Effects of stiffening parameters on axial buckling of stiffened composite shells

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In the present paper, effects of some parameters of stiffeners on the cylindrical composite shell have been studied on the axial buckling. The stiffeners are arranged in equal intervals and have the same cross-sectional area.To calculate the stiffness of these elements, the reaction between shell and stiffeners was considered.In order to solve the special buckling of these structures, the Ritz method was used and results of numerical simulations were compared. Boundary conditions of the shells were assumed as fixed or simply supported on both ends. Finally, the effects of geometry and type of stiffeners, their orientations with respect to shell axis and their numbers, shell thickness and material, stacking sequence of layers and types of boundary conditions have been investigated. Shell thickness and I and T profiles for stiffeners have maximum effects on increasing the buckling loads. With increasing angle of the stiffeners, the buckling load decreases.

Keywords:
Composite shells, Stiffeners, Axial Buckling, Stacking Sequence.

Introduction:

In more than four decades, many studies have focused on buckling, collapse, and buccal behavior of cylindrical shells.
A good part of this work was devoted to the study of reinforced cylinders
A work was carried out by Graham using an analysis method to determine the buckling loads of the ring and reinforced cylinders
Another type of amplifier layout was the layout of the middle pass-through amplifiers
Philips and Gurdal called this "Structural Analysis and Optimized Design of Reinforced Composite Sheets"
The method used to determine the buckling load of these reinforced plates was discussed
Different analytical tools created a long gap between research and the successful prediction of triple buckling patterns with reinforced cylinders in different loading conditions.
These analytical tools were developed and classified into three categories:
The discrete model simulates amplifiers such as bending and shear strength
This approach can be different in use

Such as when the plate is amplified in more than two directions or when the amplifiers are not symmetric around the half-shell surface
However, it can be very useful for simple reinforcement layouts
The work done by Wang under the title of "discrete analyzes of reinforced composite cylindrical shells" is a good example of this type of analysis.
Shell and Sheet Branch Analysis is the second approach to construct analytical models of reinforced composite cylinders.
This view is more flexible and more appropriate, and it includes a finite element modeling technique that has been popularized for examining the buckling problem of composite cylinders due to the advance in computing hardware and high precision software.
Depending on the degree of accuracy required and the range of computational costs, three types of buccal analysis can be applied.