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Simcenter 3D Flow

Simulating fluid flow for complex parts and assemblies

Benefits

- Solve the Navier-Stokes equations that describe fluid motion
- Reduce costly physical prototypes by simulating fluid flow in a virtual environment
- Increase product quality by rapidly simulating design tradeoff studies
- Integrate Simcenter 3D Flow with the the Simcenter 3D platform to streamline simulation processes by 70 percent
- Easily add multidiscipline simulation capabilities as your analysis needs grow

Summary
Simcenter™ 3D Flow software is a computational fluid dynamics (CFD) add-on solution that is fully integrated into Simcenter 3D Engineering Desktop and Simcenter 3D Structures. It provides sophisticated tools to model and simulate fluid flow for complex parts and assemblies. The integrated CFD solution enables fast and accurate fluid flow simulation and provides insight into product performance during all design development phases, limiting costly, time-consuming physical testing cycles. Simcenter 3D Flow simulation solutions are applicable across a wide range of industries, including aerospace and defense, automotive, consumer products, electronics and semiconductors, medical and energy.

Simulating with reliable and robust CFD solver technology
From the gust of air that pushes a sailboat to the hot exhaust exiting an automobile's tailpipe to the burst of medication issuing from the nozzle of an oral inhalation device, fluid dynamics are an essential and inextricable part of everyday life. The flow of gases and liquids can be crucial to both the functionality and viability of a product. Therefore, CFD analysis is a major engineering consideration. Simcenter 3D Flow delivers the basic flow analysis capabilities to help you visualize and optimize the flow characteristics of your designs for better-performing, longer-lasting products.

Simcenter 3D Flow combines the versatility of finite element analysis (FEA) technology with the power and accuracy of a control volume formulation to discretize and efficiently solve the Navier-Stokes equations that describe fluid motion. Common solutions that Simcenter 3D Flow can simulate are:

- Steady-state
- Transient
- Turbulent, laminar and mixed flows
- Forced, natural and mixed convection
- Internal or external flows
- Flows with loss of head due to solid or porous (isotropic and orthotropic) blockages

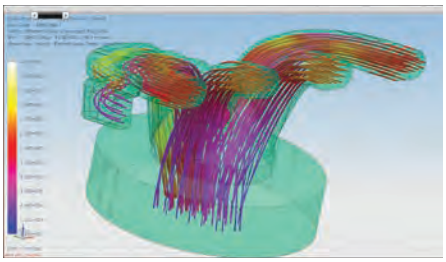
Joining dissimilar fluid meshes
The Simcenter 3D Flow solver has the ability to automatically join dissimilar fluid meshes at interfaces between different parts. This allows the user to quickly investigate many "what-if" simulation scenarios involving complex assemblies. All parts within any design assembly context can be meshed independently. The resulting disjoint fluid faces at the surface junctions between the different parts within the assembly can be connected automatically to form a single fluid domain at solve time. Individual part changes can be re-integrated quickly within the

Simcenter 3D Flow

assembly mesh, thereby avoiding the time-consuming task of remeshing the entire assembly.

Postprocessing fluid simulation results

The Simcenter 3D Flow postprocessing toolset makes it easy to generate images and reports to communicate the desired results to a design team. Flow simulation results can be displayed graphically with streamlines, ribbons or bubble displays. XY plotting tools are available to plot critical values based on time, distance or in a number of other combinations. Reporting capabilities are also available for you to create the documents that you need to communicate your results to the development team.



View exhaust flow streamlines and velocity within a manifold.

