# APPLICATION OF OPTIMAL CONTROL METHODS TO A PROBLEM OF COMPOSITE CIRCULAR PLATES DESIGN[1]

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Thin plates are widely used as the most important elements of different high-duty structures. A stringency of requirements to these structures being significantly higher than to regular structures, it brings about a necessity to apply novel composite materials (CM) when manufacturing them combining high strength and rigidity of CM with their other valuable qualities, on the one hand, and, on the other hand, developing optimal and rational design of composite structures in order to identify and use their potential capabilities to the fullest extent.

The report discusses the results of how computing optimal control methods [1] are applied to solve the problems of designing a minimum weight plates under their limited load bearing capacity. The statement of the problem is based on application of structural models of CM [2] which allowed us to describe behavior of plates with a use of a functional relationship between parameters of a material and characteristics of each CM component (such as a binder and fiber reinforcement). Structural and geometric characteristics were used as optimization parameters, while a radius of designed circular plates was an independent variable. The study of laid down optimal control problems showed that even with such a small dimensionality (2 phase variables) several factors manifest themselves making its numerical analysis more complicated: multiextremal character, rigidity of differential equations system, ill-conditioning of objective functionals and others. OPTCON-A Software [1] was used to solve optimization problems. The results of computational experiments are presented in the report.

## REFERENCES

1. A.Yu. Gornov *Computational technologies for optimal control problems.* — Novosibirsk: Nauka, 2009, 279 p. (In Russian).
2. S.K. Golushko, Yu.V. Nemirovsky *Direct and inverse mechanics problems of elastic composite plates and shells of revolution.* — M.: FIZMATLIT, 2008, 432 p. (In Russian).

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