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## A REVIEW OF ENHANCED PERFORMANCE OF A DOUBLE BASIN ACTIVE SOLAR STILL WITH EVACUATED TUBES

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**Abstract:** Water is a primary need of life, health, sanitation and is the most important issue on the international agenda. On the basis of various literature survey, a double basin active solar still is selected for further development and performance analysis. Solar still is subjected to be coupled with evacuated tubes for collecting high energy from solar radiation. Solar collector for high temperature water is feeding in to the basin of solar still. In this paper we are using two basins which are inner and outer basins. Black granite gravel is used in solar still which increases the output of distilled water by reducing the quantity of brackish or saline water in both basins. The intension of this effort is to make healthy society by providing clean, pure and fresh drinkable water. The output result will increase than previous research to fulfill the increased demand of society.

**Keywords:** Double basin solar still; Black granite gravel; Water; Distillate output; Solar radiations.

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## **INTRODUCTION**

Water is an most important and abundant substance in nature. Demand of water increasing day by day. Pure water is not only essential for man but also for earth plants and animals. The present status of available water is 97% salty, rest around 2.6% is fresh water, less than 1% water is within human reach. Means only 1% water is available for the society for direct use. Out of which the maximum fraction of water has been polluted due to non-manageable industrial developments. All ecosystems and every field of human activity depend on clean water and it is one of the most precious resources in today's world.

Desalination is one of most humankind's primitive forms of water treatment and it is still a popular treatment solution throughout the world today. Solar still is a device which is used for desalination purpose. Solar still are of two types passive still and active still. Passive solar still employs only solar radiation to evaporate water for production of distillate output. Whereas active solar still requires the addition of some mechanical source in the form of collector with solar energy. Hence the efficiency as well as distillate output of active solar still is good compared with solar still. Solar still operates similar to natural hydrological cycle of evaporation and condensation. Both basins of solar still are filled with saline water. The sun rays absorbed by collector are passed through glass cover to heat the water in the both basins. And the water gets evaporated. As the water inside the solar still evaporates, it removes all contaminates and microbes in the basin. The purified vapour condenses on the inner side of the glass. This condense vapour collects in the flask. Many solar systems were developed over the years using above principle for distillation. This paper reviews the technological development of active solar still distillation system developed by various researchers in detail.

## **LITERATURE REVIEW**

Most of the researchers used flat plate collector with single basin solar still. Some uses concentrating collector with single slope. Rai et.al.[1]: Investigated that in passive type basin stills, glass cover plate with 3mm thickness gives 16.5% more production than the cover with 6mm glass thickness conducted in door simulation experiment and found that the production rate was higher for cover inclination. Glass temperature affected the condensation rate at its lower surface. Lower glass surface temperature increases the circulation of air inside the still which enhances convective and Evaporative heat transfer between basin water and glass. Also cooler glass lower surface increased condensation. The glass cover temperature was reduced by continuous flow or intermittent flow of raw cooling water on the cover. results show that the daily yield was decreased about 44% when changing the water depth from 0.01 to 0.20m

with the initial water temperature as 35°C. Badran et.al.[2]: Investigated a single-stage, basin-type solar still and a conventional flat-plate still under local conditions. The still inlet was connected to a locally made, fin-tube collector such that its outlet was fed to the still basin instead of the common storage tank. Measurements of various temperatures, solar intensities and distilled water productions were taken for several days at various operating conditions. still connected to collector for a 24-h period; still connected only during sunlight hours from 8 am to 5 pm, and still operating alone for a 24-h period. These tests were performed using tap water and saline water as a feed. It was found that the mass of distilled water production using augmentation was increased by 52% in the case of salt water as a feed. Sampathkumar et.al.[3]: Investigated the evacuated tube collector model solar water coupled with a still conducted a performance study on various days at different timings. The main objective of the research was to effectively utilize the solar water for solar still productivity enhancement and it is working as a hybrid system. It was found that the productivity of the coupled solar still was doubled when compared to the simple solar still. The modification increased the yield. Even if the collector and solar still were coupled only after the storage tank water temperature reached 60°C. Voropoulus et.al.[4]: connected solar pond with solar collector and solar still they proved that coupling a solar collector and solar pond produces double productivity than passive solar still. Dimri et.al.[5]: found that coupling a flat plate collector with higher thermal conductivity material produces higher distillate output as well as efficiency compared with single slope solar still. Panchal et.al.[6]: made an experiment with solar still flat plate collector in climate conditions of Mehsana, Gujarat. They proved 29% increase in the efficiency of solar still by coupling with a flat plate. Panchal et.al.[7]: made an experiment with evacuated glass tube collector with solar still in climate conditions of Mehsana, Gujarat. He found 40% increase in distillate output of solar still. Kargar sharif abad et.al.[8]: integrated pulsating heat pipe with solar still. They found a remarkable increase in the rate of desalinated water production with the maximum production of 875ml/m<sup>2</sup>h.

