

## **Design of Reactive and Dissipative Materials Distribution in Silencer by using Topology Optimization**

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Silencers have been widely used to reduce sound transmission in mechanical systems. Both reactive and dissipative effects determine the acoustic attenuation performance of silencers. The attenuation performance by each effect is strongly dependent on frequency according to configurations and installed materials in silencers. Therefore, a proper combination of the reactive and dissipative effects is an important issue in the design of silencers to yield a good attenuation performance in a wide range of frequencies. In this work, distributions of reactive and dissipative materials are designed by using the topology optimization method to improve the sound transmission loss in target frequency ranges. To show the effect of reactive and dissipative materials in acoustic attenuation, a simple expansion chamber is used as a test silencer. An elastic material and poroelastic foams are used as the reactive and dissipative materials, respectively, which fill the expansion chamber as a result of topology optimization.

**Keywords:** Silencer, Sound transmission, Reactive and dissipative effect, Topology optimization