

## Ansys + ITSM

The Institute of Thermal Turbomachinery (ITSM) at the University of Stuttgart Uses Ansys Simulations to Teach Engineering Students About Turbomachines

*"Because simulation software is used widely in industry it is so important that students are graduating with a strong skillset in using it effectively. However, it's equally important that students understand the underlying physics principles. By teaching using simulation to showcase physics principles and ensuring engineers are walking away with both a foundational understanding of the how and the advanced skillset of using super sophisticated tools like Ansys CFX they will make the greatest impact in their careers. That's why I use the combination of simulation software tools paired with the very traditional, down-to-earth basics of physics in my turbomachinery courses."*

**Prof. Tekn. Dr. Damian Vogt**  
Institute Director / ITSM, University of Stuttgart

Our overall task at ITSM is to educate engineers who are in a position to independently judge whether something they analyze or engineer is correct or not. They must be able to apply basic principles to work out for themselves whether a design or a solution is plausible.

## / CHALLENGES

- Demonstrate the basics of turbomachinery operation to new college level engineering students
- Teach advanced concepts like turbomachinery blade vibrations to advanced engineering students
- Provide a tool that students can use in their projects to simulate aerodynamics, structural dynamics and fluid-structure interaction

## / TECHNOLOGY USED

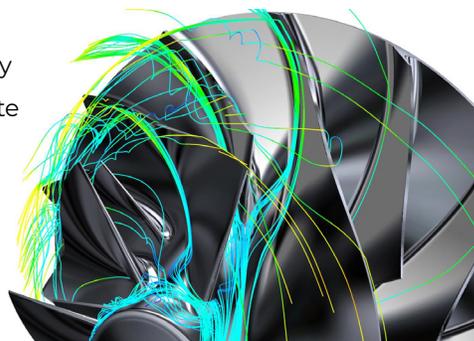
- Ansys CFX
- Ansys Mechanical

## / ENGINEERING SOLUTION

In introductory courses, we use Ansys CFX to show students the flow in a turbomachine for the first time using animated videos of rotating blade rows. By visualizing the flow in a blade-to-blade plane, the students learn about flow unsteadiness and the blade row interaction. In advanced courses, we use CFX to help the students analyze the phenomenon of blade vibration, which is critical to the operation of a turbomachine. In their projects, the students must use CFX and Ansys Mechanical to do everything from mesh generation, setting up and running a simulation to solve steady and unsteady solutions, and interpreting the results afterwards.

## / BENEFITS

Using Ansys simulation as a tool to teach students the basics of turbomachinery adds the “wow” factor we are looking for to excite their interest in the subject. Showing them videos of simulations is an attractive and inspiring way to give them insight into the basic physics of the process. As they proceed through more advanced courses, they learn to use these physics principles to evaluate the results of simulation studies. They learn to use their own insights to check the plausibility of results provided by software packages, and not just accept the results at face value.



Visualization of 3D streamlines in a centrifugal compressor impeller

## / COMPANY DESCRIPTION

ITSM is a place of teaching and research as well as a meeting point between industry and the academic world. In our research we deal with gas turbines, steam turbines and turbochargers that are of great importance for our society today, in areas such as electricity generation and transport. We teach a portfolio of courses in "Thermal Turbomachinery" as well as general training for mechanical engineering students in measurement technology.

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