

Engine and Auxiliary Systems

Edited by
Prof. Dr. A.K.M. Mohiuddin

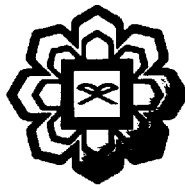


IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

Engine and Auxiliary Systems

Edited by Prof. Dr. A.K.M. Mohiuddin



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
Engine and Auxiliary Systems
A.K.M. Mohiuddin

ISBN: 978-967-418-216-8

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

Preface	iv
Table of Contents	v
Chapter 1	
<i>Experimental analysis and comparison of performance characteristics of catalytic converters</i> A.K.M. Mohiuddin	<i>1</i>
Chapter 2	
<i>Experimental analysis and simulation of catalytic converters</i> A.K.M. Mohiuddin	<i>8</i>
Chapter 3	
<i>Thermal design of mechanical devices using expert system</i> A.K.M. Mohiuddin	<i>14</i>
Chapter 4	
<i>Exhaust system optimization using GT- Power</i> A.K.M. Mohiuddin	<i>21</i>
Chapter 5	
<i>Experimental analysis to determine the relationship between noise and back pressure for muffler design – Part I: Muffler design requirements</i> A.K.M. Mohiuddin	<i>29</i>
Chapter 6	
<i>Experimental analysis to determine the relationship between noise and back pressure for muffler design – Part II: Experimental results</i> A.K.M. Mohiuddin	<i>36</i>
Chapter 7	
<i>2nd Generation IIUM Buggy Car – Part I: Design</i> A.K.M. Mohiuddin	<i>42</i>
Chapter 8	
<i>2nd Generation IIUM Buggy Car – Part II: Fabrication</i> A.K.M. Mohiuddin	<i>48</i>
Chapter 9	
<i>Robust design optimization of valve timing using multi-objective genetic algorithm (MOGA)</i> A.K.M. Mohiuddin and Yap Haw Shin	<i>53</i>
Chapter 10	
<i>A study of an aftermarket voltage stabilizer for its performance and emission on passengers vehicle</i> A.K.M. Mohiuddin, Sany Izan Ihsan and Noor Azammi Abd Murat	<i>60</i>

Chapter 11		
	<i>Investigation of engine performance using designed swirl adapter</i>	67
	A.K.M. Mohiuddin	
Chapter 12		
	<i>Comparison of various types of powertrain used in automotive vehicles in terms of performance and emission</i>	74
	A.K.M. Mohiuddin and Ali Faiz	
Chapter 13		
	<i>Automotive catalytic converters: Current status and some future perspectives</i>	80
	A.K.M. Mohiuddin and Jalal Mohammed Zayan	
Chapter 14		
	<i>3-Cylinder gasoline direct injection as opposed to 4-cylinder multi-port fuel injection for lower fuel consumption and NO_x emission</i>	86
	A.K.M. Mohiuddin and Anwar bin Mohd Sood	
Chapter 15		
	<i>Investigation of Spark Ignition Multipoint Engine Using Water Addition - Part I: Simulation</i>	92
	A.K.M. Mohiuddin and Mohammad Edilan Bin Mustaffa	
Chapter 16		
	<i>Investigation of Spark Ignition Multipoint Engine Using Water Addition - Part II: Performance and Emission</i>	101
	A.K.M. Mohiuddin and Mohammad Edilan Bin Mustaffa	
Chapter 17		
	<i>Thermodynamic Analysis of Combustion of CAMPRO CFE Engine – Part I: Simulation</i>	109
	A.K.M. Mohiuddin, Izzarief Bin Zahari and Abdullah Aiman	
Chapter 18		
	<i>Thermodynamic Analysis of Combustion of CAMPRO CFE Engine – Part II: Combustion Analysis</i>	116
	A.K.M. Mohiuddin, Izzarief Bin Zahari and Abdullah Aiman	
Chapter 19		
	<i>Development of Low Cost Catalytic Converter from Non-Precious Metals</i>	123
	A.K.M. Mohiuddin	
Chapter 20		
	<i>Performance Investigation of Energy Efficient Hybrid Engine towards Green Technology</i>	131
	Ataur Rahman	
Chapter 21		
	<i>Production of Aluminum-Silicon Carbide Composites Using Powder Metallurgy at Sintering Temperatures above the Aluminum Melting Point Part II</i>	138
	Yasin Nimir	
Chapter 22		
	<i>Comparison between composites reinforced with natural and synthetic fibers: Part I</i>	143
	Yasin Nimir	

Chapter 23		
	<i>Comparison between composites reinforced with natural fibres and synthetic fibres Part II</i>	151
	Yasin Nimir	
Chapter 24		
	<i>Production of Aluminium reinforced with SiC particulates using powder metallurgy</i>	156
	Yassin Nimir	
Chapter 25		
	<i>Development of automatic magnetic particle system for automotive parts inspection</i>	160
	Mefiah Hrairi, Mohd Shah Bin Rizal, Salah Echrif	
Chapter 26		
	<i>Performance of an Automatic Magnetic Particle Inspection of Automotive Parts</i>	166
	Mefiah Hrairi, Mohd Shah Bin Rizal, Salah Echrif	
Chapter 27		
	<i>Numerical simulation of complex turbulent flows</i>	172
	Asif Hoda	
Chapter 28		
	<i>Direct numerical simulation (DNS) and large eddy simulation (LES)</i>	177
	Asif Hoda	
Chapter 29		
	<i>Reynolds averaged navier stokes (RANS) Simulation</i>	182
	Asif Hoda	
Chapter 30		
	<i>Film Cooling of Turbine Blades</i>	192
	Asif Hoda	

Performance Investigation of Energy Efficient Hybrid Engine towards Green Technology

Ataur Rahman

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

Abstract

The rapid expansion of motor vehicle in globally dedicates the increase of energy demand in an acceleration fashion. If driving habits remain unchanged, car will have to become nearly three times more energy-efficient by 2030 just to maintain that sector's present consumption. If energy use trends are projected to year 2100, transportation would then have to be twenty times more energy-efficient, which roughly equates to 170km per litre. In a typical U.S. city, motor vehicle emissions account for 30%-50% of hydrocarbon, 80%-90% of carbon monoxide, and 40%-60% of nitrogen oxide emissions which are contaminated the environmental, changing climate and harming ecosystem. However, if the automobile is to survive as an economically sound and viable transportation system its energy consumption and harmful emissions must be reduced. Currently battery electric and hybrid cars are considered as the energy efficient. But, the problems of these technologies are the batteries recharging time, maintenance cost and disposal. The disposal of batteries might make bio-dreadful condition which is the harmful for the humans and others living things. Advanced power systems and reduced vehicle road-loads are necessary in order to make significant gains in motor vehicles energy. The aim of the project is to develop a waste energy harvesting electromagnetic hybrid engine.. The engine is expected to yield the best efficiency in the range of 65-75% at stable operation speed of 4000rpm and reduce emission about 70-80%. The additional component electro-supercharged associated with the waste heat recovery system of the engine will be used to supply the high pressure air to the engine combustion chamber for creating the massive turbulence effect of air-fuel mixture and burn the 100% mixture in shortly. In overall, it is expected that the light duty motor vehicle car travel about 30-45km by using 1 litre of petrol. A pilot study has been conducted on the development of a small scale hybrid engine by using a 120cc internal combustion SI engine with the financed of IIUM. The engine has been tested with a 2.5 kN car and found that car travel 85 km with speed of 60 km/hr by using 1 litre of petrol.