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DESALINATION USING SOLAR ENERGY

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ABSTRACT

The fresh water requirement is tremendously increasing in the present society with all kinds of industrial and factory growth leading to more and more pollution of natural resources. On the other hand, there are many arid and desert regions in the world where there are less frequent rainfalls and ground water shortage. Most of the water bodies like rivers, lakes and so forth throughout the world are saline and brackish which are not suitable for domestic, irrigation and especially for drinking purposes. Solar desalination is proven to be eco-friendly and economical way of producing the fresh water to cater to the needs of rural population.

I. INTRODUCTION

Water is one of the most important constituent for the sustenance of mankind. It is useful for many purposes like agriculture, irrigation and domestic purposes like cooking and soon. Fresh water is the most important issues of health hazard in today's world. More than two thirds of earth's surface is covered with water of which around 97% is salty, 2.6% is present as icebergs and only less than 1% of fresh water is within human reach. With the increase in population and pollution due to the technological industrial development, transportation etc., the fresh water sources which are fixed on earth's surface are now getting depleted at a much faster rate [1]. Also in the desert, rocky and arid regions of the world, there is infrequent rainfall leading to acute ground water shortage. With these reasons, desalination is found to be most challenging task and the only viable solution to derive fresh or potable water from the available brine and saline water resources all over the world [2]. The same basic principle that is involved in the production of rainfall through the hydrological cycle which occurs in nature is implemented in all the man-made desalination systems in order to produce fresh water from the salty resources. The removal or separation of salts from the water cannot be achieved automatically but it is done in desalination systems by the aid of some energy source [3].

II. DESALINATION

Desalination can be defined as any process that removes salts from water. Desalination processes may be used in municipal, industrial, or commercial applications. With improvements in technology, desalination processes are becoming cost-competitive with other methods of producing usable water for our growing needs.

In general, **desalination technologies are broadly classified into two categories** based on the principle of separation of salts and fresh water from the saline water solution. In **evaporative or thermal desalination technologies**, the extraction of fresh water is obtained through phase change by the addition of heat to the saline water solution. It consists of alternate cycles of evaporation and condensation phenomenon. These technologies are of various types namely **Multiple Effect Distillation (MED), Multi Stage Flash (MSF) desalination, Thermal Vapour Compression (TVC), Mechanical Vapour Compression (MVC) and others.** In **membrane desalination technologies**, the salts are separated from the saline water solution by the aid of selective membranes. In these pressure driven membrane processes of desalination, fresh water is obtained without phase change. Membrane desalination technologies are namely **Reverse Osmosis (RO), Electro Dialysis (ED) and others.** These conventional methods of producing fresh water are highly energy consuming techniques involving either

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requirement of heat and a kind of mechanical or electrical energy to separate salts in the case of thermal and membrane processes respectively [4].

III. SOLAR DESALINATION

Solar desalination on the other hand proves to be the most economical and viable techniques of purifying the saline water solution. It uses the naturally available abundant supply of solar energy to evaporate the water and thus this method has zero operational cost [5].

IV. DISTILLATION

The evaporation and subsequent collection of a liquid by condensation as a means of purification: the **distillation** of water [6].

V. SOLAR DISTILLATION

The process of getting potable or distilled water from brackish or saline water with the help of solar energy is known as **'solar distillation' [7]**.

Solar distillation is an economical, effective and environmentally friendly method over all the conventional distillation methods (which are energy and cost intensive techniques) for getting the pure water through the use of solar energy [8].

VI. SOLAR STILL

The **solar still** is a very simple way of distilling the water. It consists of a container whose inner surfaces is coated with black paint and is fitted with a glass cover. The container is filled with saline or brackish water to be purified. The solar radiation gets transmitted through the glass cover and is absorbed by the basin liner which in turn heats the water. The evaporated water gets condensed underneath the glass surface and is collected in a trough fitted along the length side [9].

VII. CONCLUSIONS

Conventional water purification methods are highly energy and cost intensive. It is well known that desalination plants use electrical energy which have both economical and environmental drawbacks and rely on conventional fuels. Therefore a method is required to use renewable energy, low input cost and fewer efforts for the production of potable water.

A distillation method using solar energy can be economical, environment friendly and renewable energy based technology. It is a method which can be applicable in rural, remote areas of developed and developing countries including gulf countries also where the availability of solar radiation is high.

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