Selection of blade geometry for aero engine turbine, based on modal analysis

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Abstract:

Within industrial practice, works are carried out to optimize the shape of flow channels and the shape of blades in terms of improving their aerodynamic parameters. There are no studies for the problem of improving the strength of blades and other turbine components by optimizing their shape. Complicated and lengthy process of blade design that is the reason. Both the parametrization of the geometric model and optimization by use traditional methods is difficult and time consuming. Presented state of affairs means that application research focused on the development of design methods and selection of appropriate blade geometry, taking into account the physical phenomena whose accompany them during nominal work, is need to conducted.

The paper presents the methodology of blade geometry selection taking into account the modal frequencies. A CAD 3D numerical model of turbine blade of a 45-90 kN turbine engine, which is used for regional and business aircraft, was developed. The article presents an attempts to develop for a methodology of geometry selection for lower turbine blade platform based on analyzing displacements resulting from vibrations. Solution for geometry selection was developed to improve the frequency characteristics of the blade lock shelf, based on adopted preliminary conditions. One iteration of the change of structure for lower platform was carried out. It allowed to asset that the presented methodology was developed correctly.

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