APPROVAL

DEVELOPMENT OF AN INTEGRATED MODAL ANALYSIS APPLICATION METHODOLOGY FOR BASE PAN FINITE ELEMENT MODEL VALIDATION

by

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DECLARATION

I, the undersigned, hereby declare that this report is my own independent work except as specified in the references and acknowledgements. I have not committed plagiarism in the accomplishment of this work, nor have I falsified and/or invented the data in my work. I am aware of the University regulations on Plagiarism. I accept the academic penalties that may be imposed for any violation.

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ABSTRACT

Modal analysis is used to helps mechanical engineer to analysis the dynamic properties and behaviour of a structure in term of vibrational excitation with the purpose of finding out roots of vibration failure. Vibration failure is normally caused by the natural frequency and mode shape. When resonance occurs, in serious case, it will lead the structure to crack, and therefore, this research is to develop a modal analysis for a cabinet RHS which is a part for air-conditioner under the free-free vibration. Theoretical result and experimental result of the mode shape for the cabinet RHS was found in this project and the correlation was done in order to compare between the theoretical result and experimental result. NX software was used to do the geometry clean up and finite element analysis (FEA) on the cabinet RHS in order to find out the mode shape theoretically, moreover, pre-test was also done by using NX software to choose the sensor point in order to proceed to conduct experimental modal analysis (EMA). The experimental result of mode shape of cabinet RHS was obtained by using Impact Hammer Experiment Modal Analysis (EMA) and Shaker Experiment Modal Analysis (EMA) in Brüel & Kjær software and equipment. MAC correlation was done in NX software in order to compare the natural frequency between the FEA result and the EMA result. The result for this project can take as a reference for the air conditioning industry to modify and validate the cabinet RHS in order to enhance the quality of the product as well as to reduce the cost and time consumption by not doing any further testing and investigation for a physical prototypes.

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LIST OF ABBREVIATIONS

EMA	Experimental Modal Analysis
R&D	Research And Development
MAC	Modal Assurance Criterion
CAD	Computer-Aided Design
CAE	Computer-Aided Engineering
FRF	Frequency Response Function
FE	Finite Element
FEA	Finite Element Analysis
FEM	Finite Element Method
FFT	Fast Fourier Transform
DOF	Degrees Of Freedom
COMAC	Coordinate Modal Assurance Criterion

NOMENCLATURE

Symbol	*Definition*
f_{si}	natural frequency from EMA
f_{Ti}	natural frequency rom FEA
w_i	coefficient of importance
$\psi_{A_{1j}}$	j^{th} value of mode of ψ_{A1}
$\psi_{A_{2j_i}}$	j^{th} value of mode ψ_{A2}
ψ^*	complex conjugate value
ψ_T	mode shapes from FE model
ψ_A	mode shapes from reduced DOFs model
ψ^*	complex conjugate value