is very high- reported to be 6.52 $/cubic meter of fresh water over the 20- year life time of the equipment [3].

A prototype photovoltaic-powered reverse-osmosis system without batteries has been reported where the rate of production of fresh water varies throughout the day depending on the solar insolation. The system, designed to operate from seawater and a Clark pump brine-stream energy recovery mechanism achieved a specific energy consumption of less than 4 kWh/m3 over a wide range of operation [4].

Many researchers attempted to study renewable energy powered desalination. The solar thermal-powered reverse osmosis desalination system was coupled to a solar power cycle based on a Rankine cycle with toluene, hexamethyl disiloxane and octamethyl cyclo-tetra siloxane as working fluids and two different models of parabolic trough collectors [5]. A solar-powered trans- critical CO2 (carbon dioxide) power cycle for reverse osmosis desalination based on the recovery of cryogenic energy of LNG (liquefied natural gas) has been studied [6]. The findings showed that the CO2 turbine inlet pressure reach an optimal value and the daily exergy efficiency decreased with increase in condenser temperature, and increased with an increase in mass flow rate of oil and natural gas turbine inlet pressure. A hybrid wind/solar powered desalination system based on reverse osmosis has been modelled and simulated [7]. A solar photovoltaic and solar thermal powered reverse osmosis (RO) desalination plant has been constructed and optimized for brackish water desalination [8]. Desalination of brackish water was evaluated as a viable option to cope with water scarcity and deficit in Jordan [9]. A prototype photovoltaic-powered reverse osmosis system has been constructed at CREST, Loughborough, UK. It has been attempted to optimize the desalination plant of seawater by a PV powered Reverse Osmosis to run for 8 hours during summer and 7 hours during winter while, the plant operation was adjusted to changing energy production of PV generator. [10]. The novel solar powered direct osmosis desalination process has been demonstrated [11]. The life cycle Greenhouse

Gas (GHG) emissions of a Seawater Reverse Osmosis (SWRO) desalination plant has been assessed and found that GHG emissions reduction of ~90% can be achieved by opting for renewable energy [12].

A water channel is a gadget which expels polluting influences from water by methods for a fine physical hindrance, concoction process as well as organic procedure. Water channels have positively made some amazing progress in a previous couple of years. Refining is presumably the most established technique for water decontamination. Water is first warmed to bubbling. Filtration works totally on molecule or bead estimate (and, to some degree, shape), with the end goal that particles beneath a specific size will go through the obstruction, while bigger particles are held on or in the hindrance for later evacuation.

The innovation is extraordinarily improved and the water delivered by these channels is a lot more secure and cleaner than at any other time. Be that as it may, as of late it is elusive a versatile water channel where purchasers can convey it anyplace and utilized it for more than one reason.[13]

M. Gowtham et al.; "In this research work the performance of solar concentrated distiller with latent heat storage capacity is compared with solar concentrated distiller with trays on the basin. Paraffin wax is used as the latent heat storage material. Experiments are conducted for improving productivity and this is done by various factors like heat storage capacity, exposure area and maintaining low depth. Hourly Productivity of the concentrated solar distiller is obtained for experimental duration 9AM to 5AM water was measured every hour by maintaining low depth. Analysis was made between two types of basin. Sponges were added to increase the

exposure area by capillarity effect. It is observed that due to the presence of sponges, the water output is increased to 40.83% in latent heat storage distiller and 19% increase in tray basin type, while comparing with the plain basin type. Overall productivity was improved by a maximum of 48% by using various modifications" [14]

Ozuomba J.O. et al.; "In this paper find a roof-type solar water distillation (RSWD) kit was fabricated and tested under actual environmental conditions of Urualla, an ancient town in the Eastern part of Nigeria. The system includes four major components; a rectangular wooden basin, an absorber surface, a glass roof and a condensate channel. The RSWD was able to generate 2.3m3 of distilled water within six days. Though the condensate was not large enough compared to human need as is peculiar to many solar stills, the efficiency can be enhanced by using large solar absorber surface and by any method that can increase radiant energy"[15].

