Modeling of absorbers by the help of the Theory of Porous Media combined with plate-structures

Abstract:

The modelling of sound fields in closed volumes is typically done with the help of the Statistical Energy Analysis. In the scope of this theory a diffuse sound field is assumed resulting in random angles of incidence on the surfaces. The measurements carried out for the description of those absorbers in reverberant chambers typically simulate these sound fields. However the modelling of the fluid structure interaction by the help of the Finite Element Analysis with pressure and velocity as primary variables lead to a phase correct spatial resolution. In this approach it is possible to model the absorptive surfaces with their correct wave number depending impedances. The corresponding measurements for this are measurements under varying incident waves. In the paper a method is proposed by which the wave number depending impedances for porous absorbers with covering plates and underlying voids are calculated. The system of coupled partial differential equations is transformed in the wave number-frequency domain and thus provides directly the absorptive characteristics depending on the angle of the incident wave. The application is illustrated on the basis of 2 examples. An outlook is given for the implementation of the elements into a coupled fluid-structure calculation for the assessment of the interior sound pressure level in rooms with radiating surfaces.

Publiziert als:

2nd GACM Colloquium on Computational Mechanics, Munich