Domestic Water Desalination Plant using Solar Energy

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Abstract

Rapid growth in human population as well as limitations in water resources due to the contamination and salinization have resulted in significant demand for fresh water. Therefore, it seems essential to develop new sustainable and cost-effective water supply alternatives. Desalination that is a promising method for the purification of saline water, offers unlimited, constant supply of high quality drinking water. The needs for safe and reliable water quantities continue to increase following the expected population expansion by the year 2050. Further, the absence of other sustainable water sources, desalination remains the best option that can meet domestic, public and industry water demand. It does not only address the immediate water needs but also plays a significant role in long-term issue of water security. To provide a sustainable use of desalination technology, the impacts of desalination plants should be investigated and mitigated by means of an environmental impact assessment studies. We will use the method of desalination that is cost effective and economical for village’s people.

Keyword- Domestic Water, Desalination Plant, Solar Energy

I. Introduction

Over 97% of the water on earth is unsuitable for human consumption due to its salinity. As population increase and sources of high quality, fresh drinking water decrease, using desalination processes to provide fresh water when other sources and treatment procedures are uneconomical or non-environmentally responsible is becoming more and more common. Saltwater is desalinated to produce water suitable for human consumption or irrigation. One by-product of desalination is salt. Desalination by solar energy most economical solution comparatively other solution.

Saltwater is desalinated to produce water suitable for human consumption or irrigation. One by-product of desalination is salt. Desalination is used on many seagoing ships and submarines. Most of the modern interest in desalination is focused on cost-effective provision of fresh water for human use. Along with recycled wastewater, it is one of the few rainfall-independent water sources.

Due to its energy consumption, desalinating seawater is generally more costly than fresh water from rivers or groundwater, water recycling and water conservation. However, these alternatives are not always available and depletion of reserves is a critical problem worldwide. Currently, approximately 1% of the world's population is dependent on desalinated water to meet daily needs, but the UN expects that 14% of the world's population will encounter water scarcity by 2025.

According to the International Desalination Association, in June 2015, 18,426 desalination plants operated worldwide, producing 86.8 million cubic meters per day, providing water for 300 million people. This number increased from 78.4 million cubic meters in 2013, a 10.71% increase in 2 years. The single largest desalination project is Ras Al-Khair in Saudi Arabia, which produced 1,025,000 cubic meters per day in 2014. Kuwait produces a higher proportion of its water than any other country, totaling 100% of its water use.

II. Objectives

- To collect the water sample for determine salinity in the water.
- To give the solution for the desalination of water.
- To select the suitable method of desalination for domain.

III. Advantages

- Provides people with potable water (clean & fresh drinking water).
- Provides water to the agricultural industry.
- Water quality is safe (not dangerous or hazardous to any living thing).
- Uses tried-and-tested technology (the method is proven and effective).

- Helps preserve current freshwater supplies.
- Independent of changing factors.
- Help with habitat protection.

IV. METHODOLOGY

A. *Conductivity Method*

The electrical conductivity of water is proportional to its concentration of electrically conductive salt ions. Conductivity, the amount of electrical current that can pass through the water, is easily measured with a hand-held device called a conductivity probe or meter. Conductivity then can be converted to salinity if temperature and pressure are also known. Some salinity-measuring devices do this conversion but are not accurate at concentrations higher than about 70,000 ppm.

B. *Collecting Water Sample*

1) Make sure that your collecting container is very clean. Previous contents could affect your result. Use a container with an opening large enough to take the EC meter. Do not use jars which smell (eg.vegemite, pickle jars) if samples are to be kept for a while.

Choose a sample which is representative of the body of water being considered. It needs to be a sample which is like most of the water you want to get information about. If you don't collect a representative sample you're wasting your time. Try not to take your sample too close to the surface, bottom or sides of the waterbody

Flowing Water - For rivers and creeks try to take your sample in a place where the water if flowing. Sample well below any stream> junction (a rule-of-thumb is the equivalent of 10 stream widths downstream) to allow good mixing.

Still Water - eg. Dams, swamps and lakes. Saline water is denser than fresh water. This means, that in a still water body, the saline water will settle to the bottom. If you have an offtake pipe from the base of the dam, sample water from here.

Groundwater - Stock bores can be tested at the trough. However, the water should be freshly pumped. The salinity of water sitting in an unused trough may be higher than the actual groundwater salinity level due to concentration of the salts through evaporation. Investigation bores may be tested using a bailer to collect a water sample. Make sure you ask the permission of the individual or department responsible for the bore.

Rinse the container two or three times with some of the water to be sampled. Collect the sample.

C. *Taking Salinity Reading*

2) Ensure your EC meter has been calibrated (see notes below).
3) Remove the protective cap, switch the meter on and insert the probe into the water sample up to the immersion level.
4) Move the probe up and down to remove bubbles from around the electrodes.
5) This will ensure good contact is achieved between water and electrodes (do not swirl it around as this may actually drive water out of the probe).
6) Allow the probe to reach the temperature of the water before taking a reading.
7) Temperature has a significant impact on the salinity reading. EC units are standardized to a temperature of 25ºC. Some meters automatically correct the reading taken at water temperature to a reading at 25ºC.
8) If the meter has automatic temperature compensation, wait about 30 seconds before taking your reading if the water and probe are about the same temperature. If the water is much colder than the probe, allow a longer period, say two minutes before taking a reading.
9) If the meter has no temperature compensation take the temperature of the sample and use a correction table to get the right value.
10) Read the display, and record the result as mentioned below. Rinse the probe with tank water and drain off any excess water, between each sample and at the end of sampling for the day. This will prevent false readings due to salt residues on the meter from the last sample.

D. *Recording Results*

The results of any sampling, should be recorded in a notebook for future reference. The information should include:

11) Name of collector
12) Date of sampling Salinity levels fluctuate throughout the year. The date of sampling becomes important then when comparing readings.
13) Sampling location. Make a note of where the sample was taken from. Further samples may then be taken from the same site in the future.
14) Water source Make a note of the water source. e.g. River, Creek, Lake, Dam, Swamp, Drain, Groundwater Bore, etc.
15) EC reading. Readings should all be recorded as micro Siemens per centimetre (µS/cm). See Salinity units to convert readings in other units to µS/cm.
16) Temperature reading. If the meter has no automatic compensation, record temperature and adjust resulting EC value from a calibration table.

V. RESULTS

RESULT TABLE

Sr. No.	Lab Id	Sample Identification#	Salinity (ppt)
1	PLPL/180926033	Well	0.092
2	PLPL/180926034	Underground Tank	0.42

: Detail Provided by Customer.

VI. CONCLUSION

In this paper, the different types of desalination method learned for the Dandi village and we choose the solar humidification method because it favours selected local condition.

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