2. METHODOLOGY AND APPARATUS REQUIRED

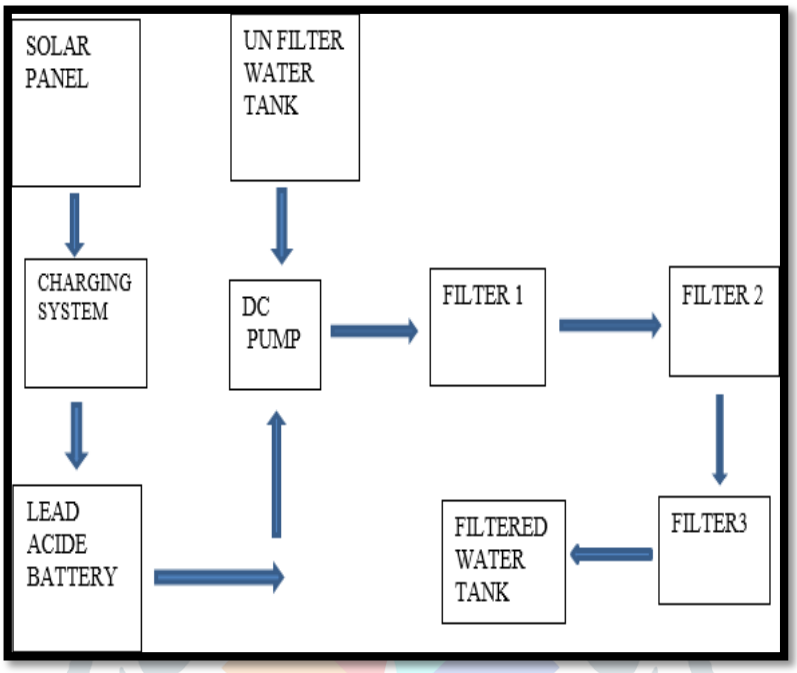

Fig.1: Block Diagram of the experimental setup

Figure 1 shows the block diagram of experimental setup and methodology. For Solar powered water purifier we use a solar panel which extracts the photons, or particles of light to knock electrons free from atoms, generating a flow of electricity. In common terms solar panel converts sunlight into DC electricity to charge the battery. It store the electric current.and further DC pump use that electricity as a source of energy from battery. DC pump take the unfiltered water and pump it into the filters. Filters are use to purify the water up to required TDS. Filtered water get stored into the water tank.

2.1 TOTAL DISSOLVED SOLIDS (TDS)

Principle: Total dissolved solids in any sample can be represented by dissolved and particulate organic and Inorganic matter and may be estimated by evaporating the filtered sample through standard filter and weighing the residue left. Thus total dissolved solids are determined as the residue left after evaporation of the filtered sample.

pH (Potentia Hydrogeni)

Principle: pH is the scale of acidity or alkalinity defines the medium of the sample. pH can be measured either by colorimetric method and by using various indicators or pH strips. It is also negative log of the hydrogen ion concentration in a solution.

