

Master's Thesis

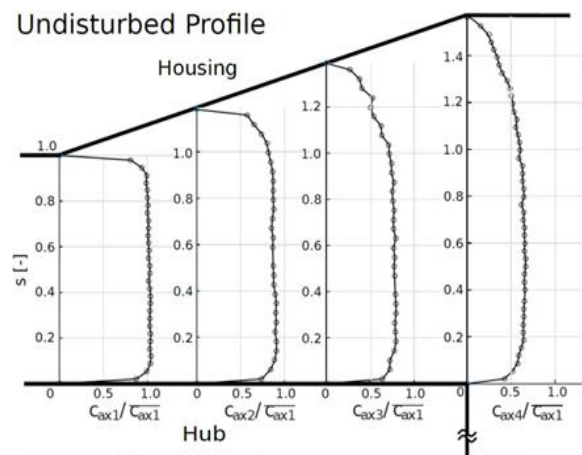
Simulation-based optimization of annular diffusers

Research Group and Project

The objects of the "Institute of Fluid Machinery (FSM)" are mainly to improve the understanding of hydraulic fluid machinery and thus increase efficiency, reduce noise emissions and enhance durability. One of the research topics is the development of an improved diffuser-silencer configuration. For this purpose we are conducting fundamental research regarding flows at adverse pressure gradient and diffuser design. In the offered project a geometry optimization of an annular diffuser should be conducted in order to reduce total pressure drop and improve flow stability.

Topic

Flows in divergent sections are likely to separate depending on the adverse pressure gradient. There is a strong dependence of flow separation on inflow profile, turbulence intensity and opening angle of the geometry. Aim of this work is to develop a diffuser geometry fulfilling a stability criterion using a modified wall-shear-stress. Therefore tools for mesh generation, flow simulation and optimization have to be coupled. The preferred tools are ICEM (mesh generation), OpenFOAM (flow simulation) and Matlab (optimization and coupling).



Definition of the Project (modifications are possible)

- Familiarization with adverse-pressure-gradient flows
- Familiarization with computational fluid dynamics (CFD)
- Coupling of tools
- Calculation of improved diffuser design
- Investigation of diffuser at different inflow conditions

Requirements

- Student in the field of mechanical engineering
- Experience with numerical tools (preferable)
- Knowledge about fluid dynamics and fluid machinery

Supervision

Johannes Walter

walter@kit.edu / Tel.: 0721 608-42369 / Kaiser-Str. 12 / 76131 Karlsruhe