Engine and Auxiliary Systems

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

IIUM Press
Published by:
IIUM Press
International Islamic University Malaysia

©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** \(\text{iv}\)

**Table of Contents** \(v\)

**Chapter 1**

*Experimental analysis and comparison of performance characteristics of catalytic converters*

A.K.M. Mohiuddin \(1\)

**Chapter 2**

*Experimental analysis and simulation of catalytic converters*

A.K.M. Mohiuddin \(8\)

**Chapter 3**

*Thermal design of mechanical devices using expert system*

A.K.M. Mohiuddin \(14\)

**Chapter 4**

*Exhaust system optimization using GT- Power*

A.K.M. Mohiuddin \(21\)

**Chapter 5**

*Experimental analysis to determine the relationship between noise and back pressure for muffler design – Part I: Muffler design requirements*

A.K.M. Mohiuddin \(29\)

**Chapter 6**

*Experimental analysis to determine the relationship between noise and back pressure for muffler design – Part II: Experimental results*

A.K.M. Mohiuddin \(36\)

**Chapter 7**

*2nd Generation IIUM Buggy Car – Part I: Design*

A.K.M. Mohiuddin \(42\)

**Chapter 8**

*2nd Generation IIUM Buggy Car – Part II: Fabrication*

A.K.M. Mohiuddin \(48\)

**Chapter 9**

*Robust design optimization of valve timing using multi-objective genetic algorithm (MOGA)*

A.K.M. Mohiuddin and Yap Haw Shin \(53\)

**Chapter 10**

*A study of an aftermarket voltage stabilizer for its performance and emission on passengers vehicle*

A.K.M. Mohiuddin, Sany Izzan Ihsan and Noor Azammi Abd Murat \(60\)
Chapter 11

Investigation of engine performance using designed swirl adapter
A.K.M. Mohiuddin

Chapter 12

Comparison of various types of powertrain used in automotive vehicles in terms of performance and emission
A.K.M. Mohiuddin and Ali Faiz

Chapter 13

Automotive catalytic converters: Current status and some future perspectives
A.K.M. Mohiuddin and Jalal Mohammed Zayan

Chapter 14

3-Cylinder gasoline direct injection as opposed to 4-cylinder multi-port fuel injection for lower fuel consumption and NOx emission
A.K.M. Mohiuddin and Anwar bin Mohd Sood

Chapter 15

Investigation of Spark Ignition Multipoint Engine Using Water Addition - Part I: Simulation
A.K.M. Mohiuddin and Mohammad Edilan Bin Mustaffa

Chapter 16

Investigation of Spark Ignition Multipoint Engine Using Water Addition - Part II: Performance and Emission
A.K.M. Mohiuddin and Mohammad Edilan Bin Mustaffa

Chapter 17

Thermodynamic Analysis of Combustion of CAMPRO CFE Engine - Part I: Simulation
A.K.M. Mohiuddin, Izzarief Bin Zahari and Abdullah Aiman

Chapter 18

Thermodynamic Analysis of Combustion of CAMPRO CFE Engine - Part II: Combustion Analysis
A.K.M. Mohiuddin, Izzarief Bin Zahari and Abdullah Aiman

Chapter 19

Development of Low Cost Catalytic Converter from Non-Precious Metals
A.K.M. Mohiuddin

Chapter 20

Performance Investigation of Energy Efficient Hybrid Engine towards Green Technology
Ataur Rahman

Chapter 21

Production of Aluminum-Silicon Carbide Composites Using Powder Metallurgy at Sintering Temperatures above the Aluminum Melting Point Part II
Yasin Nimir

Chapter 22

Comparison between composites reinforced with natural and synthetic fibers: Part I
Yasin Nimir
Chapter 23

Comparison between composites reinforced with natural fibres and synthetic fibres Part II
Yassin Nimir

Chapter 24

Production of Aluminium reinforced with SiC particulates using powder metallurgy
Yassin Nimir

Chapter 25

Development of automatic magnetic particle system for automotive parts inspection
Meflah Hrairi, Mohd Shah Bin Rizal, Salah Echref

Chapter 26

Performance of an Automatic Magnetic Particle Inspection of Automotive Parts
Meflah Hrairi, Mohd Shah Bin Rizal, Salah Echref

Chapter 27

Numerical simulation of complex turbulent flows
Asif Hoda

Chapter 28

Direct numerical simulation (DNS) and large eddy simulation (LES)
Asif Hoda

Chapter 29

Reynolds averaged navier stokes (RANS) Simulation
Asif Hoda

Chapter 30

Film Cooling of Turbine Blades
Asif Hoda
Voltage stabilizer

Chapter 10

A study of an aftermarket voltage stabilizer for its performance and emission on passengers vehicle

A.K.M. Mohiuddin, Sany Izan Ihsan and Noor Azammi Abd Murat
Department of Mechanical Engineering, International Islamic University Malaysia

Abstract
Heavy electrical load in a vehicle will consume more electrical power from the battery. Thus will affect the performance of the vehicle and voltage stabilizer is created to cater this problem. This chapter shows the experimental investigation of the performance and the emission effects of the vehicle using aftermarket voltage stabilizers. The experiment is mostly carried out in laboratory and few experiments were carried out by test drive. All data are recorded and compared with the data found from the MATLAB analysis. Chassis dynamometer test shows on certain value of capacitors it does have an increase of torque and power by 5%. From emission result by using Gas Analyzer, it shows that the voltage stabilizer could reduce some hazardous gases especially hydrocarbon which contributes to the global warming. Fuel consumption from 160 km test drive shows a 5% mileage increase from the ordinary vehicle setting. From all experiments conducted, the best capacitor value needed to be equipped in the voltage stabilizer is between 100 mF to 120 mF using 16 volt or 25 volt. With a proper value capacitors size, the authors hope this voltage stabilizer can be equipped in all consumer vehicles for good engine performance, better mileage and most importantly to reduce global warming producing less harmful emissions.

Keywords: voltage stabilizer, battery storage, performance, fuel consumption, emission

Introduction

Global warming is such an issue that needs to be focused by all researchers in all kinds of industry to minimize the effect on human being living in the planet. "The growing concern CO₂, a product of burning fuel, contributes in a major way to global warming, which spurred appearance of governmental regulations aimed at reducing CO₂ emissions" (Anderman 2004). In the automotive development, the major target in the latest technology is to reduce emission and fuel consumption. "However, novel vehicle concepts, now under development comply with the stringent demands of lower fuel consumption and CO₂ emission reduce..."