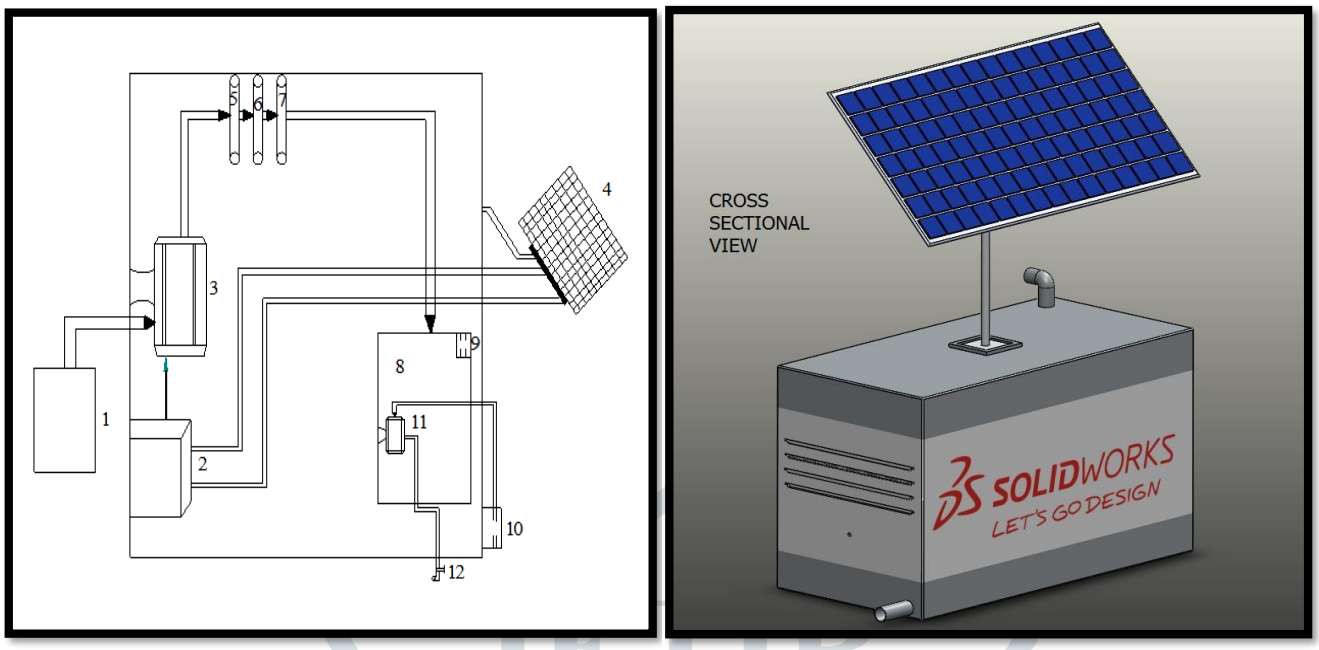

Fig. 2: Schematic Diagram of the experimental setup

1. Unfiltered tank
2. Battery
3. DC Pump
4. Solar Panel
5. Sediment filter
6. Pre-carbon filter
7. Post-carbon filter
8. Filtered tank
9. Overflow sensor
10. Proximity sensor
11. DC Pump
12. Tap

2.2 APPARATUS REQUIRED

Solar panel: Solar panel based board works by permitting photons, or particles of light, to thump electrons free from molecules, producing a progression of power. Sun based boards really include many, little units called photovoltaic cells. (Photovoltaic essentially implies they convert daylight into power.) Many cells connected together make up a sun-powered sheet.

Fig.3: Solar panel

Fig.4: Filters

Filters: Water purifiers have turned into a need for each family unit. Water purifiers guarantee that you get spotless and safe drinking water on interest with the goal that you avoid water- borne infections. There are diverse kinds of water filtration procedures, for example, Reverse Osmosis Water Filtration (RO), Ultra Filtration (UF) and UltraViolet sanitization (UV). You have to pick a water refinement framework relying upon the nature of water. All the above filtration should be possible by utilizing distinctive water channels like sediment filter, pre- carbon filter, and post-carbon filter.

Fig.5: DC Pump

DC Pump: Small electric water pump, for example, the sorts utilized in homes, as a rule, have little DC motor. The DC motor is contained in a fixed case appended to the impeller and forces it through a straightforward apparatus drive. In the focal point of the motor is a rotor with curls around it. Around those loops are magnets, which make a lasting attractive field that courses through the rotor. At the point when the engine turns on, power goes through the loops, creating an attractive field that repulses the magnets around the rotor, making the rotor turn around 180 degrees. At the point when the rotor turns, the bearing of the power in the curls flips, pushing the rotor again and making it turn the remainder of the path around. Through a progression of pushes, the rotor keeps on turning, driving the impeller and fueling the pump. The pumps that convey feed water from ground water-well or seawater intake to RO pre-treatment may be powered either by the arrays of PV module or any other power source. Solar pumps have been considered more reliable for application in remote locations.

