Theoretical and experimental investigation of the insertion loss of a dissipative muffler

By using a global theory of sound propagation in a circular duct with a dissipative material, the equivalent acoustical impedance of the cross section of the duct was calculated at low frequencies. Plane wave theory was then used to calculate the four-pole parameters of the duct using empirical formulas of the propagation constant and specific impedance of a dissipative porous material. The insertion loss of a single chamber dissipative muffler was calculated for different geometries and dissipative materials, and the insertion loss was measured using two microphone probes and white noise. The measurements were performed with different geometries and with different porous materials. The acoustical properties of the porous materials were calculated on the basis of the measured flow resistance and the calculated acoustical properties were compared with results obtained by using a standing wave tube method. A good agreement was found between the calculated and measured insertion loss of the single chamber dissipative muffler in the frequency range below the cutoff frequency of the muffler.