RESPONSE OF STRUCTURE USING MULTIPLE TUNEDMASS DAMPER: A REVIEW

1Naveen Rohira, 2Jaswant Singh

1M. Tech Scholar (Structural Engineering), 2Assistant Professor
Civil Engineering Department
CBS Group of Institutions, Jhajjar (Haryana)
Maharishi Dayanand University, Rohtak

Abstract: Through utilizing passive vibration reduction tools such as tuned mass dampers in the frameworks, we can minimize structural responses; alleviate structural harm or failure from extreme earthquake by passive energy dissipation system; and we can assess structural reaction, strength for a given earthquake, and also resist structural motion. Tuned mass damper (TMD) decreases the seismic activity resulting in complex reaction. Thus TMD may be used to protect buildings from earthquake damage and improve their power and resilience. Formulation creation of the system of passive control devices can be carried out in deterministic approach and probabilistic approach under random earthquake load and optimum configuration of passive control devices under stochastic earthquake load can also be achieved in time domain approach.

Keywords: Tuned mass damper (TMD), Deterministic Approach And Probabilistic Approach, Random Earthquake

I. Introduction

Construction of buildings with skyscraper is required today. Construction engineers are now engaged in challenging jobs due to a shortage of land, a rapid urbanization process, economic requirements and advancement in building technology. Such skyscrapers and other high-rise structures have been increasingly lightweight, compact and mildly lightened, utilizing high-strength, smart design materials and advanced technologies. One of the problems that structural engineers are experiencing today, though, is to find reliable and safer ways to secure the building and its interior from environmental threats such as earthquakes and wind charges. The creative engineering approach is to mount various types of equipment at the correct locations to make the system function better under external load conditions, thereby disrupting passengers, especially in high-rise buildings.

It has a long history of adding vibration suppression devices such as these to the structures. In the early twentieth century, negative dampers turned up. It was not until the 1950s, however, that intelligent structural techniques for controlling the air response and earthquakes of civil engineering structures began to be visualized. This has opened a new field of research for passive structural control in the last few decades. The intelligent framework technology used to monitor seismic reaction has achieved tremendous strides after outstanding research and development efforts.

The unreceptive vibration rheostat systems do not need power to run the device and are very effective to install in order to the the degree of vibration of civil engineering structures. The advantages of passive control devices are the low maintenance requirements which result. Economy overall. Countless such devices like Tuned Mass Damper (TMD), Viscoelastic Dampers (VED), Viscous Fluid Dampers (VFD), Friction Dampers (FD), Base isolation (BI), Metallic Yield Devices and Tuned Liquid Mass Damper (TLMD) etc. have been implemented to mitigate structural vibration effect by wind and earthquake excitations.

II. Literature review

Tanha and others (2006) found that it is of great importance to evaluate the effective parameters in strong motion generation such as fault type, predicted severity of the earthquake, decrease in strength and failure rupture characteristics.

Jangid (1999) notes that the optimum damping ratio of the MTMD system decreases with the increase in the number of MTMDs and increases with the increase in the mass ratio, and also notes that the optimal bandwidth of the MTMD system changes with the improvement of the increase. Quantitative Efficiency for MTMD.

Banerji et al. (2000) Note that the effectiveness of the TLD increases with increased structural basis excitability, energy dissipation increases due to the decrease, then decreases with increased structural damping, and the relative energy dissipation of the TLD also decreases. small size.

Zuo and Nayfeh (2004) indicated that multiple degrees of freedom (MDOF) of the seizure block damper (TMD) can be adjusted to effectively suppress the functions of the multiple major devices. The minimax algorithm effectively applies the best functionality to all MDOF TMDs and multiple SDOF TMDs. In general, it produces greater damping than has been improved by H2 or HN, which results in a smaller response to a specific set of disturbance inputs. Optimal H2 and HN can cancel response to different modes, and the optimum threshold only increases the minimum damping. Finally, it reveals that it is possible to create a multi-degree TMD system of freedom that perfectly matches the ideal design.

Fan and others. (1991) demonstrated that a properly constructed foundation insulation system will greatly reduce the transmitted vibrations and the pressure of the shaft generated in the structure. We have also noticed that peak acceleration and maximum deviation response have nothing to do with the coefficient of friction dependent on the friction speed.
Jangid (2008) observed that the random seismic response to an independent multi-layer structure can be achieved by looking at a model of stationary seismic ground motion with appropriate PSDF properties and varying intensity. He also noted that for a basic insulating structure, LRB has an ideal production capacity, and for this reason, the acceleration of the absolute top layer reaches a minimum. However, the bearing offset tends to decrease as the bearing is increased.

