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The application of SEA in the analysis of cab acoustics: A case study

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Statistical Energy Analysis (SEA) is a method based on the principle of conservation of energy to predict the response of complex, built up structures to a given input based on system parameters including damping and coupling loss factors. The approach uses power balance equations between subsystems of complex structures to track energy flow. Using energy concepts helps alleviate difficulties associated with more classical methods to solve noise and vibration problems at high frequencies. This paper presents the numerical analysis of vibration and sound radiation from a heavy vehicle cab carried out by using commercial SEA software. The full SEA model of the cab was assembled from individual sub system models of the interior air cavity, metal and glass panels, and other structural members. The objective is to build a hybrid SEA model of the cab interior for analysis, design and optimization. The model was effectively used for studying the effects of a variety of noise control treatments on the cab especially at high frequencies. Correlation between model prediction of interior sound pressure and test data was performed for several load conditions with great success. Power contribution analysis also was performed to determine dominant paths that transmit sound to the interior cavity and to design noise control treatments for the cab based on dominant paths. Various source, path and receiver treatments were attempted to demonstrate the usefulness of the model for interior noise reduction.

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