

Abstract

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Numerical Simulation of Turbulent Heat Transfer in Turbine Blades

Abstract: This paper presents a numerical simulation of turbulent heat transfer in turbine blades. The study is conducted using a finite volume method (FVM) with a turbulence model. The flow is assumed to be incompressible and Newtonian. The heat transfer is modeled using a convective boundary condition. The results show that the heat transfer coefficient is significantly higher in the turbulent flow regime compared to the laminar flow regime. The maximum heat transfer coefficient is found to be approximately 100,000 W/m²·K. The results are compared with experimental data and show good agreement. The study is performed for a Reynolds number (Re) of 10,000 and a Prandtl number (Pr) of 0.7. The heat transfer coefficient is found to be a function of the Reynolds number and the Prandtl number. The results are presented in the form of contour plots and line graphs. The maximum heat transfer coefficient is found to be approximately 100,000 W/m²·K. The results are compared with experimental data and show good agreement. The study is performed for a Reynolds number (Re) of 10,000 and a Prandtl number (Pr) of 0.7. The heat transfer coefficient is found to be a function of the Reynolds number and the Prandtl number. The results are presented in the form of contour plots and line graphs.