

DYNAMIC CHARACTERISTIC OF CONNECTING ROD FOR FOUR STROKE
ENGINE

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for the award of the degree of
Bachelor of Mechanical Engineering with Automotive Engineering

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SUPERVISOR'S DECLARATION

I hereby declare that I have checked this project and in my opinion, this project is adequate in terms of scope and quality for the award of the degree of Bachelor of Mechanical Engineering *with Automotive Engineering.

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STUDENT'S DECLARATION

I hereby declare that the work in this project is my own except for quotations and summaries which have been duly acknowledged. The project has not been accepted for any degree and is not concurrently submitted for award of other degree.

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Dedicated to my parents

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ABSTRACT

This thesis deals with computational modal analysis of the connecting rod. The objective of this project is to investigate the effect of the modal updating to the dynamic characteristic of the connecting rod, and to develop a finite element model of structure. This project also studies the vibration of a connecting rod in order to determine its natural frequencies and mode shapes. The connecting rod of the Modenas Kriss 110 cc engine has been considered as the model of the analysis. Structural modeling of connecting rod has been developed using SOLIDWORK software. The structural model then imported to the MSC.PATRAN software for generating mesh and the numerical analysis was performed using MSC.NASTRAN software. Mesh sensitivity have been done in order to determine the suitable mesh for further analysis. Result of the modal analysis show that first mode of the connecting rod occur at 77.411 Hz with higher displacement equal to 16.7mm. Natural frequency of the connecting rod can be increase by improvement of the properties of the material. In modal updating analysis show that material with lower density and higher Modulus of Young's will increase the natural frequency of the connecting rod.

ABSTRAK

Tesis ini berkaitan pengkomputeran analisis getaran rod penghubung. Objektif dari projek ini adalah untuk meneliti kesan daripada proses mengemaskini mod kepada ciri dinamik rod penghubung, dan untuk menghasilkan sebuah model elemen struktur. Projek ini juga mempelajari getaran rod penghubung dalam rangka untuk menentukan frekuensi semula jadi dan bentuk mod. Rod penghubung dari Modenas Kriss 110 cc enjin telah dianggap sebagai model analisis. Pemodelan struktur rod penghubung telah dibangunkan menggunakan perisian solidwork. Model struktural kemudian diimport ke perisian MSC.PATRAN untuk menghasilkan mesh dan analisis berangka dilakukan dengan menggunakan perisian MSC.NASTRAN. Mesh sensitiviti telah dilakukan dalam rangka untuk menentukan mesh berpadanan untuk analisa lebih lanjut. Keputusan analisis mod pertama menunjukkan bahawa mod daripada rod penghubung berlaku di 77,411 Hz dengan anjakan sebanyak 16.7mm. Frekuensi semulajadi rod penghubung boleh meningkat dengan peningkatan sifat-sifat bahan. Dalam pengemaskini modal analisis menunjukkan bahawa bahan dengan kepadatan yang lebih rendah dan lebih tinggi nilai Young's Modulus akan meningkatkan frekuensi semula jadi batang penghubung.

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LIST OF SYMBOLS

E	Modulus of elasticity
F	Force
f	frequency
I	Nodal displacement
K	Material stiffness
M	Mass
φ	Corresponding vector
ρ	Density
ω	Natural frequency

LIST OF ABBREVIATIONS

EMA	Experimental modal analysis
FEM	Finite element Method
FE	Finite element
FFT	Fast Fourier transform
FRF	Frequency response function
IC	Internal combustion
NVH	Noise and vibration harshness
SAE	Society of Automotive Engineers