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Discrete Element Modeling of Close Box Oscillation with Granular Particles: Force Laws and Energy Dissipation XIAN-MING BAI, LEON KEER, JANE WANG, RANDALL SNURR, Northwestern University — Partially filled cavity particle dampers are widely used in aerospace applications. In comparison to the conventional viscous fluid based damping, the temperature-independent performance and design simplicity of particle dampers make them more attractive when the temperature varies significantly. Recently, the discrete element method (DEM) has been widely used to simulate the particle damper consisting of a cavity box. In order to truly represent the real damping system, the use of accurate force laws in the DEM simulation is critical. In this work, we use different force models in DEM simulation to investigate the damping behavior of a close oscillating box filled with glass and steel particles. The force models used in this work include linear, Hertz, inelastic, plastic, history-dependent, and history-independent models. We have found that the damping is very sensitive to the shear force models, but insensitive to the normal force models. The underlying mechanism has been investigated. In order to investigate the optimum filled fraction of particles and help us design the dampers, various configurations of different filled fractions are simulated. The energy dissipation through collision and friction is also investigated in this damping device.

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