The main objective of this work is to investigate experimental performance of double basin solar still with evacuated tubes. To increase distillate output of a solar still black granite gravel is used inside the both basin of a solar still to reduce the quantity of water. The number of evacuated tubes are used to increase the distillate output. The latent heat of vaporization into the basin water, this increases rate of heat evaporation. Vapour escapes and stick to the glass cover and maximum will be the distillate through trough and collected in the flask. The water produced by this experiment of double basin solar still is the pure, clean and fresh water (i.e. can be used for food, cooking, bathing and industrial purpose, animal, plants etc.)

## SYSTEM DEVELOPMENT

To improve the heat absorption and collection by the still, it is observed that by performing the number of experiment on different materials such as the bottom sand , granite gravel or charcoal. The black granite gravel at the base gives the maximum efficiency and the best advantage of granite gravel is act as a best filter, and granite gravel beds are used as filters in rain water harvesting system. So in this experiment we used granite gravel as base material in inner and outer basin. Black granite gravel possesses a very good characteristics of working as an energy storage medium and it also releases energy during off sunshine hours. Black granite gravel with evacuated tubes produced considerable distillate output compared with other experimental techniques used by various researchers. Sea water can be heated by using horizontal and vertical reflector, which is a solar absorbing surface (short wavelength and long wavelength solar radiations).The absorbing surface of solar radiation can transfers the absorbed heat energy to the sea water, enclosed by glass transparent to solar radiation over the solar collector. Black insulation helps to minimize the conduction losses.

When evacuated tubes is connected with solar still which gives higher productivity due to increase in heat capacity of water. By injecting heat energy into the inner and outer basin increases the evaporating temperature of saline water. Evaporated Water inside the inner and outer basin is condensed by toughened glass. Condensed water of inner and outer basin is collected in flask. In fig. hanging flask are denoted by output 1 and output 2. Silicone rubber sealant is provided to hold toughened glass in contact with solar still surface. This experiment will be carried out on a solar distillation system with air tight basin. The absorber plates of inner and outer basin we are going to use are made up of aluminium sheets with black chrome. Black paint will use for increasing absorptivity of solar radiations. In remote areas people struggle for pure water. The impure water is injurious to health. To avoid the problem of impure water solar distillation system we are using.

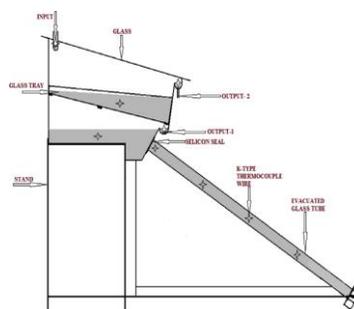


Fig. Double basin solar water distillation

## CONCLUSION

On the basis of above discussion, we conclude that, requirement of distilled water for domestic application as well as in industries like textile, pharmaceutical industries are increasing. The low grade water available free of cost. The location of India is tropical region and due to this location solar energy availability is in bulk amount. There are various methods of solar distillation developed by researchers which we discussed above. We are using double basin solar still with horizontal and vertical reflector by using evacuated tubes. The output of distillate will increase by evacuated tubes. By means of this arrangement we are able to absorb maximum solar radiation to the system and improve efficiency.

## FUTURE SCOPE

Water and energy are two most essential things for the sustaining life. All living organisms contain water the body of a human being is composed of approximately 60% of water, a fish 80%, plants between 80% and 90% water is necessary for the chemical reactions that occur in living cells. So the solution of this above problem is solar distillation. The solar distillation is a method which is free of cost. The input source and available energy is cost free. Double basin solar still gives the maximum output distillate water. This system we can use anywhere, such as, in remote areas, in industries. In future pure water will available in a large quantity to the remote places. Various scopes in developing solar still design and methods for the scientist, researchers and engineers.

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