



Solar Water Purifier

Deepak kumar sahu, Harshwardhan kunwar, Sudir kumar rajak

Rakesh singh - guide

Abstract

The aim is to produce water fit for specific purpose, Water is purified for human consumption and drinking purpose, but water purification may also be used for variety of other purposes. In general the method used include physical processes such as sedimentation, distillation and filtration. The water purification process may minimize the concentration of particulate matter including suspended particles, bacteria, parasites, viruses, fungi etc.

Introduction

The standards for drinking water quality are typically set by international standards 5-9 or governments. These standards will generally set minimum & maximum concentration of contaminants for the use that is to be made of water. It is not possible to say whether water is of an appropriate quality by visual examination.

Regular procedures such as the use of household activated carbon filter or boiling or use of alum are not sufficient for treating all the possible contaminants that may be present in water from an unknown source.

Humidification dehumidification (HDH) desalination technology Nature uses solar energy to remove dissolved salts from ocean water by means of the rain cycle. In the rain cycle, sea water gets vaporized (by solar thermal energy) and humidifies the air. Then the humidified air rises and forms clouds. Eventually, the clouds condense this water vapor as rain. The man-made version of this rain cycle is called the humidification dehumidification desalination (HDH) cycle. The main drawback of the solar still is that the various practical processes (solar absorption, evaporation, condensation, and heat recovery) all occur within a single container. By separating these functions into distinct processes, thermal inefficiencies may be lowered and overall performance drastically

improves. This separation of processes is the crucial characteristic of the HDH system. For example, the recovery of the latent heat of condensation, in the HDH process, is affected in a separate heat exchanger (the dehumidifier) in which the seawater, can be preheated. The unit for solar collection can be optimized almost autonomously of the humidification or condensation process. The HDH process, thus, promises higher efficiency due to the separation of the basic processes.

Literature Review

Now a days there are many water filtration systems are available in the market. However no one of these systems fully satisfied the needs of families with a less percentage of cleaning of drinking water.

The aim of our project is to purify the water by using solar panel & parabolic collector, which produces electricity & heats. We are using solar energy because in rural areas the amount of electricity is not sufficient and sunrays are available in our country & by using this sunrays, we will produce electricity.

For complete summary of various literature used and considered during the planning & research portions of our project can be found in appendix A.

Deepak Devasagayam, Mayuresh Kathe, Mayur Patil & Nimish Kavishwar

Department of mechanical engineering from C.R.I.T

- Concept of carbon filter & parabolic collector.

Jinesh S. Machale, Prachi D. Thakur, Piyush S. Lalwani & Gayatri M. Apte Department of chemical engineering from College of engineering & technology NH-6, Murtizapur

- Concept of parabolic collector.

Solar trough concentration fresh water production & waste water treatment 9 Feb 2007, Scrivani, El Asmar, & Bardi.

- Information related to application of solar trough in water treatment.

Sun & water : an overview of solar water treatment devices May 1998, Trudy Rolla.

- Benchmark : Florida Solar Energy Center utilizes a solar trough with concentric copper pipes for heat exchange.

Performance of a parabolic trough solar collector. Aug 2006, Journal of Energy in South Africa.

- Helpful study containing equation & charts for calculating thermal efficiency, collector acceptance angles & thermal losses.

A Brighter, Cleaner Future. Web.15 Oct 2011.

- Solar power facts.

Union of Concerned Scientists : Citizens & Scientists for environmental solutions.

- How solar energy works.

Hefei Zhang et al [1] present a hybrid solar desalination process of the multi-effect humidification dehumidification and the basin-type unit. The solar evacuated tube collector is employed in the desalination system, multi-effect humidification dehumidification desalination (HDD) process is calculated, and then the water excluded from the multi-effect HDD process is reused to desalinate in a basin-type unit further ahead. The research proves that the multi-effect HDD has much room to be enriched.

Guangping Cheng et al [2] proposed a solar desalination process using air humidification and dehumidification. In order to increase the output of freshwater, the doublepass solar air heater and

tubular solar collector are used to heat the air and seawater respectively. The air is humidified by bubbling in the seawater pool, and dehumidified in the inorganic heat pipe condenser. The heat transfer performance of the solar air heater with double vacuum glass-covers and double air passes is studied, and the theoretical model of its heat transfer and the calculation methods are given.

M. Amidpour et al [3] experimentally evaluate and optimize the humidification–dehumidification desalination process for production of fresh water from brackish water. Experimental results show that two-stage HD desalination unit can increase thermal recovery in condensers and hence, reduce thermal energy consumption and investment cost of the unit. Productivity can also be increased by 20% compared with the singlestage unit.

M. Abd Elkader [4] experimented on a three stage multieffect humidification (MEH)-dehumidification process with energy storage system which was designed, manufactured, installed and outdoor tested in the Faculty of Engineering, Suez Canal University, Port Said, Egypt. The thermal collection part of the system (three flat plate collectors) has been designed to provide hot water to the desalination chambers. The investigational test results showed that, the increase of seawater mass flow rate through the setup from 0.1 liters to 0.13 liters increases the efficiency of the system by 10 %. It can be seen from the results also, that the use of energy storage increases the output by 13.5%. Julian Blanco et al [5] have

Summary:

In present time there are so many technologies for water purification, then where the actual problem is arising. For people concern about the quality of municipally supplied drinking water & unhappy with other methods of additional purification available to them, solar purification of ground water & tap water can be pleasant & energy efficient option.

Conclusion:

The goal of our project is to efficiently produce clean drinkable water from solar energy conversion. To obtain this goal, a system was designed incorporating a parabolic solar collector. The incoming solar radiation from the sun is focused on the parabolic collector & concentrated onto a receiver pipe (carbon tube), heating the upcoming impure water.

REFERENCES

- [1] Hefei Zhang , Shaobo Hou , “A hybrid solar desalination process of the multi-effect humidification dehumidification and basin-type unit”, *Desalination* Vol. 220 (2008) Pages 552–557
- [2] Lixi Zhang, Guangping Cheng, “A New Process of Solar Desalination Based on Humidification Dehumidification Cycle”, *Proceedings of the International MultiConference of Engineers and Computer Scientists*, March 18 - 20, 2009, Hong Kong.
- [3] M. Amidpour, M. Zamen, S.M. Soufari, S. Abbasian Vahdat, , M.A. Zeinali, H. Izanloo, H. Aghababaie, “Experimental investigation of a two-stage solar Humidification dehumidification desalination Process”, *Desalination*, Volume 332, Issue 1, 2 January 2014, Pages 1–6
- [4] M. Abd Elkader, “Solar Seawater Desalination Using a Multi-Stage Multi-Effect Humidification (Meh)-Dehumidification System with Energy Storage”, *International Journal of Water Resources and Arid Environments* 1(2): 116-122, 2011. ISSN 2079-7079
- [5] Julián Blanco, Eduardo Zarza, Diego Alarcón, Sixto Malato, Javier León, “Advanced Multi-Effect Solar Desalination Technology”.
- [6] Mayuresh Kathe , Akshay Acholkar, Nimish Kavishwar, Mayur Patil, and Deepak Devasagayam., “Solar Water Purifier”, *International Journal of Engineering Technology Science and Research*, Vol 2, Issue 4, April 2015
- [7] Bassam A/K, Mousa A, “Water film cooling over the glass cover of a solar still including evaporation effects.” *Energy* 1997; 22:43–8.



[8] Kobayashi S, Murase K, Nakamura M, Toyama S. “Development and application of a roof type solar still.” Desalination 1989; 73:111–8.