Leibniz Universität Hannover

Institut für Turbomaschinen und Fluid-Dynamik

Bachelor/Project/Master Thesis

Numerical Investigation of the Influence of Support Struts on a Multi-stage Axial Compressor

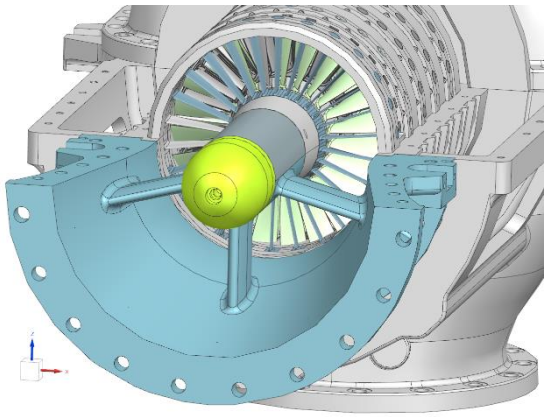

Fig. 1: Support struts in the inlet of the multi-stage axial compressor

Background:

The high-speed axial compressor at the Institute of Turbomachinery and Fluid Dynamics (TFD) is characterized by its realistic, transonic flow conditions. The test rig is used for numerous experimental investigations such as active and passive measures to reduce secondary flow losses or to validate new numerical models for flow simulations.

In the test rig, there are several support struts located directly in front of the inlet of the compressor, as shown in Fig. 1. However, as the support struts are only located in the upper half of the inlet duct, their effect on the flow is also locally limited. In order to be able to capture this effect accurately, it is necessary to model at least the first stage of the compressor as a 360° model. This increases the computational effort significantly, which is why the support struts are neglected for most numerical investigations.

The aim of this thesis is to numerically investigate and quantify the influence of the support struts on the flow in the compressor. For this purpose, several unsteady full-annulus simulations of the compressor are carried out at different operating points, evaluated and finally compared with experimental data.

Tasks:

- Familiarization with computational fluid dynamics and the CFD solver TRACE
- Meshing of the inlet area and the support struts
- Performing unsteady full-annulus simulations of the compressor and inlet duct on the university's computing cluster
- Statistical evaluation of the results

Your Profile:

- Interested in fluid mechanics, turbomachinery and numerical methods
- Previous knowledge of numerical fluid mechanics, the use of commercial flow solvers and the creation of computational meshes is an advantage
- Good knowledge of English and German

Contact Person:

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