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Pin-fin shape and orientation effects on heat transfer and fluid flow in gas turbine blade

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Gas turbine blades are usually exposed to a hot gas environment. Thus, it is essential to apply effective cooling technique to extend the blade lifetime. Turbine blades employ wedge-shaped channels for trailing edge internal cooling. Many experimental and numerical studies have been conducted on the heat transfer and flow structures in a wedge-shaped channel. In this work, we focused on a prototype based on laminar flow and wall heat transfer characteristics inside a blade trailing-edge. The numerical simulation was given by the thermal Lattice Boltzmann Method. A validation code was achieved by our previous research. In this study, five baseline configurations were used. These configurations were obtained by varying the shape and orientation against the incoming airflow. They presented a similar layout with five-row pin-fins in the main coolant region and one-row fillet circular pin-fin in the exit region. As a result, we found that the pin-fin shape and its orientation have considerable effects on the wall heat transfer proprieties. Indeed, some factors, such as higher heat transfer coefficient and pressure loss, depend on the rotation of the pin-fin.

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Time Block A (09:00-12:00 CET)

Participation

Online

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