

Alternative Energy

Edited by

A.K.M. Mohiuddin

Asif Hoda



IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011
©IIUM Press, IIUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without any prior written permission of the publisher.

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

A.K.M. Mohiuddin and Asif Hoda
Alternative Energy
A.K.M. Mohiuddin and Asif Hoda
Include index
Bibliography: p.

ISBN 978-967-418-158-1

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN. BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan

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 21

Analysis of Engine Performance with Enhanced Fuel

Sany Izan Ihsan, Khairussani Farid, Maizirwan Mel*, and AKM Mohiuddin

Department of Mechanical Engineering, Department of Biotechnology Engineering*,

International Islamic University Malaysia

ABSTRACT

The performance of an ordinary automobile engine was tested with several percentage of industrially made ethanol (99.8%) mixed with gasoline in IIUM Engine Test Bed. Without having any modification to the engine, a 1500 cc. Mitsubishi 4G15 internal combustion four engine was tested with various percentages of ethanol mixed with gasoline starting from 5%, 15%, 25% and 35%. The results show that by increasing the percentage of ethanol in the fuel, the engine can have more power as well as higher efficiency with low specific fuel consumption (SFC). The gas emission analysis also recorded that having more ethanol in gasoline will reduce the emission of some hazardous gases from the engine combustion compared to gasoline only fuel.

Keywords: *Bio-ethanol, renewable energy, alternative fuel*

INTRODUCTION

In 1970s, the renewable energy has started to be one of the famous topics to be discussed in energy science after the West starts to initiate the renewable energy programs such as National Renewable Energy Laboratory (NREL) to find the replacement for fossil-oil [1]. The idea of replacing fossil product to the other sources came after the OPEC nations cut down their oil export to the West that result in the oil crisis of the 1970s.

The Western country realize that since they are having a limited source of oil, something need to be done to make sure that their step to develop will not stop because oil for a country is just like water which is needed to give a life for a human being. But nowadays the whole world, especially the industrial and development based country such as United States, Brazil and United Kingdom [2] start to initiate the renewable energy program or research to find alternative sources to replace the fossil-fuel which is running out day by day [3].

Bio-ethanol is found to be one of the most suitable resources to replace the fossil-fuel used widely in vehicle's engine today. But since it is still a new finding, a lot of research and improvement need to be done to the bio-ethanol composition and also to the machine itself to make sure that both can work perfectly or even better than the old fossil-fuel in engine.

This work intended to look at the performance of an ordinary automobile engine running with various percentage of ethanol mixed in the fuel. It is believed that having more ethanol in the engine will