Matsagar and Janjig (2010) found that by introducing flexible viscous damper connections on the ground of adjacent insulated foundation buildings, the peak displacement can be reduced considerably, which helps to avoid impact phenomena.

Patil and Jangid (2011) observed that, in the case of TMD and MTMD, the optimal tuning frequency ratio is close to 1, and when the mass ratio is decreased, the amplitude is close to 1, they have noticed that the optimal damping ratio of TMD differs with the mass change with the ratio increase...

Marano and Greco (2008) have found that the optimized TMD used in seismically accelerated high-rise towers to mitigate vibrations can be highly effective.

Reducing the base structure vibration level but its effect depends on the relationship between ground movement characteristics and structural parameters. Researchers also noticed that acceleration influences soft soils rather than displacement, and the opposite tendency in hard soils can be observed.

Malatista (2010) studied the function of magnetic-controlled dampers (MR-TMD) in minimizing structural displacement that is exposed to harmful dynamic charges. Recognizes that any damping system has managed to say the structural reaction. He also indicated that MR-TMD's semi-active effect could enhance the damping force applied at critical moments and thus enhance the traditional TMD method.

Mustafa (2010) detected resonant ground motions in the earthquake reports recorded in different regions of the world. The motion of the Earth is defined by a narrow frequency band, which absorbs energy. Using the cosmos principle and dispersion diagram he developed a methodology for calculating the magnitude of earthly motion. These calculations are focused on the engineering properties of spectral density function of the Earth’s strength.

Tell it this way y. (1990) found that simple isolation systems are typically very successful in superstructure RMS response. We also noticed that the background of rapid reaction time to friction-shaped primary insulator devices is a broadband mechanism that involves components of high frequency. LRB and EDF accelerometer responses are narrow band devices, and the Fourier distribution includes strong peaks at the usual isolation range.

Karimi and Karimi (2011) found that the active control system reaction at various building heights was more satisfactory over time as compared to the time when only passive control system (TMD) was used. When an active control system is applied to the middle height of the building, acceleration and velocity are satisfactory control states.

Pascal and Jangid (2014) noticed that a higher mass ratio was advantageous for using MTMFD to minimize structure reaction, and also noticed that although the amount of TMFD units decreased in MTMFD, there was still approximately a decrease in reaction.

Debbarma (2012) noticed that the SDOF configuration with random device parameters will minimize the performance of TMD in random seismic response unless it is set to vibration mode due to system parameter uncertainty. The performance isn't fully lost, however. Generally it is observed the benefit from the damper tends to decrease due to the instability.

Chakraborty and Deparma (2011) note that LCVA sales continue to decrease, with growing confusion. We have noticed from analytical study that the LCVA can be overestimated if the uncertainty influencing system parameters is not recognized.

Chakraborty et al. (2012) found TLCD reduction efficiency to be dependent on weight, length, main system damping ratio and seismic density ratio. This effect was found to be especially linked to high seismic strength and low damping values.

In addition, Jangid and Datta (1995) examined the usefulness of the asymmetric system BI under automated seismic excitation. Lewandowski and Grzymislawska (2009) found that MTMD would minimize systemic displacement and device acceleration from TMD if system parameters cannot be correctly understood.

Naim and Kelly (1999) studied the nature of the protective system so that most seismic energy could be dissipated by the supersystem.

Greece, etc. (2001) examined the spontaneous seismic response of strongly damping coated rubber bearings to foundation isolated structures.

Tflanidis et al. (2008) suggested a nonlinear BI interface controller architecture with an emphasis on random simulation.

III. Conclusion and Future Work

The conclusions were drawn based on the survey Displacement of structures by RMS reduces the mass ratio and the structural damping ratio. The tuning ratio decreases, and the damping factor increases as the weight ratio increases. The RMS displacement of the structures increases with the acceleration value of peak ground. For both peak ground acceleration rates, variations in the tuning ratio and the damper damping ratio remain identical. Displacement of systems by RMS decreases with higher systemic time cycle weight. Reduction of the key framework RMS displacement is higher because there is no MTMD more consistent with the mass transmission network. Similar results for a particular earthquake were found using MTMD considering medium and soft soil compared with STMD.
References


