THEORETICAL AND NUMERICAL ESTIMATION OF SOUND POWER FROM OUT OF PLANE MODES OF A FREE ANNULAR CIRCULAR PLATE HAVING PARABOLICALLY VARYING THICKNESS

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ABSTRACT

In this study, the sound radiation characteristic of an annular circular plate with parabolically varying thickness with different taper ratios and different excitation locations are analysed. The mass of the plate is kept constant for all thickness variations. Rayleigh integral is applied to determine the acoustic radiation coupling between interacting structural modes of the plate. Further, this method is applied to determine the self and mutual radiation from out of plane \((m, n)^{th}\) modes. The same problem is also solved by ANSYS to draw the comparison. The sound power is generated by harmonic force at different excitation locations is calculated from self and mutual radiation. It is observed that the mutual radiation due to modal coupling exists only when two out of plane structural modes have same \(n\). Finally, excitation location with different taper ratios provides us a solution for peak sound power actuation as well as peak sound power reduction.

KEYWORDS: Thick Annular Plate, Natural Frequencies, Taper Ratio, Sound Power, Tapered Plate & Parabolic Varying Thickness

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