

Influence of Aspect Ratio of Vibratory Flap on Dynamic Response of Clamped Rectangular Plate

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Abstract

The transverse vibration control of a clamped, rectangular, isotropic plate by a vibratory flap subjected to harmonic excitation has been investigated by Finite Element Analysis (FEA) and experimental technique. The vibratory flap is a new plate-type dynamic vibration absorber, which can vibrate on the plate when attached as a cantilever plate. The study has been focused specifically on the influence of aspect ratio of vibratory flap on the dynamic response of the plate at constant mass ratio and constant tuning frequency ratio. The study has revealed that the dynamic response of the plate varies with respect to the aspect ratio for aforementioned conditions. An optimum aspect ratio has also been obtained by minimizing the mass ratio with maximum attenuation in the first and second target frequencies. The results have shown that the optimized flap can trim down the plate vibrations by up to 90–95% in the fundamental mode. Moreover, the dynamic response of the plate can be improved to a great extent due to the adoption of an optimal aspect ratio of the flap. Finally, the experimental outcomes have shown fairly good agreement with the results obtained from the finite element analysis.

Keywords:

- Aspect ratio
- Optimization
- Vibration control
- Rectangular plate
- Plate type dynamic vibration absorber
- Vibratory flap