



**STRESS AND THERMAL ANALYSIS  
ON THE PISTON HEAD USING  
FINITE ELEMENT ANALYSIS (FEA)**

**MOHD HAIRUL BIN ASNAWEE  
(2002333846)**

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Universiti Teknologi Mara (UiTM)**

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## ABSTRACT

This study on the Stress and Thermal Analysis are motivated by the problem that occur in the SI Engines. **MSC. Nastran Software** is a **Finite Element Methods Analysis** that uses to determine the stress and thermal on the piston head. The analysis base on the piston head in the Spark Ignition (SI) Engines. The objective of the project is to analyze stress and thermal on the piston head and to select the best sparks ignition timing angle that produce less maximum stress and thermal on the piston head. The angles in this analysis are  $-18^{\circ}$ ,  $-16^{\circ}$ ,  $-12^{\circ}$ ,  $-10^{\circ}$  and  $-8^{\circ}$  before the Top Dead Center (TDC). The piston type is flat piston head.

From the result and data analysis, the best selection of the spark ignition angle that has less maximum stress and temperature is at angle  $-8^{\circ}$  before TDC. The maximum stress is  $1.74 \times 10^8$  Pa and the maximum temperature is  $1260^{\circ}$  C and. This lower stress and temperature will give long lifecycles to the piston in S.I. Engines before failure. Therefore, it will reduce the cost of the engine maintenance. Finally, the study of the stress and thermal analysis has successfully full fill the objectives of this final project.

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## **CHAPTER I**

### **INTRODUCTION**

#### **1.0 Introduction**

Designers and technologists are the people are involved to solve the practical problem, which arise out of life's situation. As we notice that, transportation using cars and motorcycles are widely use in the world. Majorities their use internal combustion engine 4 stroke engines. We find that the end of the day the engines will failure. One of the failures is due to the excessive stress and the heat transfer on the piston head in combustion engines. Due to this problem, the analysis of stress and heat transfer analysis on the piston head using Finite Element Analysis (FEA) has been done. This will help to overcome the problem and redesign the product.