

# A Review of Advanced Distillation System Using Renewable Energy

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**Abstract:** The intention of this effort is to make healthy society by providing clean, pure and fresh drinkable water. The influence of Advanced RE Distillation System (AREDS) single slope or wick type solar still attached with inlet pipe of copper tube and blackened plate along with reflector for improving the efficiency of solar still to avoid short-supply of drinkable water which is fit to drink. Today it is also required in several Industries, Hospitals, school and colleges, Agricultural uses. The supply of pre-heated water has to improve of AREDS. The AREDS means a special arrangement using direct radiation (short-wavelength radiations) to throw the pre-heated water into basin so that will escapes maximum vapor. The output result will increase than previous research to fulfill the increased demand of society .Therefore regulating the potable water sources.

**Keywords:** Renewable Energy;Short-Wavelength Radiations; Water; Wick Type Solar Still; Efficiency.

## I.INTRODUCTION

The purpose of this effort is to develops new experimental set-up and improvement in the efficiency of a wick type single slope solar still with advanced distillation system. In the construction and operation the auxiliary arrangement is used to supply pre-heated water in a copper tube with black coated plate and reflector (mirror) also addition of gravel's at the bottom of basin as shown in Fig.1 By doing this arrangement there is definite addition of latent heat of vaporization into the basin water, this increase of heat increases evaporation rates of vapor. More the vapor 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 advanced distillation system is the pure, clean and fresh water (*i.e.* can be used for food cooking, bathing and consumption *etc.*)

## II. SYSTEM DEVELOPMENT

To improve the heat absorption and collection by the still, it is observed that by experiment on different materials on the bottom-sand, gravel, or charcoal. The gravel at base gives the maximum efficiency. An additional advantage of gravel is acts as a best filter, and gravel beds are used as filters in rain water harvesting system. Therefore, we determine to use

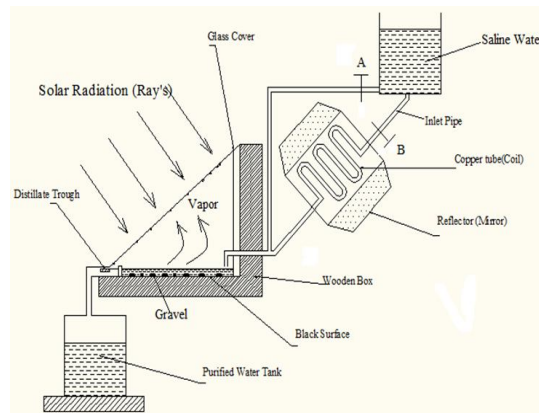


Fig.1 Experimental set-up (Advanced RE Distillation System)

Gravel as base material in our advanced distillation system [1]. A typical pre-heated liquid can be heated by using inlet pipe of copper tube and blackened plate along with reflector which is having the black, solar energy (short-wavelength radiations) absorbing surface. This surface can transfer the absorbed energy to the water, enclosed by glass transparent to solar radiation over the solar collector. Black insulation works as to minimize the conduction losses. When complete water heater is connected with solar still which gives higher productivity due to the increase in the heat capacity of water. By injecting the thermal (short-wavelength radiations) energy in to the basin from collector increases the evaporating collector temperature. This collector acts as external heating element [2].

The experiment is carried on a solar distillation system, it is an air tight basin, made up of concrete or cement, G.I sheet or Fiber Reinforced Plastic (FRP) with top cover of opaque material like glass and plastic *etc.* The inner surface of the basin is kept blackened to efficiently absorb the solar isolation incident on it. The typical arrangement is made to collect the distillate at slope end of the glass cover. The contaminant or dirty water is fed into the basin for purification. Solar isolation that passes through the opaque body to heats water in blackened basin thus evaporating water which gets condensed and fix to the cooler inside of the glass and collected in a flask as distillate attached to glass [3].

In growing countries there is a trouble of pure water. This water is injurious for drinking and also it adversely affects on health. To avoid this difficulty a solar still is designed which circulate the source of potable water. The heat in the form of short-wavelength rays from the sun evaporates water inside the solar still. As the radiation reaches the surface of the water it heats up the water and there by rising the temperature which is higher than the ambient. Energy distributed to each element of the still, solar time, direction of direct radiation, clear sky radiation, optical parameters of the cover, convection inside and outside are accounted. Theoretical basis of the heat and mass transfer mechanisms inside this solar still has been developed. By observing above factors it is concluded that the efficiency increases rapidly with increase of short-wavelength sun rays and also by rising feed water temperature [4].

Basically two types of radiations are available on the earth surface, first are known as in line radiation or beam radiation (short-wavelength) and other called as diffused radiation or scattered radiations (long-wavelength) when these both combined are called as Global or Total radiations. Out of these two solar still distillates more water can be produced by the direct (short wave-length) type of radiations as these radiations are having the high heat energy. Intensity of direct radiations is measured by an instrument called as pyranometer. As observed from the pre-heated water and normal water the amount of heat flow by sun's radiation, convection and evaporation is fully depends on the temperature difference between the water and the opaque cover. Its efficiency will be increased by the complete utilization of the heat energy absorb by black body. Hence if we used pre-heated water then the proper utilization of latent heat of vaporization is obtained and efficiency enhances. The maximum efficiency is available by using single wick type solar still during hours 14.00hrs (PM) and minimum at 09.30hrs (A.M) [5].

### III.CONCLUSION

From above discussion we conclude that, requirement of distilled water in industries like pharmaceutical industries, as well as for domestic application are very high. For distillation of water we required low grade and free of cost energy. Geographical location of India is Tropical region and due to this location solar energy (RE) is available in mass quantity. For water distillation there are number of methods are available, in above discussion we use incident type system with and without reflector (mirror) for water distillation. Efficiency of without reflector and auxiliary system is 17.1% and it is quite less than amount of solar radiations available.

To improve above efficiency we use same system but with reflector and auxiliary heater. By using reflector sun rays (short-wavelength) are collected and reflected in to the system, by means of this arrangement we are able to absorb maximum sun rays (short-wavelength) to the system and improve the efficiency.

### IV. FUTURE SCOPE

The water and the energy are the two most essential things for the sustaining of life. Only less than 1% water is available for the ordinary (domestic) purpose out of which the maximum water has been polluted due to non manageable industrial growth. Advanced solar still is a device which can solve the problem of potable water without using the high grade energy. Various parameters decide which solar still to be use in particular cases. Solar stills may be introduced in India where the remote places are more than far away from the source of fresh water and where the high levels TDS (Total dissolved solids) founds. A single sloped wick type solar still receives more heat over a double sloped solar still at low and high altitude regions. There is a huge scope to the scientist, researchers; engineers to continuous improve in various kinds of designs and methods to enhance the productivity of solar still which is beneficial to enlarge the solar sector. A solar still may be used in villages and mass production of fresh water. Globally the problem of impure water is increasing day by day hence there is huge chance to produce fresh water by using solar still, and in special situations a solar still can provide fresh water economically than any other method. The solar distillation process requires low grade energy which is freely available and also there is no green house pollutant as in the case with other purification techniques using fossil fuels. In future it can be used in remote places where there is no electricity and fuels.

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