

Alternative Energy

Edited by

A.K.M. Mohiuddin

Asif Hoda



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Table of Contents

Table of Contents	v
Preface	viii
Chapter 1	
The Impact of energy utilization on environment.....	1
M.N.A. Hawlader	
Chapter 2	
Desalination of Seawater to provide fresh water	9
M.N.A. Hawlader	
Chapter 3	
A solar assisted desalination system using heat pump.....	16
M.N.A. Hawlader, Leong Chiing Yang	
Chapter 4	
An experimental study of a phase change storage system.....	23
M.N.A. Hawlader and Smita Panga	
Chapter 5	
Moisture migration in a grain column subjected to drying	30
M.N.A. Hawlader and Md. Shafique J. Chowdhury	
Chapter 6	
Solar Drying of Guavas, Papayas and Apples	38
M.N.A. Hawlader and Lee Hwee Peng	
Chapter 7	
Drying under inert environment: the quality of Mango and Rockmelon.....	47
M.N.A. Hawlader and Pan Jiahe	
Chapter 8	
A low temperature flat plate solar collector	53
M.N.A. Hawlader, M. Zakir Ullah and Maung Than Htut	
Chapter 9	
Optimization of an integrated solar heat-pump system.....	60
M N A Hawlader and Ye Shaochun	
Chapter 10	
Comparative study of performance characteristics using <i>Jatropha</i> Oil Methyl Esters Biodiesel and Diesel.....	69
A.K.M. Mohiuddin and Azan Mohd	
Chapter 11	
Comparative Study of Emission Characteristics using <i>Jatropha</i> Oil Methyl Esters Biodiesel and Diesel	74
A.K.M. Mohiuddin and Azan Mohd	
Chapter 12	
Waste Cooking Oil Utilization for Biodiesel Production.....	79
A.K.M. Mohiuddin and Nabeel Adeyemi	
Chapter 13	
Flow Characteristic of Mixing Impeller for Liquid-Liquid Mixing	85
A.K.M. Mohiuddin and Nabeel Adeyemi	
Chapter 14	
Solar Energy Management for Poverty Alleviation and Income Generating Activities.....	91
A.K.M. Mohiuddin	

Chapter 15	
	Turbulence model for axial mixing impeller in unbaffled vessel..... 97
	A.K.M. Mohiuddin, Nabeel Adeyemi and Muhamad Husaini
Chapter 16	
	Optimization and economic analysis of a solar assisted heat pump drying system..... 103
	M.N.A. Hawlader, S. M. A. Rahman and K.A. Jahangeer
Chapter 17	
	A solar heat pump water heater for rural hospitals 117
	M.N.A. Hawlader and M. Zakir Ullah
Chapter 18	
	A solar heat-pump system for air-conditioning, water heating and drying 126
	M N A Hawlader, K A Jahangeer, Ye Shaochun and Choy Tack Hoon
Chapter 19	
	Engineering design – An approach to the development of creativity 132
	M.N.A. Hawlader
Chapter 20	
	Analysis of Engine Performance with NGV 140
	Sany Izan Ihsan, Nabila Sulaiman, AKM Mohiuddin and Maizirwan Mel
Chapter 21	
	Analysis of Engine Performance with Enhanced Fuel..... 147
	Sany Izan Ihsan, Khairussani Farid, Maizirwan Mel, and AKM Mohiuddin
Chapter 22	
	CFD analysis of an evacuated solar still..... 156
	Ahmad F. Ismail, Mirghani I. Ahmed, Yousif A. Abakr
Chapter 23	
	Developments on Solar Operated Water Desalination..... 163
	Mirghani I. Ahmed, Yousif A. Abakr and Ahmad F. Ismail
Chapter 24	
	Theoretical and experimental evaluation of LPG as refrigerant for domestic refrigerators and freezers 169
	M.M. El-Awad, M.I. Ahmed
Chapter 25	
	Preliminary investigation of biodiesel reactor optimization using combine CFD-Taguchi method 179
	A.K.M. Mohiuddin and Nabeel A Adeyemi
Chapter 26	
	Alternative mixing strategy for biodiesel production: mixed flow impeller characterization 188
	A.K.M. Mohiuddin and Nabeel Adeyemi
Chapter 27	
	Experimental Investigation of a Multistage Evacuated Solar Still 197
	Yousif. A. Abakr, Ahmad F. Ismail and Mirghani I. Ahmed
Chapter 28	
	Modelling of electronics heat sink – Influence of the wake function generation on the accuracy of CFD analysis 203
	M. I. Ahmed, A. F. Ismail, Y. A. Abakr
Chapter 29	
	The effect of the operating conditions on the apparent viscosity of crude palm oil during separation..... 213

Sulaiman Al-Zuhair, Yousif A. Abakr and Mirghani I. Ahmed

Chapter 30

Thermal analysis of a micro device used for detection of colorectal cancer..... 220

Mirghani I. Ahmed, Meftah Hrairi

Chapter 31

Performance of different photovoltaic cells operating under the meteorological conditions of Singapore..... 229

M.N.A Hawlader, Lee Poh Seng and Chua Kok Kiang

Chapter 32

Analyses of motion and drag coefficient of water droplets in a natural draught cooling tower..... 240

Liu Baomin and M. N. A. Hawlader

Chapter 33

A solar assisted heat pump system for desalination..... 252

Zakaria Mohd. Amin, M N A Hawlader and Azharul Karim

Chapter 34

Comparative study of combustion characteristics using Jatropha oil methyl esters biodiesel and diesel..... 261

A.K.M. Mohiuddin and Azan Mohd

Chapter 35

Performance of evaporator collector and air collector in a solar assisted heat pump dryer.
..... 269

S. M. A. Rahman and M. N. A. Hawlader

Chapter 2

Desalination of Seawater to provide fresh water

M.N.A. Hawlader

Department of Mechanical Engineering, Kulliyah of Engineering,

International Islamic University Malaysia

Abstract

A comparative study of MSF, MED and RO processes has been made and the relative performance of different methods has been discussed in this study. RO has been showing a great promise, and further developments of new membrane materials and pre-treatment processes are likely to reduce the cost of water production dramatically. MED is making good progress, as shown by recent findings, and the production cost of water is less than MSF in certain cases. Cogeneration, water and power, and hybrid system are likely to be the future direction.

Keywords: Desalination, multi-stage flash distillation, multi-effect distillation, reverse osmosis, performance, costs.

INTRODUCTION

There is a short supply of water in many parts of the world. This may be attributed to the growth of population, increased industrial activities, shortage of land areas and nature of climatic conditions. The concept of desalination for the production of fresh water is not new, and this method of obtaining fresh water was used on board ships in the year, as early as, 1700 [1]. The technology has grown up steadily, and current desalination systems have massive capacities; some even designed to supply water for an entire state. For example, the Al Jubail II Complex in Saudi Arabia produces close to a million cubic metres of fresh water per day.

There are several ways of classifying the desalination methods that have been employed over the years. These are as follows:

- i) processes where seawater undergoes a phase change i.e. distillation, freezing;
- ii) processes without phase change i.e. membrane method.

The distillation method is considered energy intensive and requires supply of thermal energy at temperature less than 120°C. Three methods, multi-stage flash (MSF) distillation, multi-effect distillation (MED) and vapour compression (VC), found wider applications in the Gulf states [2]. MSF has been widely used in the Middle East for large-scale conversion of seawater to fresh water. In recent years, significant developments are taking place in MED and beginning to compete with MSF. MED is considered thermodynamically more efficient than MSF but it could not compete with MSF