INVESTIGATION OF THE TIP GAP REGION OF A TURBINE BLADE

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In a turbine, blades rotate close to a stationary peripheral wall. The pressure difference between pressure and suction side induces a flow over the tip of the blade. This tip leakage flow is detrimental to the stage performance. Combined with the reduced aerodynamic performance of the blade, higher thermal loading and increased heat transfer rates near the tip occur as well. The objective is to investigate and understand this flow phenomena, for compressible flow conditions ($M_{2,is}$ = 0,9 ... 1,15 and $Re_{2,is}$ = 450000 ... 900000).

A literature survey indicated that almost all existing papers were related to incompressible flow conditions. Until now, no detailed experiment was done in compressible flow conditions. The effects of compressibility to the tip clearance phenomena are still unknown. Experiments will be conducted on a linear cascade containing 4 flat tip blades in the CT-2 facility. The blades are fixed as well as the endwall (no relative wall motion). In parallel with the experiments, numerical simulations were carried out; 2D, 3D and 3D computations with tip gap were performed to make a thorough comparison and understand the effects of the presence of this tip gap. The modelling of the tip gap needed special attention. A typical result is shown in the figure below, demonstrating the blade unloading close to the tip.