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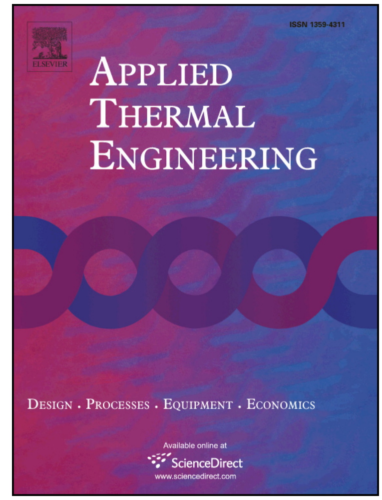

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Xiaojun Fan, Changhe Du, Liang Li, Sen Li

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Xiaojun Fan, Changhe Du, Liang Li*, and Sen Li

Institute of Turbomachinery, Xi'an Jiaotong University, Xi'an 710049, China

*Corresponding author: Liang Li, Institute of Turbomachinery, Xi'an Jiaotong University, Xi'an 710049, People's Republic of China

Email: liliang@mail.xjtu.edu.cn

Abstract

The vortex chamber model with film holes is established to investigate the effect of film holes on vortex cooling in gas turbine blade leading edge. The 3D viscous steady Reynolds Averaged Navier-Stokes (RANS) equations and the standard *k*-*ω* model are utilized for numerical computation. Results show that the existence of film holes has a strong disturbance on the internal flow, which increases the upstream velocity of film holes and decreases the downstream velocity. Meanwhile, the heat transfer intensity is enhanced by 5.2% compared to the case without film holes. The pressure coefficient presents a fluctuant decrease for all cases. However, an increase in circumferential angle contributes to a decrease in pressure coefficient. The circumferential angle at 90° is the most suitable considering both average heat transfer coefficient and Nusselt number distribution. When the diameter ratio of film holes increases to 0.1, it has the highest heat transfer intensity. As the mass flow of film holes increases, the mainstream velocity, the averaged pressure coefficient C_{ps} and the globally averaged Nusselt number Nu_a will decrease.

Keywords

Vortex cooling, film hole, circumferential angle, diameter ratio, mass flow