

Structural Response Reduction Using Vibration Control Systems based on MR Fluid Dampers or MR Elastomers

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SUMMARY

In order to mitigate the excessive responses of civil engineering structures such as bridges, buildings and stay cables, various structural control systems have been developed based on magneto-rheological (MR) fluid dampers so far. In the early 2000's, an adaptive passive control system using an MR fluid dampers and an electromagnetic induction (EMI) device was proposed to simplify the control system by replacing a feedback control part including sensors, a controller and a power supply without the sacrifice of control performance. Its feasibility has been validated mainly through numerical simulations and experimental tests with small-scale structural models. Also, the real-time hybrid simulation, which is the combination of numerical integration of the equation of motion for a numerical substructure and the physical testing for an experimental substructure, has been used for investigating its applicability to full-scale structures. In addition to an MR fluid damper, an MR elastomer, its solid-state analogue, has received considerable research attention in recent years. The possibility of MR elastomer-based base isolation systems has been examined by several researchers. In this paper, the recent research outcomes on the adaptive passive system and MR elastomer-based base isolation system are provided. Moreover, their current status and future research directions are discussed.