

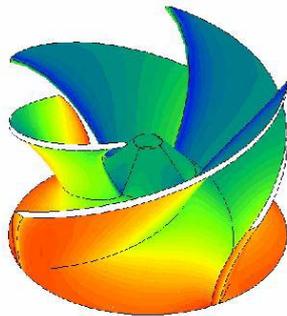
# Engineering Fluid Dynamics

Research of the Group *Engineering Fluid Dynamics* deals with theoretical, numerical and experimental studies, all aimed for applications in Mechanical Engineering.

In particular, research focuses on the fields listed below.

## Rotating flow machines

The flow in centrifugal pumps and around wind turbine blades is studied experimentally and numerically, with the objective of developing methods for predicting the performance of these machines (such as head, efficiency, cavitation characteristics for pumps and generated power for turbines), and thus developing tools for improving the design of such machines. A rotating test-rig has been developed for experimental studies of the flows in impeller channels.



## Aero-acoustics

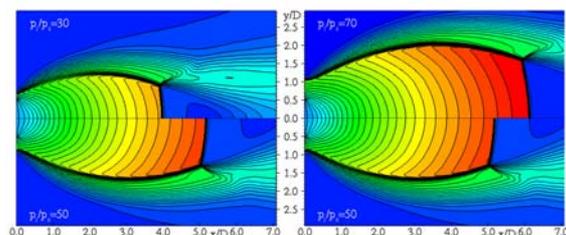
In Computational Aero-acoustics finite-element methods are developed for computing sound propagation in fluids. The capabilities of these methods are analysed mathematically.

Within the field of Experimental Aero-acoustics we study the generation of sound by objects.

Furthermore, acoustics in two-phase flows are studied theoretically.

## Aerodynamics, gasdynamics and flows with phase transitions

Models and computational methods are developed for high-speed condensing flows of mixtures of gases and liquids in complex



geometries. Attention is focused on slipping droplets in turbulent flow and on droplet radius distributions.

Further work deals with cavitating flows and the development of computational methods for determining such flows.

## Fluid-structure interaction and aero-elasticity

Research on fluid-structure focuses on flow-induced vibrations of compressor valves and on the unsteady motion of bluff bodies, in particular of gas bubbles and solid spheres, induced by vortex shedding. Both numerical and experimental investigations are conducted.

## Thin-film flows

The flow in narrow domains under extreme conditions between deforming surfaces is studied theoretically and experimentally. A typical example is the lubricant film in roller bearings (Elasto-Hydrodynamic Lubrication). The theoretical research involves modelling, development of efficient numerical solution algorithms, and the use of these solvers to obtain general design rules for practical use. The experimental research involves validation of the predictions and the study of grease lubrication phenomena.

## Bio-physical flows

This research deals with the flow in and out of lungs. In particular, the flow-induced deformation of the elastic tubes is studied. Research is aimed at developing new diagnostic and therapeutic tools.

