

Title: Adaptive Mass Damper using MRE for dynamic vibration reduction of piping systems (ADMIRE Pipes)

Duration: 2 Years (Apr 2024 to March 2026)

Deliverables:

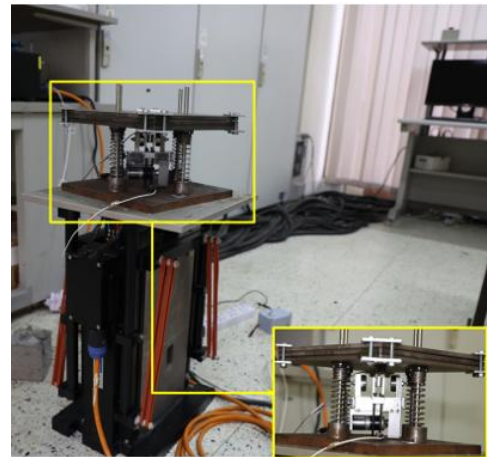
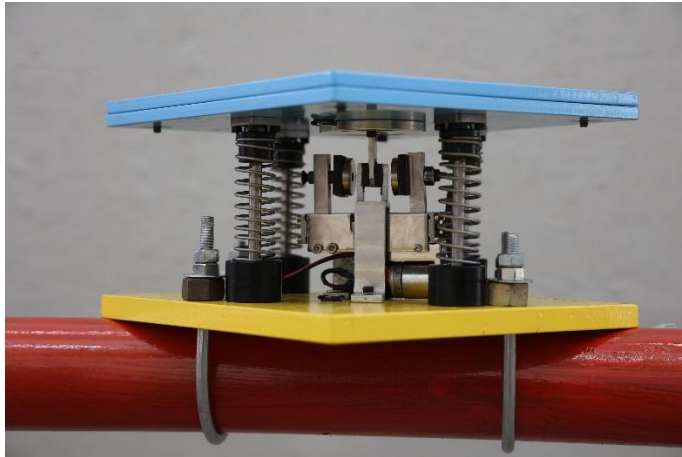
- **Provisional Patent Filed :** Product: Adaptive Mass Damper using magnetorheological elastomers for dynamic vibration reduction
- **Product Developed:** Adaptive Mass Damper using magnetorheological elastomers for dynamic vibration reduction of piping systems

Significant Achievements:

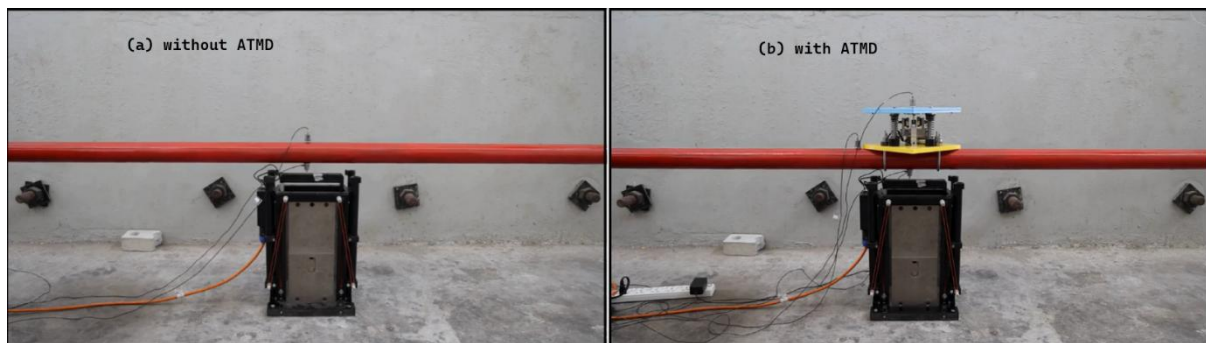
- **Indigenous MRE-Based Adaptive Mass Damper:** Developed and demonstrated a first-of-its-kind indigenous MRE-based adaptive mass damper (MRE-AMD) with a patentable architecture for vibration control of piping systems.
- **Magneto-Mechanical Characterization:** Designed a dedicated shear test rig and characterized two RTV-based MRE formulations, generating stiffness and damping data under varying magnetic fields for device optimization.
- **Validated Numerical Framework:** Developed and experimentally validated ANSYS FE models of the MRE element and the coupled pipe–MRE-AMD system, establishing a reliable design and scaling tool.
- **Semi-Active Adaptive Control:** Demonstrated frequency tuning and enhanced energy dissipation using repositionable permanent magnets, eliminating the need for continuous power supply.
- **Superior Vibration Mitigation:** Experimentally verified that the MRE-AMD outperforms conventional passive TMDs, achieving **85 - 93% peak response reduction** over the target frequency range under harmonic excitation.
- **Technology Advancement:** Advanced the technology from **TRL 3 to TRL 5**, filed a patent, and established readiness for field-scale demonstration and commercialization

Team:

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Overall View and Dynamic Characterization of the ADMiRE Pipe Device



Laboratory Demonstration of the ADMiRE Pipe Device

Date: 25/06/2026