

# Engine and Auxiliary Systems

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

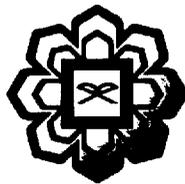


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# **Engine and Auxiliary Systems**

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



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## Table of Contents

<b>Preface</b>	<b>iv</b>
<b>Table of Contents</b>	<b>v</b>
<b>Chapter 1</b>	
<i>Experimental analysis and comparison of performance characteristics of catalytic converters</i> A.K.M. Mohiuddin	<i>1</i>
<b>Chapter 2</b>	
<i>Experimental analysis and simulation of catalytic converters</i> A.K.M. Mohiuddin	<i>8</i>
<b>Chapter 3</b>	
<i>Thermal design of mechanical devices using expert system</i> A.K.M. Mohiuddin	<i>14</i>
<b>Chapter 4</b>	
<i>Exhaust system optimization using GT- Power</i> A.K.M. Mohiuddin	<i>21</i>
<b>Chapter 5</b>	
<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>
<b>Chapter 6</b>	
<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>
<b>Chapter 7</b>	
<i>2<sup>nd</sup> Generation IIUM Buggy Car – Part I: Design</i> A.K.M. Mohiuddin	<i>42</i>
<b>Chapter 8</b>	
<i>2<sup>nd</sup> Generation IIUM Buggy Car – Part II: Fabrication</i> A.K.M. Mohiuddin	<i>48</i>
<b>Chapter 9</b>	
<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>
<b>Chapter 10</b>	
<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>

<b>Chapter 11</b>		
	<i>Investigation of engine performance using designed swirl adapter</i>	67
	A.K.M. Mohiuddin	
<b>Chapter 12</b>		
	<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	
<b>Chapter 13</b>		
	<i>Automotive catalytic converters: Current status and some future perspectives</i>	80
	A.K.M. Mohiuddin and Jalal Mohammed Zayan	
<b>Chapter 14</b>		
	<i>3-Cylinder gasoline direct injection as opposed to 4-cylinder multi-port fuel injection for lower fuel consumption and NO<sub>x</sub> emission</i>	86
	A.K.M. Mohiuddin and Anwar bin Mohd Sood	
<b>Chapter 15</b>		
	<i>Investigation of Spark Ignition Multipoint Engine Using Water Addition - Part I: Simulation</i>	92
	A.K.M. Mohiuddin and Mohammad Edilan Bin Mustaffa	
<b>Chapter 16</b>		
	<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	
<b>Chapter 17</b>		
	<i>Thermodynamic Analysis of Combustion of CAMPRO CFE Engine – Part I: Simulation</i>	109
	A.K.M. Mohiuddin, Izzarief Bin Zahari and Abdullah Aiman	
<b>Chapter 18</b>		
	<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	
<b>Chapter 19</b>		
	<i>Development of Low Cost Catalytic Converter from Non-Precious Metals</i>	123
	A.K.M. Mohiuddin	
<b>Chapter 20</b>		
	<i>Performance Investigation of Energy Efficient Hybrid Engine towards Green Technology</i>	131
	Ataur Rahman	
<b>Chapter 21</b>		
	<i>Production of Aluminum-Silicon Carbide Composites Using Powder Metallurgy at Sintering Temperatures above the Aluminum Melting Point Part II</i>	138
	Yasin Nimir	
<b>Chapter 22</b>		
	<i>Comparison between composites reinforced with natural and synthetic fibers: Part I</i>	143
	Yasin Nimir	

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

Development of Low Cost Catalytic Converter from Non-Precious Metals

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**Abstract**

The purpose of this chapter is to discuss the uses of non-precious metals for the development catalytic converters. Copper powder and nickel catalyst were chosen as the alternative **catalysts** to reduce the use of precious group metals (PGMs) platinum, palladium, and rhodium. Simulation by COMSOL has shown that Nickel and copper were very effective in reducing NO<sub>x</sub> during rich condition of air-fuel mixture while oxidizing CO and HC during lean condition. Simulations using FLUENT and COMSOL have shown the actual characteristics of the catalytic converter performance. The flow throughout catalytic converter and the backpressure have successfully determined. Furthermore, catalyst conversion efficiency also has been shown clearly. On the other hands, the experimental results have excellently validated the simulation results in terms of the nature and trends of the catalytic converter performance as well as its efficiency. Catalyst distribution and application of the non-zoning monolith substrates have further contributes to cut down the production cost.

*Keywords:* catalytic converter, non-precious metals, simulation, conversion efficiency, performance characteristics.

**Introduction**

Automotive catalysts work as three-way catalysts converting carbon monoxide (CO), hydrocarbons, and nitric oxide (NO<sub>x</sub>), the three major pollutants into CO<sub>2</sub>, N<sub>2</sub> and H<sub>2</sub>O. The reactions that occur in the catalytic converter are due to a catalyst. The catalyst is in a separate phase to the reactants is said to be heterogeneous, or contact catalyst. Contact catalysts are materials with the capability of adsorbing molecules of gases or liquids onto their **surfaces**. Presently, the most widely used three-way catalysts in gasoline engines are ceramic **honeycomb** supports containing noble metals such as platinum, rhodium, and palladium. These catalysts are often called as the precious metals because they are used widely in jewellery.