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DETERMINATION OF OPTIMAL CONFIGURATION OF LAYERED COMPOSITE UNDER STATIC LOADING

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Composite materials are now widely used in the mechanical and aerospace industries because they enable designers to achieve significant weight savings [1]. Another advantage is that more complex shapes can be produced due to the manufacturing techniques used, and the total number of parts can be significantly reduced [2].

The mechanical properties of a composite material vary significantly depending on the fiber orientation, and it is necessary to tailor the composite for each specific application to improve the material properties [3]. This study examines the optimal design of laminated plates and shells under various constraints. In many applications, laminated composites are subjected to in-plane loading, so the stiffness and strength properties must be optimized. For static bending loads, laminated composites are designed to maximize bending stiffness. In other cases, bending loads or natural frequencies must be maximized. However, in most applications, several constraints are applied simultaneously and multi-criteria optimization methods are used [4].

Using a stiffness invariant formulation, it is shown that the effects of composite package thickness and stacking can be separated and that for symmetric balanced laminates, all stacking can be represented by only two parameters regardless of the number of plies. Thus, the optimization problem is greatly simplified. Determining the optimal configuration for a composite subjected to arbitrary in-plane loading is a challenging problem. For unidirectional composites, the method of calculating the principal stress, which is to align the fibers in the direction of the highest principal stress, can be used very effectively. Thus, the tangential stresses in the principal stress of the material can be utilized very effectively.

References

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THE INFLUENCE OF NON-METALLIC INCLUSIONS ON HOT ROLLING CRACKING DEFECTS OF INDUCTION-MELTED Fe-Mn-Al-Si-Ni-Cr-V-C LIGHTWEIGHT STEELS

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The production of Fe-Mn-Al-C steels remains an expensive and difficult process due to a number of features, associated with their chemical composition. Small volumes of such steels are conveniently smelted in vacuum induction furnaces [1]. In laboratory smelting conditions, the weight of ingots usually does not exceed several kilograms, and for industrial installations it may reach 400 kg. Methods, based on arc remelting, are the