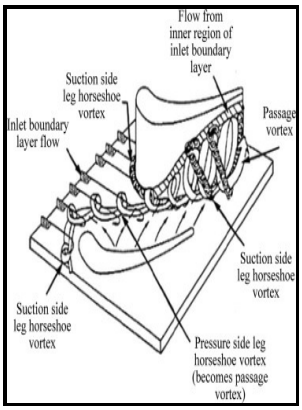
Interaction mechanisms between tip leakage flow and the passage vortex in a linear turbine rotor cascade

National Aerospace Laboratory - Interaction Between Inlet Boundary Layer, Tip



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Effect of Triangular Grooved Tip on Blade Tip Region Heat Transfer

Yaras, Zhu YingKang, and S. To study the effect of the triangular grooved tip shape, five triangular grooved tips were designed by changing the relative apex location of the triangular groove.

Aerodynamic Interaction Between an Incoming Vortex and Tip Leakage Flow in a Turbine Cascade

Experimental study of endwall and tip clearance flows in a two - dimensional turbine rotor blade cascade - effect of incidence angle. Other traverses were also performed of the tip-casing endwall flows both inside and outside the tip-clearance gap using a micro five-hole pitot tube to reveal the axial development of the interaction throughout the cascade passage. In the numerical study, a Rankine-like vortex was defined at the inlet of the computational domain to simulate the incoming swirling vortex SV.

Effects of turbine blade tip shape on total pressure loss and secondary flow of a linear turbine cascade

Numerical computations were conducted for a total of six tip shapes, including a squealer tip.

Aerodynamic Interaction Between an Incoming Vortex and Tip Leakage Flow in a Turbine Cascade

Due to area contraction caused by the tip separation vortex, the fluid moving towards the tip gap from the pressure side is accelerated. The discharge coefficient and the total pressure loss coefficient within the tip gap show similar tendency with lower values near the leading and trailing edge regions.

Effects of upstream Rankine vortex on tip leakage vortex breakdown in a subsonic turbine

The leakage vortex breakdown was almost the same as that in the uniform inlet case. In order to understand the flow physics of this vortices interaction, the effects of incoming vortex on the downstream tip leakage flow are investigated by experimental, numerical, and analytical methods.

Effects of turbine blade tip shape on total pressure loss and secondary flow of a linear turbine cascade

The pressure gradient from the pressure side to the suction side is greatly decreased for the grooved tip, and the resulting leakage flow is weaker.

Effects of upstream Rankine vortex on tip leakage vortex breakdown in a subsonic turbine

The suction side squealer tip and grooved tip can effectively decrease the intensity of the tip leakage vortex, improve the flow capacity and reduce loss of the turbine cascade passage and the grooved tip performs the best. The leakage vortex induces aerodynamics losses and a high heat transfer coefficient on the suction side of the near blade tip region. Based on a carefully defined blockage extracting method, the variations of blockage parameter inside the blade passage were analyzed.

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