FABRICATION AND ANALYSIS OF SINGLE BASIN DOUBLE SLOPE SOLAR STILL WITH FINNED SURFACE

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ABSTRACT:

It is found that Solar distillation systems economically feasible in desalination of saline water. A solar distillation system is cost-effective and simple technology. Free of cost, non-polluting type solar energy is used to produce distilled water. The present work shows that high grade energy savings is possible with use of different efficiency enhancement techniques for solar stills. Experimentation is total carried out total five days in a month march 2020 from 1st march to 6th march compared to the efficiency of simple solar still single basin double slope solar still with finned surface efficiency is more simple solar still gives 1L pure water from the 6L of saline water in 7 hours but this will gives 5L of pure water from 8L of saline water in 5 hours the cost of the equipment is also less as compared to the other aqua technics. The operational cost is also less.

Key words: Solar Energy, Solar Still, Finned Surface.

Introduction:

Solar distillation is a relatively simple treatment of brackish (i.e. contain dissolved salts) water supplies. Distillation is one of many processes that can be used for water purification and can use any heating source. Solar energy is a low tech option. In this process, water is evaporated; using the energy of the sun then the vapour condenses as pure water. This process removes salts and other impurities. Solar distillation is used to produce drinking water or to produce pure water for lead-acid batteries, laboratories, hospitals and in producing commercial products such as rose water. It is recommended that drinking water has 100 to 1000 mg/l of salt to maintain electrolyte levels and for taste. Some saline water may need to be added to the distilled water for acceptable drinking water. Solar water distillation is a very old technology. An early large-scale solar still was built in 1872 to supply a mining community in Chile with drinking water. It has been used for emergency situations including the navy introduction of inflatable stills for lifeboats. There are a number of other approaches to desalination such as photovoltaic powered reverse osmosis, for which small-scale commercially available equipment is available; solar distillation has to be compared with these options to determine its appropriateness to any situation. If treatment with polluted water is required rather than desalination, slow sand filtration is a low-cost option.

METHODOLOGY EXPERIMENTATION:

EXPERIMENT LOCATION:

The experiment is carried out at Rajamahendravarm, Andhrapradesh, india. It has exceptionally hot &dry during summer with temperature reaching as high as 30^0C.

All the observations and readings on experimental setups are taken in the month of march 2020 from 1st march 2020 to 6th march 2020 The time duration for observations of solar still is from 9:00 AM to 5:00 PM for experimental setups of arrangement of only Black Coating, Black Coating with Finned Surface arrangement .All readings are taken at 2 cm depth of water in Basin so that total 8 lit. of water in inner basin of single basin double slope solar still. Temperature is measured for every 1 hour with the help of infrared thermometer.

In Experimentation total Four Efficiency enhancement techniques are used separately like Black Coating only, Black Coating with Finned surface. Total two Experimental setups of solar still are manufactured, one is simple setup which does not contains any Enhancement techniques and another setup is containing one Enhancement technique as mentioned above. Experimentation is carried out on two setups at same time so that each solar still with enhancement technique is compared with simple Experimental setup of solar still. Dimension of outer basin are (120cm×90cm×20cm). thickness of glass is 0.5cm.

MAIN PARTS OF SOLAR STILL:

BASIN: It is the part of the system in which the water to be distilled is kept. It is therefore essential that it must absorb solar energy. Hence, it is necessary that the material has high absorptivity or very less reflectivity and very less transmitivity. These are the criteria for selecting the basin materials.

CONDENSATE CHANNEL: It is the part of the system in which condensed water is collected. Sheet of required dimension is first cut out, and then it is folded by using the folding machine.

BLACK LINEAR: Solar radiation transmitted through transparent cover is absorbed in the black lining. Black bodies are good absorbers. Black paint is used as liner.

TRANSPARENT COVER: Glazing glass is used and thickness of 0.5 cm is selected. The use of glass is because of its inherent property of producing greenhouse effect inside the still. Glass transmits over 90% of incident radiation in the visible range.

FINNED SURFACE: Finned surface is provide because it absorbs more radiation compared to the normal surface.

