One-way translational magnetic mass damper model for structural response control against dynamic loadings

ABSTRACT

Structural responses should be reduced to minimize the consequent structural damage caused by dynamic excitation. The one-way translational magnetic mass damper model is developed as a new type of damper for the purpose of structural response control. The damper utilizes the concept of repulsive force between magnets with same poles to create a magnetic force to stabilize or bring the structure back to its original position. The dynamic performance of the structure was tested using a harmonic shaking table. In this study, the three parameters used are excitation speeds: 2.5V (low), 6.0V (medium) and 8.5V (high); strength of magnets: weak (N35), medium (N45) and strong (N52); and the mass in the damper: 40 g, 101 g and 162 g. The correlations of the parameters towards the structural displacement are verified in the testing. The displacement is highly reduced up to 100% at the first level and 85.2% at the fifth level. The most optimum structural response control was attained when a strong magnetic strength and mass of 162 g are used. When tested with three excitation speeds; 2.5V, 6.0V and 8.5V, the damper with this setting provides the optimum damping effect towards the structure in terms of displacement.