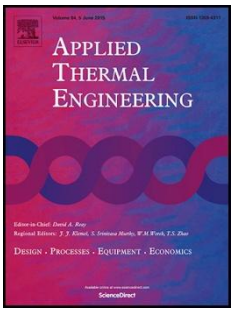
Accepted Manuscript



Title: Factors affecting solar stills productivity and improvement techniques: a detailed review.

Author: S.W. Sharshir, Nuo Yang, Guilong Peng, A.E. Kabeel

PII: S1359-4311(15)01287-9
DOI: http://dx.doi.org/doi: 10.1016/j.applthermaleng.2015.11.041
Reference: ATE 7322

To appear in: *Applied Thermal Engineering*

Received date: 26-9-2015
Accepted date: 14-11-2015

Please cite this article as: S.W. Sharshir, Nuo Yang, Guilong Peng, A.E. Kabeel, Factors affecting solar stills productivity and improvement techniques: a detailed review., *Applied Thermal Engineering* (2016), http://dx.doi.org/doi: 10.1016/j.applthermaleng.2015.11.041.

Factors affecting solar stills productivity and improvement techniques: A detailed review.

S.W. Sharshir[a, b],Nuo Yang[a], Guilong Peng[a],A.E. Kabeel[c]

[a]School of Energy and Power Engineering, Huazhong University of Science and Technology, Wuhan 430074, China
[b] Mechanical Engineering Department, Faculty of Engineering, Kafrelsheikh University, Kafrelsheikh, Egypt.
[c] Mechanical Power Engineering Department, Faculty of Engineering, Tanta University, Tanta, Egypt.
Email: nuo@hust.edu.cn, Tel 008618140680449, fax00862787540724
Email: kabeel6@hotmail.com, Tel 00201001543587, fax 0020403453860

Abstract

The worldwide request for portable water is continuously growing because of industrial, population and agricultural growth, the result is water leaks that have already reached serious amounts in many places of the world. To overcome this problem, there is a demand for some supportable sources for the water purification. Solar still is a valuable device that can be used for purifying of brackish and salt water for drinking purposes. In this article,a review of factors affecting solar still production (climatic conditions, operations and design parameters) and enhancement techniques (wicks, internal and external condensers, internal and external reflectors, phase change materials, Stepped solar still and a new method improved the solar still yield by using nanoparticles) has been argued. Using of sponge cubes in the basin water caused a significant enhancement in solar still production (up to 273%) whereas using cuprous oxide nanoparticles increased the distilled yield by 133.64% and 93.87% with and without the fan respectively.

Keywords:
Solar still, Distillation, Solar collectors, Thermal efficiency

1. Introduction

The request for drinking water in the world is growing and assizes on drinking water quality has become more tough [1].Owing to the inadequate fresh water resources in many countries all over the world, desalination industry has been extensively grown within these countries. It is predictable that the world-wide-desalinated water supply will become 54 billion m^3 per year by 2020 [2]. Improving the efficiency and effectiveness of water purification technology to yield clean water and protect the environment in a sustainable manner is considered as the main challenge of the 21st century [3]. Consequently, serious efforts are underway all over the world to avoid this looming crisis with preservation of the existing limited fresh water supply and to change the large amounts of available seawater by different desalination technologies. In desalination technologies,the saline or brackish water is evaporated by the use of thermal energy and the resultant steam is collected and condensed as a final product. Thermal technologies include Vapor Compression (VC), Multi Stage Flash (MSF), Multi Effect Distillation (MED) whereas membrane technologies includes Microfiltration (MF), Nano filtration (NF),Ultrafiltration (UF) and Reverse Osmosis (RO). MSF, MED, and RO are commercially applied in huge capacities in cities and water is passed through a couple of special membranes, perpendicular to which there is an electric field. Water does not pass through the membranes while dissolving salts pass selectively. In this article, a review of factors affecting solar stills