Dynamic Stability Analysis of Cross-Ply Laminated Cylindrical Shells Subjected to Radial-Impact External Pressure

by

Yasuji YAMAGISHI[*1], Hiromitsu WATANABE[*2] and Hirakazu KASUYA[*3]

Abstract

The problem of the dynamic stability of cross-ply laminated cylindrical shells subjected to radial-impact external pressure is described. First, the motion of cylindrical shells subjected to radial-impact external pressure is defined as axially symmetric motion. Following this definition, certain perturbations are superimposed on this motion and their effect on the behavior of the shell is investigated. The symmetric state of motion of the shell is stable if the perturbations remain bounded. The solutions for the prebuckling motion and the perturbed motion are obtained using Galerkin's method. Stable regions are determined utilizing Mathieu's equation. The inevitability of dynamically unstable behavior is supported analytically and the effects of various factors, such as external pressure ratio, number of layers, inner lamination angle and dynamic unstable mode, are clarified.

Key words : *Structural analysis, Cross-ply laminated cylindrical shells, Dynamic stability, Composite materials, Radial-impact external pressure, Mathieu's equation*

* 1 : Graduate Student, Course of Mechanical Engineering.

* 2 : Tachi‑S Co., Ltd.

* 3 : Professor, Department of Prime Mover Engineering.