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# AERODYNAMIC OPTIMIZATION OF SPATIAL FORM OF IMPELLER BLADE OF SUPERSONIC COMPRESSOR STAGE

The study is addressed to an aerodynamic optimization of a high-loaded impeller of a supersonic compressor stage. A numerical simulation of the flow through the impeller is the basic tool using the complete averaged Navier–Stocks equations and a two-parameter model of turbulence. The special features of the approach used are the application of sufficiently rough computational grids sensitive to variations in the blade form; the formulation of the qualitative criteria as values of the power characteristics of the impeller averaged on the air flow; the application of a sufficiently simple procedure of variations in a spatial form of the impeller blade; the search of an optimal spatial form of the blade using points of the equally distributed sequences in space of variables. From the study made two versions of a spatial form of the impeller blade have been chosen providing an increase in values of its power characteristics in comparison with the prototype (in the first case an adiabatic efficiency only increases, in the second case an adiabatic efficiency and the pressure ratio of the impeller increase). A given choice is validated by the subsequent computation of the power characteristics of the impeller with the reference and optimized blades using a comprehensive computational grid. It is demonstrated as a whole that based on the proposed rational choice of a moderate number of the parameters employed for varying a spatial form of the blade, its pressure ratio can be increased significantly in a simultaneous increase in an adiabatic efficiency. The research results can be used for an aerodynamic optimization of a spatial form of blades of fixed and rotating blade rims of compressors.

**Keywords:** *aerodynamic optimization, impeller of compressor stage, numerical simulation, spatial form of blade, power characteristics.*

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