Integrating with Simcenter 3D

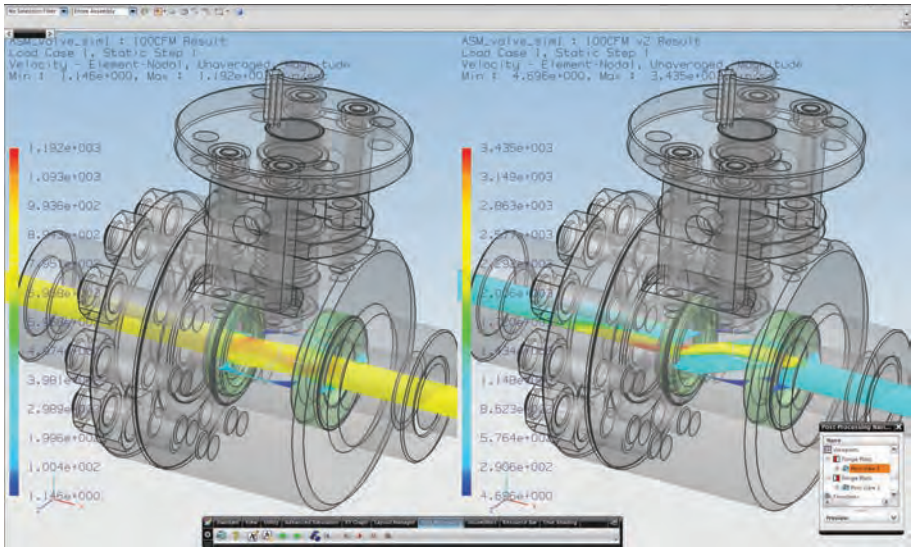
Simcenter 3D Flow is an add-on to the Simcenter 3D platform to deliver CFD solutions. By integrating with the Simcenter 3D platform, CFD engineers gain additional benefits from this modern simulation environment that can help them speed simulation processes and make smarter engineering decisions faster.

Preprocess complex models in less time

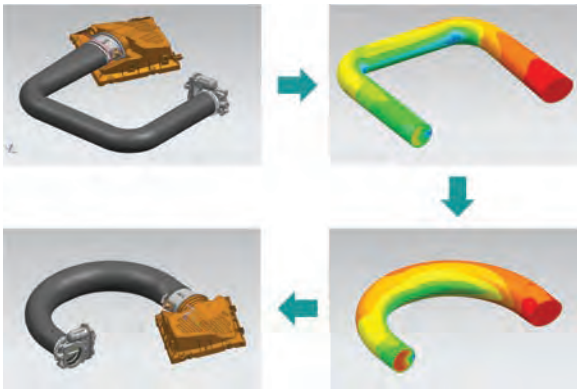
CFD engineers have access to an extensive set of tools for creating CFD analysis-ready geometry and meshes. The user can fully leverage direct geometry editing with synchronous technology to easily edit and de-feature geometry prior to meshing and defining the analysis model.

CFD users can also add the Simcenter 3D Advanced Fluid Modeling module to

Simulate underhood airflow.



Use Simcenter 3D Flow to simulate internal flow within valves and pipes.



Optimize design geometry based on flow simulation results.

deliver even more preprocessing power to Simcenter 3D specifically for CFD analysis. Simcenter 3D Advanced Fluid Modeling provides surface wrapping technology that can be used to generate associative fluid domain geometry from a complex CAD assembly. This module also delivers capabilities for boundary layer meshing and CFD General Notation System (CGNS) import and export.

Using associative analysis models for rapid design-analysis iterations

CFD models created and solved in Simcenter 3D are associated to the base geometry. When the underlying design geometry changes, Simcenter 3D rapidly updates the associated analysis geometry, mesh and boundary conditions as required, enabling the analyst to avoid manually recreating the analysis model. This means that you can rerun your flow simulation earlier and speed design-analysis iterations.

Solving multiphysics problems

As part of the Simcenter 3D environment, you can combine solutions from Simcenter 3D Flow with other Simcenter 3D solutions for thermal and structural analysis. For example, you can simulate fully-coupled thermo-fluid interaction problems when Simcenter 3D Flow is used in combination with Simcenter 3D Thermal. Pressures from flow analyses can also be mapped to structural analysis solutions available in Simcenter 3D Structures.

Optimizing airflow

As part of the Simcenter 3D platform, Simcenter 3D Flow can take advantage of geometry optimization to achieve optimal airflow in or around your products. You can use CFD analysis to drive and optimize geometry dimensions and get the best design in less time.

Siemens PLM Software
www.siemens.com/plm

Americas +1 314 264 8499
Europe +44 (0) 1276 413200
AsiaPacific +852 2230 3308

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