

New Trends in Optimal Design of Composite Materials

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The current trends in machine design demonstrate that a centre of gravity is continuously shifted from a structural design towards a material design mainly due to an increasing number of new materials and a development of new technologies enabling us to produce required machines. It is worth to emphasise that the optimal material design should take into account not only the required functional properties of machines but also the availability of technological processes and their influence on the mechanical properties. The aim of the paper: A) to show the possibility of optimisation of technological processes in order to eliminate or to enhance the effects of induced internal stresses during production of composite structures, B) using homogenisation approach to discuss the problem of fibre shape optimisation to obtain the required material properties. Problems are analysed in the elastic range using variational formulations with Lagrange's coefficients. Numerical examples have been solved to illustrate the effectiveness of the method.

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