

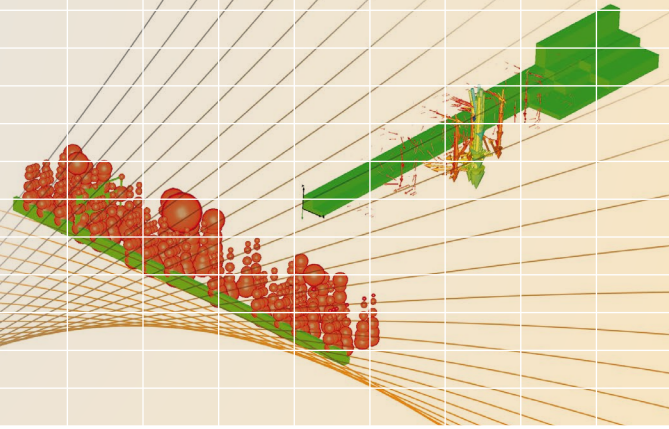
FluidDynamics Library – 3D Automotive Cabin Models

3D Modelling of Cabins and Air-Conditioning Systems within One Single Simulation Environ- ment

The FluidDynamics library realizes **CFD-simulations with Modelica language** and provides standard interfaces to 1D-Modelica-models for a seamless connection.

The FluidDynamics library allows the modelling and simulation of gas flows, such as humid air, in three-dimensional spaces. Dynamically changing boundary conditions can be defined locally. Moreover, dynamic wall and window models can be connected. The maximum resolution of the cubic grid depends on the capacity of the computer hardware and is typically limited to about 1000 - 2000 cells. Larger spaces can even be modelled through the definition of symmetry boundary conditions.

- > **Dramatically reduced license costs** by using less expensive Modelica simulators
- > **Obsolete middleware for coupling** since CFD models are part of the Modelica model
- > **Instant simulation success** since convergence is automatically controlled by the solver
- > **Full Modelica flexibility** since the model code is open and transparent, user modifications can be introduced and the tool has more options for symbolic transformation
- > **Geometry-dependent gas dynamics** by using Navier-Stokes-equations



Calculation of air flows using Navier-Stokes equations in Modelica language

The FluidDynamics library makes costly, time-consuming co-simulation of CFD and system simulation redundant



The FluidDynamics library enables the user to carry out three-dimensional flow simulations coupled, for example, with an air-conditioning system simultaneously in one single simulation environment. Expensive coupling software is no longer necessary. The pre- and post-processing is realized in the Score lite Excel Add-in, which is shipped with the FluidDynamics library. The process of grid generation is simplified so that no explicit knowledge in this complex field is needed.

Dynamic Weather Data

Automatically generated boundary conditions converted from weather data

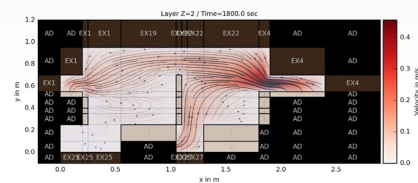
The Weather package imports your weather data and converts it automatically into boundary conditions for the simulation:

- > Simulation of cruise profiles
- > Changing sun positions
- > The effect of cloud coverage on the air-conditioning system

Coarse - Grid CFD

3D Flow Simulation in Modelica

The coarse grid CFD approach is completely implemented in Modelica language. The model code is open and transparent. Using the standard interfaces, the CFD model can be easily connected to 1D models in the same simulation environment. With the Excel-Add-In XRG Score lite, which is shipped with the FluidDynamics Library, no additional meshing or post-processing tool is required.



Ready-To-Use

Pre-defined cabin models

Minimized modelling efforts by taking advantage of the ready-to-use and re-usable cabin models with differing levels of detail:

- + Instant results even for non-experts