



COLLOQUIUM

In accordance with article 4.6.8 of the SSNS-wb.

Group: Engineering Fluid Dynamics

As part of his MSc thesis assignment

Mike Koopmans

will give a presentation, entitled:

Impact of Tip Leakage Flow on Performance of a Radial Inflow Gas Turbine

Date: Friday June 18, 2010

Time: 14.00 hr

Room: Horst C 101

Summary:

Leakage flows in gas turbines are a major source of performance loss. These leakage flows often arise due to clearances between rotating and stationary parts. Due to the complexity of the flow through a gas turbine, the impact of leakage flows on gas turbine performance is difficult to determine. In the present numerical investigation the tip leakage flow in the nozzle guide vanes and turbine rotor of a radial inflow gas turbine have been investigated. In order to assess the impact of leakage flow on the isentropic efficiency of the gas turbine, geometries with varying clearances have been considered.

Employing ANSYS CFX, the Reynolds-averaged Navier-Stokes (RANS) equations, in combination with the SST k- ω turbulence model, were solved on a multiblock structured grid. For the basis configuration the results show a good match with available experimental test data: the differences between numerical results and experimental data are less than 5% for both the nozzle guide vane and the turbine rotor.

The numerical simulations show that reducing the clearances in both parts of the gas turbine, the amount of leakage flow is significantly reduced and the isentropic efficiency is increased. The investigation also showed that injecting cooling flow in the turbine rotor the vortex, that is formed by the leakage flow, is significantly reduced.

Assessment committee:

Prof.dr.ir. H.W.M. Hoeijmakers (chairman)
Dr.ir. E.T.A. van der Weide (mentor)
Prof.dr.ir. T.H. van der Meer
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