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ORIGINAL ARTICLE

Film cooling modeling of a gas turbine blade by considering different injection holes with and without opening angles through CFD

E. Hosseini[1]

[1] Department of Mechanical Engineering, Dezful Branch, Islamic Azad University, Dezful, Iran

ABSTRACT – One way to achieve high performance in the gas turbine is to increase the inlet temperature of the turbine. Different cooling techniques have been carried out in order to protect the turbine blades which have been exposed to such high temperatures. Film cooling as an essential cooling method needs to be enhanced to meet the challenging demand. The purpose of the present research is to analyze the film cooling performance over a NACA 0012 gas turbine blade using six different injection holes with and without opening angles, separately through Computational Fluid Dynamics (CFD). 2D Reynolds-Averaged Navier-Stokes (RANS) equations are implemented to consider the heat transfer and flow characteristics by using CFD code Ansys Fluent v16. The flow is considered as steady, turbulent, and incompressible. The RANS equation is solved with the finite-volume method for obtaining solutions. The simulation results revealed that the k-ω SST turbulence model is suitable for simulating the flow characteristics and analyzing the performance of film cooling over the blade. Also, the opening angle has a significant effect on increasing the cooling efficiency for the upper blade surface. The highest value of cooling efficiency is obtained by the injection hole with an opening angle of 15° and height of D. In this configuration, the coolant injected from hole provides better cooling coverage for the entire blade which increases the cooling effectiveness.

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Retraction Notice:

JMES editorial team takes integrity matters seriously and would not allow any manipulation of scientific articles. We would like to apologise to JMES readers for any inconvenience caused by this retraction. Please contact the editor in chief for more info.

*CORRESPONDING AUTHOR | E. Hosseini | ✉ ebrahim.2019.hosseini@gmail.com