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ON THE EFFECT OF THE TANGENTIAL OFFSET OF BLADES ON THE POWER CHARACTERISTICS OF THE IMPELLER OF A SUPERSONIC COMPRESSOR STAGE

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The aim of this paper is to computationally study the effect of the tangential offset of blades on the power characteristics of the impeller of a supersonic compressor stage. The main computational tool was the method for numerical simulation of 3D turbulent gas flows developed earlier at the Institute of Technical Mechanics of the National Academy of Sciences of Ukraine and the State Space Agency of Ukraine. As a result of a set of parametric calculations, it is shown that the introduction of a tangential offset may increase the adiabatic efficiency of the impeller with a simultaneous increase in the compression ratio. The distributions of the adiabatic efficiency along the passage height at the impeller outlet presented in this paper illustrate the increase in the impeller efficiency near the hub and the casing surface when a tangential offset is used. The paper demonstrates that in numerical studies efficient use can be made of specially chosen "coarse" meshes that, nevertheless, keep the sensitivity of the computed data to a variation of the blade shape. It is also shown that the impeller power characteristics can be estimated using their values averaged over the working range of the air flow rate through the impeller. The validity of this approach is confirmed by calculating on a fine mesh the power characteristics of an impeller with blades of a standard shape and a shape changed by the introduction of an offset. The results of this study may be used in the aerodynamic optimization of the 3D shape of compressor stator and rotor blades.

Keywords: *tangential offset of blades, compressor stage impeller, numerical simulation, uniformly distributed sequence, power characteristics.*

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