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Effect of Untreated Water Flow Rate at Certain Temperature on the Discharge of Treated Water

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Abstract

Desalination requires large energy. This experiment deals to desalinate brackish water through solar panels. The discharge from desalination plants is almost entirely water, and .01 percent is salt. Desalination is a process that extracts minerals from saline water. Solar-powered desalination technologies can be used to treat non-traditional water sources to increase water supplies in rural, arid areas. Water scarceness is a rising dilemma for large regions of the world. Access to safe, fresh and pure clean drinking water is one of the most important and prime troubles in different parts of the world. Among many of water cleansing technologies solar desalination/distillation/purification is one of the most sustainable and striking method engaged to congregate the supply of clean and pure drinkable water in remote areas at a very sound cost. Six types of dripper having discharge 3 - 8 lh-1were installed one by one and measured discharge and volume of clean water indicated that at 6 lh-1untreated water discharge have maximum evaporation and volume of clean water was 19.2 lh-1 at same temperature and radiations. Now strategy was developed that when increased the temperature the intake discharge of untreated water must be increased and salt drained water two times more than treated water.

Keywords: Solar Desalination Panels, Reverse Osmosis, Brackish water and Desalinized Water

Major classification: Health Science.

1. Introduction

The reduction of groundwater is an apparition offered for many parts of the world that depend on the un managed utilization of groundwater. Groundwater irrigation has been a key strength after the remarkable raise in food productivity in South Asia. The consistency and suitability of groundwater exploit and the supplementary water it brought have ended it a vital part of the region's green revolution since the 1970s. However, groundwater is also the world's 'mainly mined reserve' (UNESCO, 2003; Mukherjee, 2015). Over recent decades, groundwater use has grown exponentially in scale and passion in many places, principal to aquifer depletion and groundwater pollution (Giordano, 2009.; Wada et al., 2010; Kulkarni et al., 2015).

The use of solar irradiation for management of chemically and biologically contaminated water is not an innovative drift (Sinton et al., 2002). With increasing global population, the fissure among the supply and demand for water is widening and is reaching such disquieting levels that in some part of the world, it is pretense a menace to human survival (Li, and Tian, 2009). The remaining percentage is made up of brackish water, vaguely salty water found as surface water in estuaries and as groundwater in salty aquifers. The need for fresh water is at the apex of the international schema of decisive problems, at least as definitely as climate change. India as a country has 16% of the world's population and 4% of its fresh water resources (Abraham, and Luthra, 2011).

The fresh water scarcity is a rising setback all over the world because only 1% of earth's water is freshwater available for human to drink. The US geological survey established that 96.5% of earth's water is sited in seas and oceans and 1.7% of earth's water is positioned in the ice caps (Pangarkar et al., 2010). Water dearth tends to arise in regions with high received solar energy (Brutsaert, 2005). Such areas are gaining population faster than the rest of the country in the United States. Southwestern states, the most dry and high irradiance regions in the nation—have constantly detained high population growth rates (Mackun et al., 2011).. The multiple effects of drought and growth advocate these states face considerable challenges meeting current and future water needs (Scott and Pasqualetti, 2010). Consequently, drinking water of acceptable quality has become a scarce commodity. The total global water reserves are approximately 1.4 billion km3, of which around 97.5% is in the oceans and the remaining 2.5% is fresh water present in the atmosphere, ice, mountains and ground water. Of the total, only _0.014% is directly available for human beings and other organisms (Al Kharabsheh and Yogi, 2003).

Water desalination with solar utilization is ever more suitable an aggressive way out for supplying drinking water in many countries around the world. The desalination of brackish water has been documented as one of the most sustainable and new water resource alternate. It plays a decisive task in the socio-economic progress for many communities and industrial sectors. Presently there are above 14,000 desalination plants in operation worldwide providing several billion gallons of water per day. Large scale conventional heat and power plants are installed are in the Middle East and Gulf region. However, since they are operated using fossil fuels, they are becoming costly to operate and they produce the pollution and greenhouse gas emissions that are increasingly injurious to the environment. Furthermore such plants are not cost-effectively workable in distant areas, still in coastal regions where seawater is plentiful. Many areas often experience a shortage of fossil fuels and insufficient and defective electricity supply. The combination of renewable energy resources in desalination and water purification is becoming more viable as costs of conventional systems increase, commitments to reduce greenhouse gas emissions are implemented and targets for exploiting renewable energy are set. Thus, solar energy could provide a sustainable alternative to drive the desalination plants, especially in countries which lie on the solar belt such as Africa, the Middle East, India, Pakistan and China. Stipulation of harmless drinking water is a crucial for the life and consequences in socio-economic development. Fresh water assets are speedily decreasing owing to raise in the population and mismanagement and the promising climate changes are more accelerating the procedure of water scarcity. This is dire need of the time to purify saline water into drinkable principally in the coastal areas which have lowly right to use the safe drinking water and ground water is often brackish. The coastal population is prone to a number of health problems because of using insecure water. Distillation is one of many processes that can be used for water purification. This requires an energy input, as heat, solar radiation can be the source of energy. In this process, water is evaporated, thus separating water vapor from dissolved matter, which is condensed as pure water. Solar power desalination and air water technologies are having very low maintenance and operation cost, easy installation and operation, no skilled labor requirement, low initial investment as compared to reverse osmosis, no high tech exchange parts like batteries, filters or membranes, and independent drinking water supply for individual families**.** Most of our earth surface is enclosed by water; though, below 1% of total accessible water is fresh water which frequently exists in lakes, rivers and underground. Once more, in relation to one-third of that potential fresh water can only be used for human needs due to mixed factors. Approximately1.1 billion People in this world have inadequate access to safe drinking water. Approximately 26 countries do not have sufficient water to continue agriculture and economic developments. Arid and semiarid countries have serious intermittent drought considering at least 80%. A third of Africans and most of Middle-East people survive without adequate water (Bouchekima, 2003).

