

AERODYNAMIC OPTIMIZATION OF THE SHAPE OF SUPERSONIC COMPRESSOR STAGE GUIDE BLADES

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This paper is concerned with the development of approaches to aerodynamic improvement of turbomachine blade rows. The aim of this paper is to verify the workability of the authors' technique for the aerodynamic optimization of the shape of compressor rotor blades as applied to the optimization of supersonic compressor stage guide blades. The basic method is numerical simulation of 3D turbulent flow in blade rows based on the complete averaged Navier–Stokes equations and a two-parameter turbulence model. The features of the approach to optimization employed in this work are that the 3D blade shape is varied using a small number of parameters without any pre-approximation of the initial blade shape and the optimum compressor blade shape is sought for by a systematic scanning of a multidimensional region of independent variables at points that form a uniformly distributed sequence. The investigation conducted has made it possible to find two 3D blade shapes for the guide blading under study such that the loss coefficient is far lower in comparison with the prior art. It is shown that the appropriate choice of the parameters whereby the 3D guide blade shape is varied may considerably improve the efficiency of the guide blading in the operating airflow range. The results obtained in this work may be used in the aerodynamic optimization of the multirow compressor blade shape.

Keywords: *aerodynamic optimization, compressor stage guide blading, numerical simulation, 3D blade shape, loss coefficient.*

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