Fig.6: Lead Acid Battery

Lead Acid Battery: The battery which utilizes wipe lead and lead peroxide for the transformation of the substance vitality into electrical power, such sort of battery is known as a lead corrosive battery. The lead corrosive battery is most usually utilized in the power stations and substations since it has higher cell voltage and lower cost. Batteries can be included in the system to balance the electrical output of the PV module during day time and facilitate the extended operation during night time and overcast days

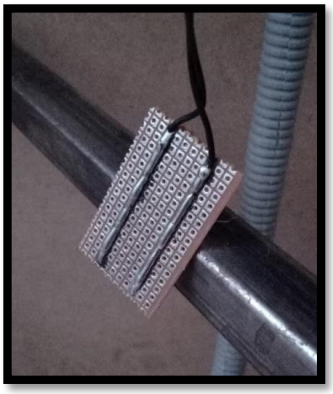

Fig.7: Overflow Sensor

Overflow sensor: It is an integrated circuit device which is programmed to sense the flow of water level up to a certain level. When the water reaches that level the DC pump get shut off. Which helps to stop the overflow of tank. Basically it is used to stop the wastage of water from the tank.

2.3 EXPERIMENTAL PROCEDURE

- Connection of DC Pump input into the unfiltered source of water.
- A solar panel charged the battery and pass current to DC Pump.
- Source of unfiltered water should continue running water.
- Pump pass the unfiltered water to the filter1, further filter1 to filter2 and finally filter2 to filter3.
- Filtered water gets stored into the tank.
- As the tank filled the overflow sensor sense the level of water in the tank and automatically DC Pump get switched off.
- Using a proximity sensor as per the requirement we can get filtered water.

3. RESULTS AND DISCUSSION

Table.1: TDS Values

Serial No.	TDS Value before filtration	TDS Value after filtration
1.	155	61
2.	161	66
3.	159	63

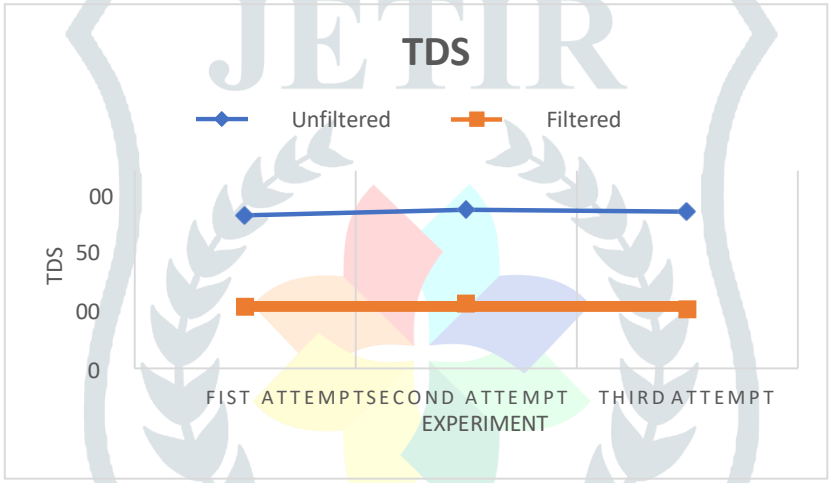

Fig.8: Comparison of TDS value of unfiltered and filtered water

From the above results it is inferred that, Experiment of water purifier, before filtering water is 110 on TDS scale after filtering the water TDS vale decrease to 64, which contain minimum chlorine. The TDS value decrease eventually as the uncleaned water is processed through three different filter candles.

4. CONCLUSION

The solar still is friendly to nature and eco-system. Various types and developments in active solar distillation systems, theoretical analysis and future scope for research were reviewed in detail. Based on the review and discussions, as solar energy is being used for the purification of water, which is cheap and abundant, it can be used everywhere where electricity is not available. Here, the overflow sensor and proximity sensor which is used also prevents the water from overflowing. Moreover, reverse osmosis is a good disinfectant process. This project has only capital cost and almost no running cost. Hence, it will prove to be useful in the near future.

- In general day to day life, we use for drinking and cooking purpose.
- It is used in food and beverages industry.
- It is used in the pharmaceutical and cosmetic industry.
- It is used in laboratories and hospitals.
- Use solar power as a source of energy.
- Reducing the cost of filtered water.

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