

LAMINATED VIBRATION ISOLATORS WITH MAGNETO-RHEOLOGICAL ELASTOMERS (MRE)

Adaptable vibration isolator with controllable dynamic shear properties, highly suitable for seismic vibration control applications

Protection of non-structural components from failure during a seismic event is imperative to achieve seismically resilient infrastructure. To ensure these secondary components remains functional after a major seismic event, an effective isolation technique is needed to protect them from high acceleration. Traditional isolation pads are often inadequate, and innovative control systems and strategies which are adaptive in nature are required. Semi-active control concepts, commonly used in structural control, can be extended to protect secondary components such as equipment in building structures. By selecting semi-active control devices with adaptability and smartness, safety of equipment can be ensured even in varied loading conditions. A semi-active laminated vibration isolator made adaptive using magneto-rheological elastomers, is proposed as a viable solution for seismic protection of non-structural components.

Features / Highlights

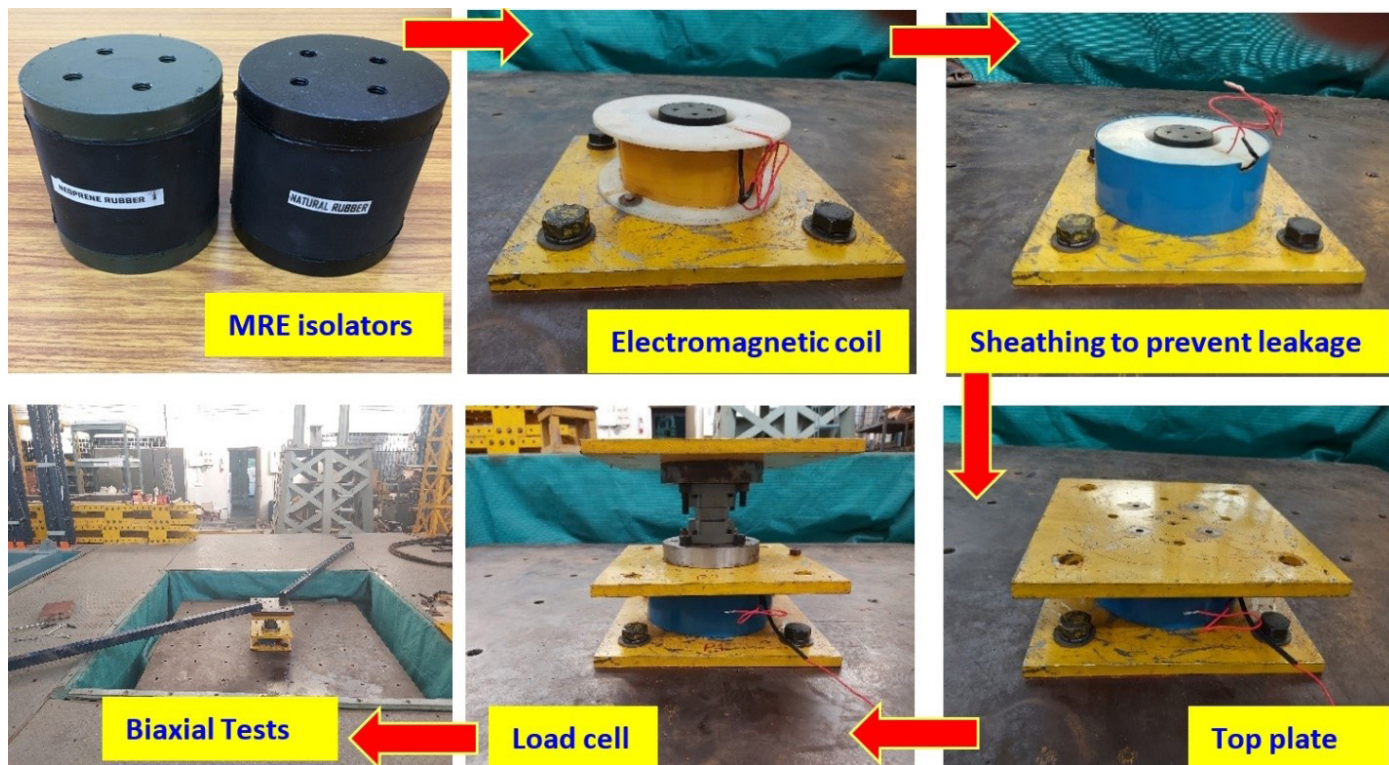
- Prototype design of isolator, with adaptable shear isolation
- Designed using magneto-rheological elastomer (MRE) sheets, with steel plates in alternating layers
- Laminated in structure to ensure high vertical stiffness
- Isotropic MRE using natural and chloroprene-based rubber matrix, infused with CI particles
- External electromagnetic field arrangement to change the MRE properties

Technical Details

- 6 layers of MRE with 5 steel shims
- NR based MRE with 40% CI and CR based MRE with 70% CI composition
- Upto 23% increase in stiffness and 28% increase in damping in shear mode, due to external magnetic field
- Custom-designed Electromagnetic arrangement for magnetic field variation upto 0.3T

Applications

- Seismic protection of non-structural components
- Seismic protection of equipment in critical infrastructure
- Vibration protection of machines



Testing of MRE isolators using shake table

Status of Technology

- Compounding, fabrication and characterization of NR and CR based MRE
- Design of laminated vibration isolator with high vertical stiffness
- Design of electromagnetic solenoid arrangement
- Laboratory demonstration of developed prototype isolator under uniaxial and biaxial sinusoidal loading condition using shake table

Future Plan

- Development of large scale vibration isolators with higher vertical load carrying capacity suitable for buildings



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