INFRARED THERMOMETER: It is used to measure the temperatures of water, outside and inside temperatures and atmospheric temperature.

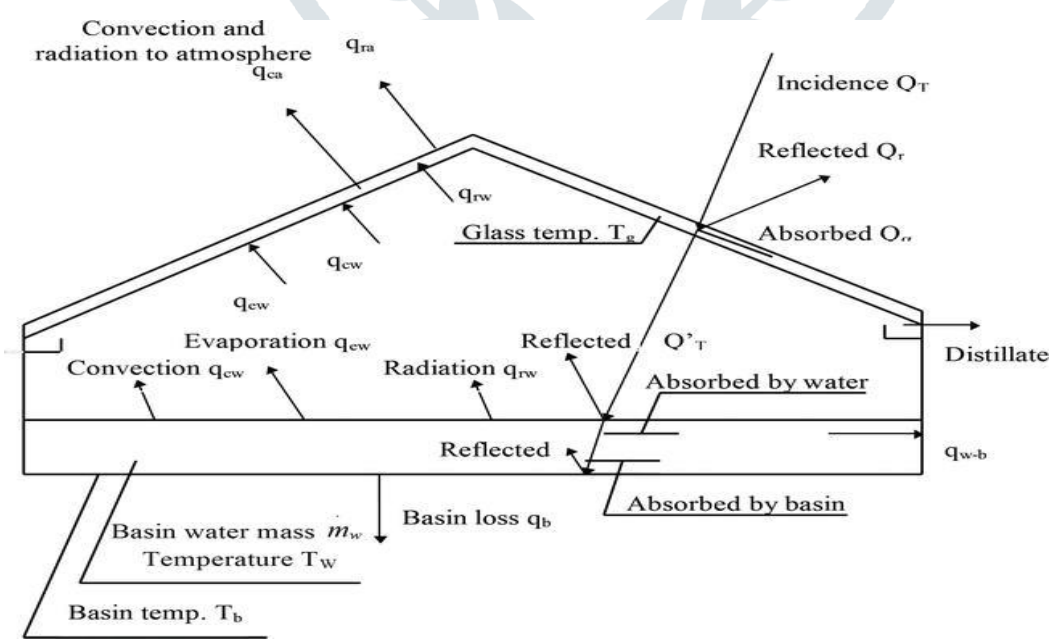

FIG 1 : single basin double slope solar still

Sr.no.	Setup	Capital Cost (Rs.)
1	Simple setup	12500/-
2	Simple setup with black coating	12750/-
3	Black coating with finned surface	13200/-

Table 1: capital cost of solar still

Sr. No.	Setup Type	Day	Distillate output	Average distillate	Efficiency (%)
1.	Setup with black coating and finned surface	1	0.885	0.875	19.95%
2.		2	0.935		21.08%
3.		3	0.881		19.86%
4.		4	0.889		20.04%
5.		5	0.789		17.79%
6.		6	0.872		19.66%

Table 2 : Experimental results

Efficiency of solar still

$$E= q*2.3/A.G$$

E = Efficiency of the still.

A = Aperture area of the still in = 0.5237

q = Distillate Output in lit./day

G = Global irradiation energy in

= 19.476 MJ/M^2

= 5.41 Kwh/m^2

Caluculation for efficiency of solar still :

$$0.885*2.3/0.5237*19476=0.1995=19.95\%$$

Like wise all efficiency calculations are carried out

Results and discussion:

Distillate output is more in experimental setup which consists of only Black Coating compared to simple setup. Also it has been seen that distillate output is more in experimental setup which consists of Black Coating with finned surface. . Hence efficiency of simple setup is increases by use of Black Coating, Finned Surface. For a simple setup the efficiency is approximately around 11-12% but with the finned surface the efficiency is around 21%.

Conclusion:

From this Experimental investigation we can conclude that the increase in temperature and hence the evaporation is maximum in the period of 12:00 am to 03:00 pm. The saline water we have supplied 8 liters we will get the pure water of 5 liters in 5hrs.