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Numerical investigation of the flow in gas turbine blade trailing edge internal cooling passages JAEHYUN RYU, WONTAE HWANG, Seoul National University — Gas turbine blades operate at very high temperatures, often beyond material limits. Internal and external cooling enable the blade to survive these extreme temperatures. The trailing edge of the blade is designed to be sharp for high aerodynamic efficiency, but this makes internal convective cooling poor at the corner. The effect of ribs was assessed in a right triangle channel containing a sharp corner, representing a simplified trailing edge. First, 45 angled ribs on the pressure and suction side walls were investigated. The Reynolds-averaged Navier-Stokes (RANS) results show fairly good agreement with previous results from magnetic resonance velocimetry (MRV) and large eddy simulation (LES). Different turbulence models were assessed, and the baseline explicit algebraic Reynolds stress model (BSL EARSM) was adequate in capturing the flow structure. Next, we optimized rib geometry via design of experiments (DOE), by changing the rib height to channel height ratio and rib angle. 3-level full factorial design (FFD) was used to determine the DOE points. Streamwise flow velocity at the sharp corner and friction factor were set as objective functions. The corner flow velocity increases as the rib is angled less toward the flow, at the penalty of an increase in friction factor.

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