Trim-Structure interface simulation techniques based on Finite Element Modelling

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The acoustic comfort in vehicles becomes more and more important and, hence, an improved determination of the vibroacoustic behavior gained in importance in the past decades. One of the vital components for noise reduction within a car body are porous insulation materials. Unfortunately, conventional numerical simulation approaches to determine acoustic response of such trim systems struggle to reflect realistic behavior and have a poor agreement with measurement data. On the one hand, reproducibility is a big issue for absorber materials. On the other hand, trim-structure interface phenomena are usually not taken into consideration in numerical models. This leads to inaccurate vibroacoustic wave propagation estimations and to the failure in the acoustic comfort determination, as a result. The current paper focuses on the investigation of trim-structure interface phenomena and proposes a simulation approach to determine the observed interaction patterns. With the help of the inverse optimization approache a good agreement has been achieved between experimental and numerical results for several configurations of porous materials. Additionally, sensitivity analyses have been performed to identify most influential simulation parameters.

Keywords: ICTCA 2023; acoustic absorber; interface phenomena; porous materials.