



COLLOQUIUM

In accordance with article 4.6.8 of the SSNS-wb.

Group: Engineering Fluid Dynamics

As part of his MSc thesis assignment

Remco Bernardus Nicolaas Bod

will give a presentation, entitled:

Characteristics of Flow over Enclosed Rotating Disk A Numerical Approach of Analyzing Thrust Disk of Sealless Compressor Unit

Date: Friday June 24, 2011

Time: 14.00

Room: Horst C101

Summary:

SIEMENS develops a sealless gas compressor concept which comprises compressor, electric motor and active magnetic bearing technology integrated in a single casing. In the bearing heat is generated due to friction in narrow clearance gaps (typically 1 to 1.5 mm), specifically the ones between the rotating disk and its stationary enclosure. To prevent an excessive temperature rise cooling is required. To remove heat a pressurized gas stream is taken from the first stage of the compressor and is led to the areas where cooling is required and subsequently re-injected in the inlet gas stream.

For the overall compressor performance flow distribution as well as heat generation is of prime importance. The cooling gas stream contributes significantly to the compressor overall losses and should be minimized without compromising machine operation and reliability. Therefore suitable models are required particularly for the flow through the bearing. Such models will enable improvements in the design of the machine.

The present study, performed at SIEMENS Hengelo, presents the development of a suitable model for the cooling flow through the active magnetic thrust bearing. For this ANSYS ICEM is used to define the geometry and to create the computational mesh. ANSYS CFX is employed to perform the flow simulations. In these simulations process conditions and geometric parameters are varied to determine design-rule type of relations that can be used to predict the heat development in the gap between the rotating disk and the stationary enclosure. These relationships can be integrated in the existing general simulation procedure for predicting compressor performance and the required cooling flow.

Assessment committee:

prof.dr.ir. H.W.M. Hoeijmakers (chairman/mentor)
ir. G. de Boer (mentor)
ir. J.J. Slot (mentor)
prof.dr.ir. T.H. van der Meer
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