Finite element modeling and updating for dynamic study of exhaust structure

M. S. M. Fouzi[1,3], *M. S. M. Sani*[1,2]

[1] Advanced Structural Integrity and Vibration Research (ASiVR), Faculty of Mechanical Engineering Universiti Malaysia Pahang, Pekan, Malaysia

[2] Automotive Engineering Centre, Universiti Malaysia Pahang, Pekan, Malaysia

[3] Department of Mechanical Engineering, Politeknik Ungku Omar, Ipoh, Malaysia

ABSTRACT

Modal analysis is an approach to determine the dynamic behavior of a structure through numerical analysis or experimental approach. Nowadays, numerical analysis has been preferred by most researchers and engineers compared to experimental analysis to analyze the structure due to expenditure and time consuming factors of the research. Recently, numerical analysis is done computationally or well known as Finite Element Analysis (FEA) by using finite element (FE) model to replicate the real test structure. Instead of advantage of FE analysis, the trustworthiness of FE model has been questioned since simplification has been made during design stage for complex structure and inaccurate of geometry input of the model. Hence, this paper is carried out to reduce the discrepancies between numerical prediction results with measured test data on FE model of exhaust structure by implementing FE model updating using SOL200 algorithm. Initially, the FE model is running on normal mode analysis SOL103 to extract the modal parameters such as natural frequency and mode shape. Then, the numerical pre-diction result has been correlated and validated with measured test data obtained through Experimental Modal Analysis (EMA). Due to disagreement between numerical result and experimental data in correlation process, the FE model has been updated using SOL200 algorithm. The percentage error between numerical prediction result and measured test data is minimized from 5.67 to 3.23% after been updated. It's shown the capability SOL200 algorithm in preparing the reliable FE model before been used for further analysis such as structural dynamic modification.

KEYWORDS

Dynamic study; Joints strategy; Finite element analysis; Experimental modal analysis; FE model updating

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