Journal of Thermal Engineering *http://eds.yildiz.edu.tr/journal-of-thermal-engineering/Articles*
Yildiz Technical University Press, Istanbul, Turkey *Manuscript Received November 01, 2014; Accepted December 17, 2014*
Vol. 1, Issue No. 4, pp. 287-288, October, 2015.

This paper was recommended for publication in revised form by Regional Editor Balaram Kundu

SOLAR DISTILLATION PRACTICE FOR WATER DESALINATION SYSTEMS

***Omid Mahian**
Department of Mechanical Engineering, Ferdowsi University of Mashhad, Mashhad, Iran

Ali Kianifar
Department of Mechanical Engineering, Ferdowsi University of Mashhad, Mashhad, Iran

Raviwat Srisomba
Fluid Mechanics, Thermal Engineering and Multiphase Flow Research Lab. (FUTURE), Department of Mechanical Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangmod, Bangkok 10140, Thailand

Phubate Thiangtham
Fluid Mechanics, Thermal Engineering and Multiphase Flow Research Lab. (FUTURE), Department of Mechanical Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangmod, Bangkok 10140, Thailand

Chaiwat Jumpholkul
Fluid Mechanics, Thermal Engineering and Multiphase Flow Research Lab. (FUTURE), Department of Mechanical Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangmod, Bangkok 10140, Thailand

Somchai Wongwises
Fluid Mechanics, Thermal Engineering and Multiphase Flow Research Lab. (FUTURE), Department of Mechanical Engineering, Faculty of Engineering, King Mongkut's University of Technology Thonburi, Bangmod, Bangkok 10140, Thailand

** Corresponding author: O. Mahian, E-mail: omid.mahian@gmail.com*

"Based on the best knowledge of the authors, the present book "Solar Distillation Practice For Water Desalination Systems" authored by G. N. Tiwari and A. K. Tiwari, published in 2008, Anamaya Publishers, New Delhi, is the most comprehensive source for the researchers that deal with solar energy based desalination systems. In this article, a review of this book is conducted and some suggestions are given for the next editions."

With the increase of the world population, shortage of drinking water has converted to one of the biggest crises in the present century. Using solar stills is one of the solutions to provide fresh and drinkable water. Solar stills are usually simple devices that are useful to produce drinking water, especially in arid and remote regions. Many studies, both theoretically and experimentally, have been performed on solar stills. The book of "Solar Distillation Practice For Water Desalination Systems" is one of the most comprehensive references for the researchers in this field. This book is written in 270 pages, eleven chapters and four appendices with enough solved examples to have a better understanding of solar stills.

Chapter 1 presents a background and ways to provide fresh water. Next, basic principles of solar still performance, appropriate conditions for utilization, and advantages and limitations for using solar stills are presented.

Chapter 2 discusses different shapes of heat transfer in solar stills i.e. evaporation, convection, conduction, and radiation. First, the basic parameters of heat transfer and fluid flow, such as Nusslt, Grashof, Prandtl, and Rayleigh numbers are defined. Next, the required equations to obtain the internal and external heat transfer rates of solar stills are given. This chapter

summarizes the important correlations which are used to estimate the daily yield of a solar still.

Chapter 3 gives the required equations to calculate the solar radiation on horizontal and inclined surfaces.

Chapter 4 is about solar collectors because they can be coupled to solar stills to enhance the productivity. Analyzes related to different solar collectors such as flat plate, evacuated tube, and parabolic collectors are presented.

Chapters 5 presents different designs of passive solar stills. In passive solar stills, there is no an external device or source such as solar collector to enhance the productivity. Conventional solar stills, different designs of single basin solar stills, life raft type solar still, film covered solar still, wiping spherical still, concentric tube solar still, solar earth-water still, air supported solar still, solar stills equipped to reflector and other designs of passive solar stills are discussed in this chapter.

Chapter 6 focuses on active solar stills. Single flat plate and multi flat plate collectors, PV/ T system, evacuated tube collector, and concentrator are introduced as some devices to enhance the productivity of active solar stills.

Chapter 7 investigates important factors which affect the productivity of a solar still. The effects of many parameters such as solar radiation, wind velocity, water depth, ambient temperature, inclination, and insulation on the productivity are discussed. Furthermore, some methods such as using reflectors, internal condensers, storage materials, and black dye are listed as possible solutions to enhance the daily yield.

Chapter 8 presents the applications of solar distillation including drinking water production, rose water preparation, greenhouse- cum- distillation, desert green house, and sea water greenhouse distillation.

Chapter 9 deals with the thermal modeling of solar stills. The information given in chapter 2 is useful in this chapter. The readers will be familiarized with thermal modeling of simple passive solar stills and active solar stills which are equipped to a flat plate collector. Energy efficiency and daily yield of solar still are two key parameters which are obtained in the modeling.

Chapter 10 concerns the energy analysis of solar stills, including passive solar stills, active solar stills, and PV integrated active solar still. The analysis includes the calculation of embodied energy, annual energy saving which leads to obtain the energy payback time.

Chapter 11 discusses the economic analysis of solar stills. First, the method to obtain the cost of production of one liter water is presented through calculation of the capital cost of solar still structure, interest rate, estimated lifetime, maintenance cost, and salvage value. Next, equations related to estimating the payback time to return the investment are given.

Three of appendices are regarding the conversion of units, thermophysical properties of air and water, and climatic data. In the fourth appendix, exergy analysis of solar stills is presented.

For next editions, besides updating the references, it is suggested to add a chapter concerning CFD simulations of solar stills. In addition, a part can be devoted to using novel technologies such as nanotechnology for productivity enhancement of solar stills.