

10. Study of Vibration Control Using Parametric Excitation

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Tuned mass dampers incorporating additional mass with the natural frequency tuned to that of the structure in question are used for the passive vibration control of various structures. These passive vibration control devices generate significant damping effects close the natural frequency of the structure. However, a new vibration system by adding additional mass can result in unintended resonance phenomena. To prevent this unwanted resonance, we explored a new passive vibration control device, comprised of a pendulum and a torsion bar spring, based on the parametric excitation characteristics. Through vibration model experiments and response analysis, we confirmed the following:

- i. A device with a mass ratio of $1/75$ reduces structural response to about $1/2$ without generating new resonance phenomena.
- ii. The vibration control effect can be accurately evaluated via response analysis based on appropriate models of the structure and the vibration control device.
- iii. The smaller the device damping, the greater the vibration control effects (response reduction rate / response reduction range).

Key words: parametric excitation, tuned mass damper, vibration experiment, response analysis