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Research Developments in Vibration Control of Structure Using Tuned Liquid Column Dampers: A State-of-the-Art Review

Authors : Jay Gohel, Anant Parghi

Abstract : A tuned liquid column damper (TLCD) is a modified passive system of tuned mass damper, where a liquid is used in place of mass in the structure. A TLCD consists of U-shaped tube with an orifice that produces damping against the liquid motion in the tube. This paper provides a state-of-the-art review on the vibration control of wind and earthquake excited structures using liquid dampers. Further, the paper will also discuss the theoretical background of TCLD, history of liquid dampers and existing literature on experimental, numerical, and analytical study. The review will also include different configuration of TLCD viz single TLCD, multi tuned liquid column damper (MTLCD), TLCD-Interior (TLCDI), tuned liquid column ball damper (TLCBD), tuned liquid column ball gas damper (TLCBGD), and pendulum liquid column damper (PLCD). The dynamic characteristics of the different configurate TLCD system and their effectiveness in reducing the vibration of structure will be discussed. The effectiveness of semi-active TLCD will be also discussed with reference to experimental and analytical results. In addition, the review will also provide the numerous examples of implemented TLCD to control the vibration in real structures. Based on the comprehensive review of literature, some important conclusions will be made and the need for future research will be identified for vibration control of structures using TLCD.

Keywords : earthquake, wind, tuned liquid column damper, passive response control, structures
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