Solar distillation is a method where solar energy is used to generate fresh water from saline or brackish water for drinking, domestic and other purposes. There are several distillation methods developed for water desalination technology which vary in minimalism, cost and applications. In the last decades, many researchers have been conducted to minimize the cost of this process, and several methods have been developed. Among these methods, solar distillation occurs as one of the best practical and the most economical, especially for mass production of fresh water from high saline water like seawater (Saidur et al., 2011).

2. Experiment Procedure/ Design

The following are the description of solar powered water desalination system AROCELL solar water purifies Australian technology. It only use sun energy, there are no moving parts, no electronics. It is robust and easy to setup, low maintenance and very low in operating cost because the water purifier only need solar energy. The feed water is supplied by gravity or pressure pump CAROCELL direct solar powered desalination technology, working at ambient temperature, heats the input water causing vapors condensation change precluding all bacteria and pathogens, therefore eliminating all water borne diseases Exposure to ultra violet light and extreme heat from solar energy through the advanced composite panels enhances the germ killing process. CAROCELL's increased efficiency (65% with peak efficiencies above 80%) over other solar distillation products (30-40%) is a combination of the proprietary materials used to dramatically increase the temperature of the feed water on the solar collector which enhances the evaporation/condensation processes inside the panel. Additionally, this sophisticated geometrical design has easy maintenance, optimum performance and a self-controlling natural convection loop enabling widely superior energy recovery (Muhammad et al., 2018).

The study was conducted to gather data of clean water volume per day along with temperature and solar irradiation. The out flow rate of clean water measured at constant in flow of untreated water along with temperature at 8.0 am to 4 pm daily. It was observed that inflow of untreated water needs to be adjusted along with temperature variation to increase the clean water volume per day. Now strategy was developed that when increased the temperature the intake discharge of untreated water must be increased and salt drained water two times more than treated water. This strategy was applied for further data generation. Temperature data were used of agro met station of CAEWRI, NARC, Islamabad.

3. Results and Discussions

Reverse Osmosis (RO) is the one and only one regularly used domestic filtration system that removes even all the impurities. RO is required if the Total Dissolved Solids (TDS) exceeds a certain value. The use of solar irradiation for treatment of chemically and biologically contaminated water is not a new trend [17]. Pure water is the basic necessary for all living organism. Now days, the availability of clean water resource is a major issue for mankind. A lack of infrastructure for water storage and distribution is also a factor in the developing world. More than71% of the earth surface is covered with the water, but only 1% clean drinkable water is available with the international standards (Rahul and Tiwari, 2009).

Table 1: Effect of untreated water flow rate at certain temperature on the discharge of treated water recorded at NARC Islamabad

Temperature (C^0)		**Discharge(lh^{-1})**			**Solar Irradiation**	**Treated Water**
Min.	**Max.**	**Untreated**	**Treated**	**Drain**	**Islamabad ($KWhm^{-2}$)**	**($lday^{-1}$)**
15.7	**27.5**	**10**	**1.90**	**8.10**	**174**	**15.2**
		9	**2.10**	**6.90**	**174**	**16.8**
		8	**2.15**	**5.85**	**174**	**17.2**
		7	**2.25**	**4.75**	**174**	**18.0**
		6	**2.40**	**3.60**	**174**	**19.2***
		5	**2.20**	**2.80**	**174**	**17.6**

The solar desalination systems were installed in these areas where saline water ranges from (3,000–20,000) PPM for evaluation and their field performance. The study was conducted to gather data of clean water volume per day along with temperature and solar irradiation. The out flow rate of clean water measured at constant in flow of untreated water along with temperature at 8.0 am to 4 pm daily. Data indicated in Table 1 showed that the discharge volume of cleaning water was increasing as well as the temperature of the sunlight hours increasing. It was observed that inflow of untreated water needs to be adjusted along with temperature variation to increase the clean water volume per day. Six types of dripper having discharge 3 - 8 lh^{-1}were installed one by one and the data of measured discharge and volume of clean water indicated that at 6 lh^{-1}untreated water discharge have maximum evaporation and volume of clean water was 19.2 lh^{-1} followed by 7 lh^{-1}untreated water discharge produced clean water was 18.0 lh^{-1} at same temperature and radiations (Table-1).

Figure 1: Train the farmers for operation and maintenance of solar desalination system

Similarly results were also produced by the findings of Muhammad et al. (2018). This experiment resulted that 7 lh-1 intake discharges gained the highest position in attaining the clean water during summer season. The efficiency of desalinization rate was reduced to 8.8 – 10.4 liter in winter due to less sunshine hours as well as low temperature as comparing to summer (Ullah et al., 2018a). Ullah et al. (2018b) concluded that the purification of saline water into drinkable water depends upon the intake saline water capacity of each desalinization solar unit. The desalinization solar units performed better results if intake water adjustment was done @6 liters/hr/panel).The brackish water converts into fit water having very minute salts at Goth Bashirullah, Gadani, Lasbella, Baluchistan (Ullah et al., 22018c).

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