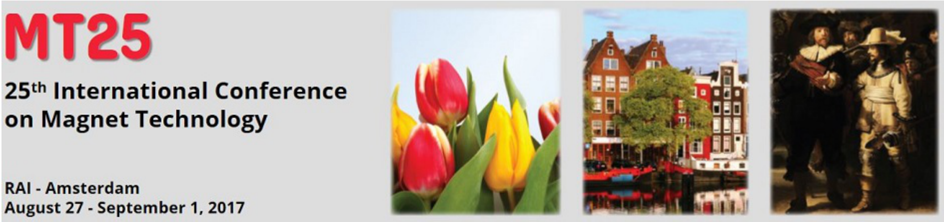

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Analysis and Optimization of Adjustable Magnetic Fluid Damper in DC Magnetic Field

Wednesday 30 August 2017 13:15 (1h 45m)

Magnetic fluid is a stable colloidal dispersion of single domain magnetic nanoparticles in a carrier fluid [1]. Magnetic fluid can be widely used in various fields [1-2]. Based on the magneto-viscous characteristic, magnetic fluid has many unique advantages as damping medium. This paper presents an adjustable magnetic fluid damper. This damper is composed of an induction coil, a non-magnetic vessel, two non-magnetic springs, and a cylindrical inertia mass. The coil is wrapped around outside of the vessel to provide magnetic field. The cylindrical inertia mass is fixed to the vessel by two springs. The vessel is filled with magnetic fluid and sealed. The different input currents in the coil can generate different magnetic field, which can change the viscosity of the magnetic fluid and adjust the damping parameters of the damper. Based on the Bernoulli equation and the continuity equation, the damping force and equivalent damping coefficient of the damper are obtained. The factors that influence the damping parameters are analyzed, including the viscosity of the magnetic fluid in a magnetic field, the radius and length of the inertia mass, and the size of the gap between inertia mass and vessel. The multi - objective parameters of the shock absorber are optimized by the genetic algorithm. The optimal combination of the performance parameters of the shock absorber is obtained, and then the numerical simulation is carried out. The results show that the adjustable magnetic fluid damper shows high sensitivity and adjustable for the low frequency and small damping vibration.
[1] I Torresdíaz, C Rinaldi, "Recent progress in ferrofluids research: novel applications of magnetically controllable and tunable fluids,'Soft Matter, vol.10, no.43, pp. 8584-8602, 2014.
[2] N Choudhary and D Kaur. "Vibration Damping Materials and Their Applications in Nano/Micro-Electro-Mechanical Systems: A Review,"J. Nanopart. Res., vol.15, no.3, pp. 1907-1924, 2015.

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