ACOUSTICS2008/1963
An impedance matching technique for active-passive vibration control

Jonas Svensson, Patrik Andersson and Wolfgang Kropp
Chalmers University of Technology, Division of Applied Acoustics, SE-41296 Gothenburg, Sweden

Impedance matching techniques have shown potential for active vibration control of structures in bending. Such structures are commonly described by Euler-Bernoulli theory. Previous studies concerning impedance matching of these structures have only considered scalar quantities. However, for an Euler-Bernoulli beam four field variables are involved which implies that a scalar impedance is insufficient. The purpose of this study is therefore to expand the technique to include full 2x2 matrices. This is achieved by first deriving the reflection matrix as a function of the characteristic impedance matrices of an Euler-Bernoulli beam and an arbitrary termination impedance. An active impedance load is then introduced in order to manipulate the reflection matrix. A theoretical example is given where the approach is utilized to match the junction between an Euler-Bernoulli beam and a sandwich composite. This proposed active-passive damping configuration employs active control to enclose all incident power in the sandwich composite. Results show that the active impedance load is responsible for the main part of the power absorption over a broad frequency range.