CONJUGATE HEAT TRANSFER INVESTIGATION OF RIB-ROUGHENED COOLING CHANNELS

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This experimental work deals with the analysis of the conjugate thermal performance of a metallic scaled model of a turbine blade rib-roughened internal cooling channel.

A new experimental set-up is designed and built. This experiment is characterised by the particularity of the physical boundary conditions imposed, namely a constant heat flux along the bottom of the investigated ribbed metallic wall. This thermal problem is classified as conjugate: the main heat transfer phenomena, conduction and convection, are coupled.

The Infrared Thermography technique is applied to measure the temperature distribution on top of the metallic wall ribbed surface.

A numerical approach is used to calculate the heat transfer coefficient along the top ribbed surface of the channel. A commercial code, FLUENT, is used to solve the energy equation starting from the measured boundary conditions. The wall heat flux is computed from the numerical results. The numerical domain used for the computation is created and meshed with GAMBIT. A deep investigation is performed testing a set of numerical domains and determining the most appropriate.

A complete view of the conjugate heat transfer on the investigate geometry is obtained, analysed and compared with previous experimental data Fig.(1-2).

Flow measurements complete the characterisation of the investigated phenomenon.

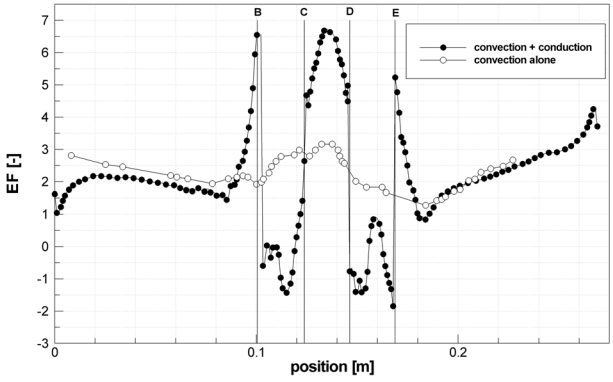

Figure 1: Enhancement factor

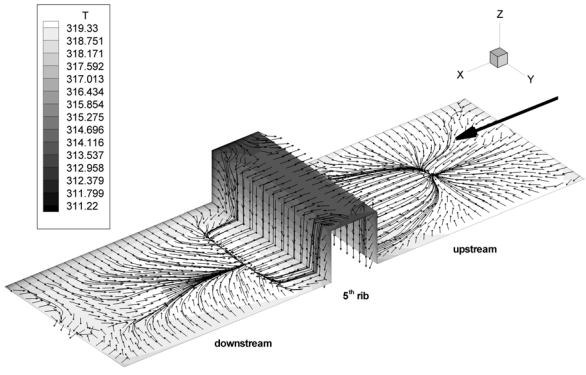

Figure 2: Temperature [K] vs. gradient