Alternative Energy

Edited by

A.K.M. Mohiuddin
Asif Hoda

IIUM Press
# 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 *Jatropha* Oil Methyl Esters  
Biodiesel and Diesel ...................................................................................................... 69  
A.K.M. Mohiuddin and Azan Mohd  

Chapter 11  
Comparative Study of Emission Characteristics using *Jatropha* 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

v
Chapter 15  
Turbulence model for axial mixing impeller in un baffled vessel .............................. 97  
A.K.M. Mohiuddin, Nabeel Adeyemi and Muhamed 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. Ismaill 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 20

Analysis of Engine Performance with NGV

Sany Izan Ihsan, Nabila Sulaiman, AKM Mohiuddin and Maizirwan Mel

Department of Mechanical Engineering, Department of Biotechnology Engineering,
International Islamic University Malaysia

ABSTRACT
This paper presents experimental results carried out to evaluate brake thermal efficiency and fuel consumption by gasoline and compressed natural gas (CNG). In this experiment, a 4-cylinders gasoline engine has been modified to bi-fuel engine, then the engine is operated for the condition of fixed load condition to obtain same brake power output from both fuels and all the corresponding results such as fuel flow rate and brake thermal efficiency have been measured for evaluation. The test results show that gasoline has higher fuel consumption and brake thermal efficiency than CNG. Details results including fuel consumption and brake thermal efficiency have been discussed in this paper.

INTRODUCTION
Natural gas vehicle (NGV) is not new in the industry; however, it is becoming an uprising issue because of its advantages compared to gasoline. The increasing number of vehicles from million of cars and light-duty trucks, almost exclusively operating on gasoline and diesel fuel, are major contributors to severe environmental problems such as global warming, haze and acid rain. The major sources of particulates (small unburned particles of hydrocarbons and sulfur) and nitrogen oxides are from diesel fuel that being used by heavy duty trucks and buses also caused emissions and these particulates have cancer-causing potential and it could cause significant respiratory problems.
Alternate vehicle fuels such as natural gas have long been proposed as a way to provide significant air quality benefits over gasoline fuels. Significant advances have been made in the past few years that have highlighted the efficiency and emission potential of NGV. In transportation sector, natural gas is becoming more important because it is more environmentally friendly, safer and lower fuel cost compared to gasoline power vehicle. NGV was found to give NOx emission of about 75% less and produced approximately 35% less CO2, compared to conventional gasoline vehicles. Natural gas also has low well-to-wheel emissions, except for hydrocarbons that escape throughout the fuel chain. Lighter than air, with a high ignition temperature, it has better safety characteristics than gasoline, although a risk of explosion exists in closed spaces. In addition, in response to the high fuel prices of gasoline nowadays, it insisted the drivers to use alternative fuels like natural gas which is cheaper than gasoline.