

Abstract

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evaluation of different turbulence models numerical solvers for a transonic turbine blade cascade

the gas path over the turbine blades is a very complex flow field due to the variation of flow regime the corresponding heat transfer, this investigation is devoted to study the two three-dimensional predictive modeling capability for airfoil external heat transfer by using pressure based solver pbs density based solver dbs. the results show the effects of strong secondary vortices, laminar-to-turbulent transition, also show stagnation region characteristics. simulations were performed on an irregular quadratic grid with the fluent 6.3 software package which solves the rans equations by using finite volume methods with second order accuracy. data were obtained for the exit reynolds numbers equal the facility maximum point of 2.50×10^6 , including the blade aspect ratio of 1.17. it has been concluded in particular that rather fine computational three dimensional grids are needed to get accurate local heat transfer controlled by complex 3d structure of secondary flows. results of numerical simulation of the two three-dimensional turbulent flow heat transfer in a transonic turbine cascade are presented. employing several turbulence models (spalart allmaras, rng k- ϵ sst k- ω model). detailed heat transfer predictions are given for a power generation turbine rotor with 127 deg of nominal turning an axial chord of 130 mm with highly three-dimensional blade passage flows that resulted from the high flow turning flow boundary layer with highly three-dimensional blade passage flows that resulted from the high flow turning flow boundary layer. the comparison was made with the experimental the numerical results of giel colleagues [1] a good agreement was found with the density based solvers spalart allmaras turbulent model.