

The Scattering in Flexible Reactive Silencer Containing Rigid Partitioning

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Abstract : The noise emanating from the ducting of heating, ventilation, and air-conditioning (HVAC) system is often attenuated by using the dissipative silencers. Such devices work well for the high-frequency noise but are less operative in the low-frequency noise range. The present study analyzes a reactive silencer comprising expansion chamber of the elastic membranes partitioned symmetrically by a rigid plate. The Mode-Matching scheme has been developed to solve the governing boundary value problem. The orthogonal and non-orthogonal duct modes of acoustic pressures and normal velocities are matched at interfaces. It enables to recast the differential system into the infinite system of linear algebraic of equations, which is, then truncated and inverted for the solution. The truncated solution is validated through the conservation of energy and reconstruction of matching conditions. The results for scattering energy flux and transmission loss are shown against frequency and the dimensions of the chamber. It is seen that the stop-band of the silencer can be shifted to the broadband by changing the dimensions of the chamber and the properties of the elastic membranes. The modeled reactive silencer is more efficient in low frequency regime where the passive devices are least effective.

Keywords : acoustic scattering, elastic membranes mode-matching, reactive silencer

Conference Title : ICANV 2018 : International Conference on Acoustics, Noise and Vibration

Conference Location : Vancouver, Canada

Conference Dates : August 09-10, 2018