THE INVESTIGATION OF THE STRESS-STRAIN STATE IN SPACESHIP DESIGNS ELEMENTS MADE OF COMPOSITE MATERIALS

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Unique properties of composite materials allow to make high-strength, lightweight hulls of spaceships, satellites. For their creation various kinds of fiberglass which have excellent chemical and biological durability are mainly used. To its advantages also concern: strength and technological properties, improvement of working conditions, reduction of charges on ventilation of industrial rooms. One of interesting applications of composite materials in spaceship building is the use of carbon fiber for spaceship's body flaps.

The layered plastics reinforced by fiber glass, for example, at once have found wide application in spaceship building from the moment of the beginning of their use as industrial materials. Their application as constructional materials has been caused by a successful combination of unique properties: the high attitude of durability to mass, durability and stability to the outer space, simplicity of operation and repair, rigidity, especially at very low temperatures, their not magnetic and dielectric properties, and also their low thermal conduction in comparison with metals. Besides these materials enable spaceship builders to use in designs elastic of the composites which are absent at usual metals. For example, at a correct choice of initial components, and also process of reception of composites including orientation of the reinforcing fibrous additive, is possible manage the constructional material meeting specific demands to the given design and also to frame a reliable design, more lightweight and effective. Use of a monolithic seamless design reduces amount of seams to a minimum and excludes many expensive secondary processes of assembly (for example, mechanical bonds by means of welding or riveting).

The carrying elements are made of composite materials, important details and units as in spaceship building, and construction of the hangar constructions. Application of these materials in various crucial products demands maintenance of their high quality and reliability.

However, delimitation of durability of such materials remains an actual problem of mechanics of a deformable firm body. The results of experimental tests are known, but the experiment gives only a particular picture for a particular material at a given temperature and is not immune to various errors. The authors solved the flat problem of determining the VAT that occurs when pulling reinforcing bars from a profile that has both rectilinear and curvilinear anisotropy. This solution can also be used in the study of the strength of the reinforcement for axial tension of the rods. The problem is solved by the asymptotic Manevich-Pavlenko method.

Anisotropy of an elastic medium usually leads to significant difficulties in solving boundary value problems. However, the application of this method allows one to use the anisotropy characteristics of an elastic medium as parameters of asymptotic integration. As a result, it is possible to split the stress-strain state of the plate adhered to the rod into two components that have different properties. The boundary-value problem of the theory of elasticity is reduced to the sequential solution of problems of the theory of potential, and the solution of the original problem is defined as a superposition of these components.

The key to solving a particular problem is, as you know, the construction of its mathematical model. In the process of creating such a model, they try to take into account some features of the problem, completely neglecting others and only to a certain extent taking into account the third. The most useful approximations occur when one or more of the parameters or variables of the problem are small (or large). If the perturbation value is one of the dimensionless physical or geometric parameters, then we speak of the perturbation of the parameters. If the magnitude of the perturbation is one of the independent variables (in dimensionless form), then we speak of the perturbation of coordinates**.** Approaches of this type become more and more accurate as the perturbation tends to zero (or infinity), i.e. they are asymptotic solutions. All in all, the result can be improved by considering it as the first step in the scheme of successive approximations. The resulting ranks, although not necessarily convergent, are asymptotic expansions by construction. Usually only the first approximation is calculated, sometimes the second. The main point of the second approximation is that it helps to understand the first. Under the most favorable conditions, the solutions obtained by the perturbation method lead to satisfactory results as a whole. In most cases, ranks cannot be assumed to converge, especially if the parameter is perturbed. Nevertheless, the asymptotic nature of these ranks means that several terms of the expansion can give quite sufficient accuracy in the entire region for reasonably small.

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