World Academy of Science, Engineering and Technology
International Journal of Mechanical and Industrial Engineering
Vol:8, No:08, 2014

CFD Simulation on Gas Turbine Blade and Effect of Twisted Hole Shape on Film Cooling Effectiveness

Authors : Thulodin Mat Lazim, Aminuddin Saat, Ammar Fakhir Abdulwahid, Zaid Sattar Kareem

Abstract : Film cooling is one of the cooling systems investigated for the application to gas turbine blades. Gas turbines use film cooling in addition to turbulence internal cooling to protect the blades outer surface from hot gases. The present study concentrates on the numerical investigation of film cooling performance for a row of twisted cylindrical holes in modern turbine blade. The adiabatic film effectiveness and the heat transfer coefficient are determined numerical on a flat plate downstream of a row of inclined different cross section area hole exit by using Computational Fluid Dynamics (CFD). The swirling motion of the film coolant was induced the twisted angle of film cooling holes, which inclined an angle of α toward the vertical direction and surface of blade turbine. The holes angle α of the impingement mainstream was changed from 90°, 65°, 45°, 30° and 20°. The film cooling effectiveness on surface of blade turbine wall was measured by using 3D Computational Fluid Dynamics (CFD). Results showed that the effectiveness of rectangular twisted hole has the effectiveness among other cross section area of the hole at blowing ratio (0.5, 1, 1.5 and 2).

Keywords : turbine blade cooling, film cooling, geometry shape of hole, turbulent flow
Conference Title : ICMPE 2014 : International Conference on Mechanical and Production Engineering
Conference Location : Kuala Lumpur, Malaysia
Conference Dates : August 25-26, 2014