DEVELOPMENT OF STEPPED STILL SOLAR DESALINATION SYSTEM

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ABSTRACT

Solar still is widely used in solar desalination processes. But the productivity of the solar still is very low. To enhance the productivity of the single basin solar still many research works is being carried out up till now. In this work change the design of solar still used stepped solar still. Study the shape of the absorber surface over the distillate yield obtained the shape of the absorber surface provided in the basins of solar stills. The shape of use absorber surface plate area convex and concave increase basin water temperature causes the productivity and efficiency increase. In this work, experimental results were compared with conventional basin type still and still with wicks. That stepped solar stills can increase the distillate productivity about conventional solar stills, many reports studied the performance of stepped solar still. We are attempting to study the present status of different designs and performance of stepped solar stills enhances the productivity and efficiency of stepped solar still.

I. INTRODUCTION

Water is the one of the resources that is potentially useful to all living beings. Often water sources are brackish containing harmful bacteria and therefore cannot be used for drinking. Distillation is the one of the processes that can be used for water purification. Desalination refers to the process of remove- ng salt and other minerals from water. Water is desalinated in order to convert salt water to fresh water which is suitable for human consumption or irrigation. Most of the research in desalination was focused on developing cost-effective ways of providing fresh water for human use. Various research works are being carried out to improve the performance of the still. The basin area of the still, free surface area of water, inlet temperature of water, wind velocity, solar radiation, depth is some of the factors that three times more than the conventional system. solar integrated along with solar still to enhance productivity. Many materials such as sponges, fins, wick and pebbles are added in the still and maximum 78% productivity was found for fin, sponge combinations. It was shown that about 20% of daily efficiency has been improved in the modified still. Lalit (2013) When the convex and concave type stepped solar stills were used, the average daily water distillate had been found to be 56.60% and 29.24% higher than that of flat type stepped solar still, respectively Theoretical analysis is also made by solving energy balance equations and compared with experimental.

II.COMPONENTS

2.1.WATER TANK

Storage tanks are containers that hold liquids, compressed gases or mediums used for the short- or long-term storage of heat or cold. The term can be used for reservoirs, and for manufactured containers. The usage of the word tank for reservoirs is uncommon in American English but is moderately common in British English. In other countries, the term tends to refer only to artificial containers.

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Storage tanks are available in many shapes: vertical and horizontal cylindrical; open top and closed top; flat bottom, cone bottom, slope bottom and dish bottom. Large tanks tend to be vertical cylindrical, or to have rounded corners transition from vertical side wall to bottom profile, to easier withstand hydraulic hydrostatically induced pressure of contained liquid. Most container tanks for handling liquids during transportation are designed to handle varying degrees of pressure. A large storage tank is sometimes mounted on a lorry or on an articulated lorry trailer, which is then called a tanker.

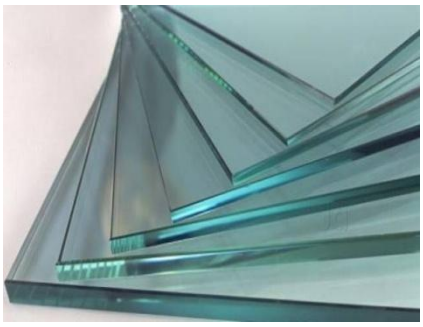
2.2 FLOW CONTROL VAVE

Flow control valves are used to regulate the flow rate and pressure of liquids or gases through a pipeline.Flow control valves are essential foroptimizing system performance, relying on a flow passage or port with a variable flow area.

2.3 GLASS PLATE

Plate glass, flat glass or sheet glass is a type of glass, initially produced in plane form, commonly used for windows, glass doors, transparent walls, and windscreens. For modern architectural and automotive applications, the flat glass is sometimes bent after production of the plane sheet. Flat glass stands in contrast to container glass (used for bottles, jars, cups) and glass fibre. Flat glass has a higher magnesium oxide and sodium oxide content than container glass, and lower silica, calcium oxide, and aluminium oxide content. (From the lower soluble oxide content comes the better chemical durability of container glass against water, which is required especially for storage ofbeverages and food). Most flat glass is soda–lime glass, produced by the float glass process (1950s). Other processes for making flat glass include:

- Broad sheet method (13th century)
- Window crown glass technique (14th century)
- Blown plate method (17th century)
- Plate polishing (17th century)
- Cylinder blown sheet method
- Machine drawn cylinder sheet method (early 20th century)
- Rolling (rolled plate glass, figure rolled glass) (19th century)
- Fourcault process (1900s)
- Overflow downdraw method (1960s)



2.4 TEMPERATURE SENSOR

A temperature sensor is a device, typically, a thermocouple or RTD that provides for temperature measurement through an electrical signal. A thermocouple (T/C) is made from two dissimilar metals that generate electrical voltage in direct proportion to changes in temperature. An RTD (Resistance Temperature Detector) is a variable resistor that will change its electrical resistance in direct proportion to changes intemperature in a precise, repeatable and nearly linear manner.

III.PRINCIPLES OF OPERATION

Thermocouples

A thermocouple is made from two dissimilar metal wires. The wires are are joined together at one end to form a measuring (hot) junction. The other end,

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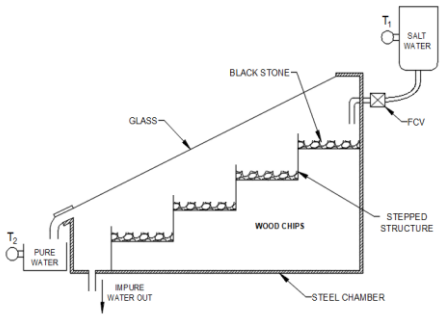
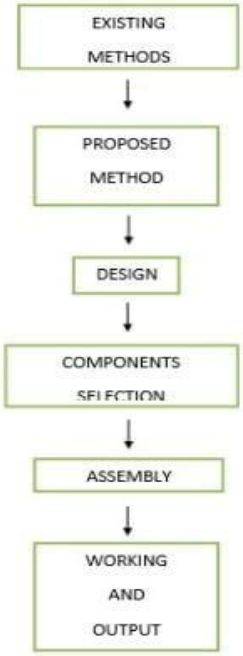
known as the reference (cold) junction, is connected across an electronic measurement device (controller or digital indicator). A thermocouple will generate a measurement signal not in response to actual temperature, but in response to a difference in temperature between the measuring and reference junctions.

RTD

To greater or lesser degrees, all electrical conducting materials have some amount of resistance to the flow of electricity. When a known electric voltage passes through a conductor, the resistance varies based on the temperature of the conductor. This resistance can be measured and will correspond to a specific temperature. While various elements are affected by temperature in different ways, platinum is commonly used in an RTD due to its purity, linearity and stability over a wide range of temperatures. An electronic readout device, such as a controller or digital indicator designed to measure resistance, is required for use with RTD sensors.



IV. FLOW CHART



V.CONCLUSION

For augmenting the evaporation rate, a stepped solar still is fabricated and tested, which could maintain minimum depth in the basin. Two different depths of trays are used. The production rate increased by 53.3% when black stones are used in the stepped solar still. When black stones and wood chips are used, the productivity increased by 68% and 65% respectively. An attempt is made by using both black stones and wood chips in stepped solar still and productivity increased by 98% than the conventional stepped solar still. Theoretical predictions closely agree with experiment result.

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