



**STRESS ANALYSIS OF THE PISTON DUE TO HEAT TRANSFER USING
FINITE ELEMENT ANALYSIS (FEA) SOFTWARE**

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ABSTRACT

This final project is a study about the stress analysis of the piston due to the heat transfer. This project consist of the heat engine process, stress analysis, study the software for simulation purpose, simulation of the piston model and finally get the results from the simulation. The Finite Element Analysis (FEA) Nastran software is used to simulate the stress on entire of the piston model in the internal combustion chamber. The model of the piston is constructing in the CATIA V5 software and then the simulation was done in Finite Element Analysis (FEA) Nastran software. From the results of the simulation, the stress distribution and the critical area was acting on the piston model when the heat flux was applied to the piston can be analyzed. All of the description and result of the research are included in this thesis. The finding of this project is that the aluminium alloy used to employ on the piston had lower stress distribution due to the higher heat dissipation compare to the cast iron. It is hoped that this research can produce some relevant basic information and benefit to any parties who would like to further it.

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CHAPTER I

PRELIMINARY WORKS

1.0 Introduction

The *internal combustion* (IC) engine is a heat engine that converts chemical energy in a fuel into mechanical energy. Chemical of the fuel is first converted to thermal energy by means of combustion or oxidation with air inside the engine. This thermal energy raises the temperature and pressure of the gases within the engine and the high-pressure gas then expands against the mechanical mechanisms of the engine. The main function of an internal combustion engine in a system is to provide useable power output.

Internal combustion engines can be classified into *spark ignition* (SI) engine and *compression ignition* (CI) engine. A SI engine starts the combustion process in each cycle by use of a spark plug. The spark plug gives a high-voltage electrical discharge between two electrodes, which ignites the air-fuel mixture in the combustion chamber. The combustion process in a CI engine starts when the air-fuel mixture self-ignites due to high temperature in the combustion chamber caused by high compression.