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Simcenter 3D Advanced Flow

Extend flow analysis solutions

Benefits

- Extend flow solution capabilities in Simcenter 3D Flow and Simcenter 3D Electronic Systems Cooling
- Speed solution time through parallel flow calculations
- Reduce costly physical prototypes by using flow simulation to understand product performance
- Gain further insight through coupled thermo-fluid multiphysics analysis using Simcenter 3D Advanced Flow with Simcenter 3D Thermal or Simcenter 3D Advanced Thermal
- Achieve faster CFD results through a consistent environment that allows you to quickly move from design to advanced CFD results
- Track the interface between two fluids in a sloshing problem
- Couple 1D to 3D flow submodels to simulate complex systems

Summary

Simcenter™ 3D Advanced Flow software is a powerful and comprehensive solution for computational fluid dynamics (CFD) problems. Simcenter 3D Advanced Flow is an add-on module to both Simcenter 3D Flow and Simcenter 3D Electronic Systems Cooling that extends the flow simulation capabilities of these products to include internal or external fluid flow including compressible and high-speed flows, non-Newtonian fluids, tracking of heavy particles, and multiple rotating frames of reference. Combined with Simcenter 3D Thermal and Simcenter 3D Advanced Thermal, Simcenter 3D Advanced Flow solves a wide range of multiphysics scenarios involving strong coupling of fluid flow and heat transfer.

Simcenter 3D Advanced Flow enables you to model and simulate complex fluid flow problems through an element-based, finite volume CFD scheme used to compute 3D fluid velocity, temperature and pressure by solving the Navier-Stokes equations. Applications of Simcenter 3D Advanced Flow include:

- Simulation of fluid movement in a moving container (liquid filling and sloshing)
- Simulation of automotive underhood cooling
- Flow and thermal comfort analysis for HVAC systems
- Modeling high-speed compressible flows
- Simulation of rotating equipment
- Simulation of non-Newtonian fluid flow

Simcenter 3D Advanced Flow features

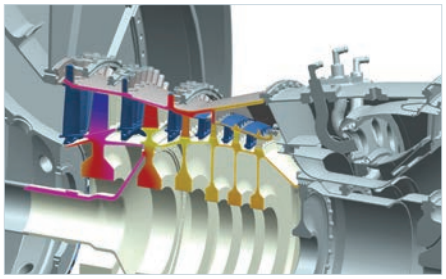
Solver capabilities

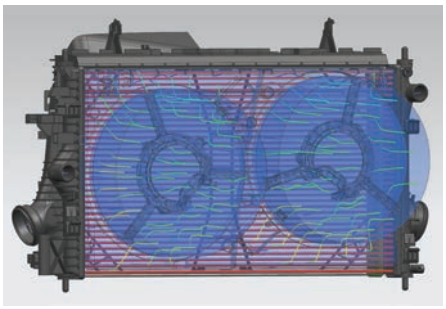
Simcenter 3D Advanced Flow adds the following capabilities to Simcenter 3D Flow:

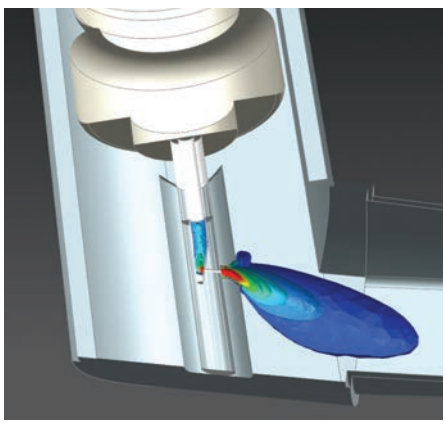
- Single and multiple rotating frames of reference
- Additional turbulence models such as SST, k-Omega and LES
- High-speed flows with supersonic inlet
- General scalars diffusion and heavy particle dynamics tracking
- Humidity and condensation algorithm
- Non-Newtonian fluid models
- Translational and rotational periodicity
- 1D duct flow coupled with 3D flow
- Implicit convection correlations to ambient conditions
- Mixing plane boundary condition
- Two-phase, immiscible fluid flow for sloshing applications
- Multi-species filling (and emptying) and open volume enclosures within the fluid domain
- High Knudsen number (slip) flow

Simcenter 3D Advanced Flow

- Parallel computing with up to eight solver processes on a single machine
- Unlimited-process parallel computing with Simcenter 3D Thermal/Flow DMP add-on
- Fully coupled pressure-velocity scheme applied in parallel solver mode
- Semi-implicit, second-order time integration methods for use in conjunction with LES turbulence model
- Second-order central differencing scheme







Add-on results postprocessing options

- Mach number
- Humidity and condensation data
- Scalars distribution data
- Additional turbulence data
- Tracking of heavy particles
- PPD-percentage people dissatisfied (HVAC applications)
- Specialized outputs for non-Newtonian fluids
- Shear rate/dynamic viscosity output for non-Newtonian fluids
- PMV-predicted mean vote (HVAC applications)
- Track and plot flow data on specific regions at run time

Acoustic power density result option

Fluid-thermal multiphysics

Simcenter 3D Advanced Flow seamlessly couples with Simcenter 3D Thermal and Simcenter 3D Advanced Thermal for simulation of complex thermo-fluid interactions and conjugate heat transfer. The thermo-fluid solver handles disjoint meshes at fluid/solid boundaries allowing great flexibility in assembly context thermo-fluid interactions. The fluid domain and thermal domain do not need to share nodes at the interface; the coupled solver will create the appropriate heat transfer coupling at all the solid/fluid interfaces.

Fluid-structural coupling

Pressure and shear force results from the Simcenter 3D Flow solution can be used as a pre-stress condition for a structural analysis. The NX™ Nastran® license is sold separately.

Supported hardware/OS

Simcenter 3D Advanced Flow is an add-on module to Simcenter 3D Engineering Desktop. It requires either a license of Simcenter 3D Flow or Simcenter 3D Electronic Systems Cooling as a prerequisite. Simcenter 3D Advanced Flow is available on the same supported hardware platforms as Simcenter 3D Engineering Desktop. Contact Siemens PLM Software for for any other specific hardware/OS support requests.

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