The influence of temperature differences for the analysis of thin orthotropic cylindrical shell

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Abstract

A problem of elasticity of cylindrical shell made of orthotropic different resistant material is considered in this article. The problem is uncoupled, i.e. it consists of two separate problems: of structural mechanics and of thermodynamics. The article contains research of a shell within the framework of shallow shells theory. The solution is based on the technical hypotheses of Kirchhof–Love. The relations of Treschev are used in the capacity of physical dependencies. The main relations are used in the form of the elastic solutions method of Ilushin. The process of heat transfer is described by classic equation of heat conductivity. The article introduces a system of solving equations in combined form supplemented by initial conditions and boundary conditions. The object of the problem is a shell that suffers evenly distributed load placed perpendicularly to the inner surface of the shell as well as thermal action in the form of temperature differentiation on the inner and outer surfaces of the shell. The shell is being examined in the particular moment of time when the temperature transfer has subsided. The article contains the solution of the specific problem of thermo-elastic bending of thin circular cylindrical shell made of three-reinforced woven polymer. Some specific results of stress––strain state analysis are shown: deflections of the shell, axial and circular stresses, followed by the comparison of the results with and without consideration of thermal action, as well as analysis of influence of thermal action on the stress–strain state of the shell.

Keywords

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