

Ansys + ITSM

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

"Many students have an infinite trust in software tools. In most cases the software costs a lot so they think whatever comes out must be correct. But you have to do a sanity check on the results even if the tool is super sophisticated like Ansys CFX. 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 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. They can visualize the flow in a blade-to-blade plane to see the unsteady interaction, the blade row interaction and the turbine and compressor status. 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 simulations 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.

/ 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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