

# Vibration control system with energy harvesting MR damper

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The presentation deals with vibration control system with energy harvesting magnetorheological damper (EH-MR) that integrates energy harvesting, a dynamic sensor and MR damping technologies [1, 2, 3]. The EH-MR is able to recover energy from external excitations using an electromagnetic energy extractor, and to adjust itself to excitations by varying the damping characteristics. The advantage of the device is its adaptability to external excitations and the fact that it does not need any extra power supply unit or a sensor on account of its self-powered and self-sensing capabilities.

The presentation explains the structure of the system and explores its experimental testing. There are two objectives of the presentation. The first one is to get an insight into the structure of the EH-MR damper and to compare results of experimental study against numerical data. The second objective is to evaluate performance of the vibration control system with the EH-MR that was employed in a single DOF mechanical structure [4]. For this purpose experiments were performed to investigate the EH-MR damper in the vibration control system. Of particular interests were self-powered and self-sensing capabilities of the EH-MR damper. It was assumed that the device was powered only by energy harvested from vibration, while measurement and control electronics was powered from the external power source. Self-powered capability of the EH-MR damper was investigated using sky-hook and on-off algorithms while self-sensing capability by the use of continuous balance and on-off balance algorithms. The obtained results demonstrate that:

- the EH-MR provides a smart and compact solution with the potential application to vibration control,
- the level of harvested energy is sufficient to activate the EH-MR damper in the vibration control system,
- the vibration control system with the EH-MR damper is feasible, has good performance and enables significant reduction of the resonance peak.

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