

Numerical Investigation of Heat Transfer Characteristics of Different Rib Shapes in a Gas Turbine Blade

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Abstract : The heat transfer and friction loss performances of a single rib-roughened rectangular cooling channel having four novel rib shapes were evaluated through numerical investigation using Ansys CFX. The investigation was conducted on a rectangular channel of aspect ratio (AR) = 4:1 with rib height to hydraulic diameter ratio (e/D_h) of 0.1 and rib pitch to height ratio (e/P) of 10 at $Re = 30,000$. The computations were performed by solving the RANS equation using $k-\epsilon$ turbulence model. Fluid flow simulation results of stationery case for different configuration are presented in terms of thermal performance parameter, Nusselt number and friction factor. These parameters indicate that a particular configuration of novel shaped ribs provides better heat transfer characteristics over the conventional 45° ribs. The numerical investigation undertaken in this study indicates an increase in overall efficiency of gas turbine due to increased thermal performance parameter, heat transfer co-efficient and less pumping pressure.

Keywords : gas turbine, rib shapes, nusselt number, thermal performance parameter

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