SIEMENS

NX 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 NX Flow with the NX CAE platform to streamline simulation processes by 70 percent
- Easily add multidiscipline simulation capabilities as your analysis needs grow

Summary
NX™ Flow software is a computational fluid dynamics (CFD) add-on solution that is fully integrated into NX Advanced FEM and NX Advanced Simulation. 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. NX Flow simulation solutions are applicable across a wide range of industries, including: aerospace and defense, automotive, consumer products, electronics and semi-conductors, 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. NX 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.

NX 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 NX Flow can simulate are:

- Steady-state
- Transient
- Turbulent, laminar and mixed flows
- Forced, natural and mixed convection
- Internal or external flows

Joining dissimilar fluid meshes
The NX Flow solver has the ability to automatically join dissimilar fluid meshes at interfaces between different parts. This
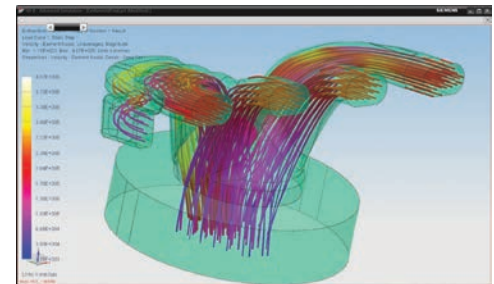
NX Flow

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

Simulate underhood airflow.

Postprocessing fluid simulation results

The NX 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 NX CAE

NX Flow is an add-on to the NX CAE platform to deliver CFD solutions. By integrating with the NX CAE 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 defeature geometry prior to meshing and defining the analysis model.

CFD users can also add the NX Advanced Fluid Modeling module to deliver even more preprocessing power to NX CAE specifically for CFD analysis. NX 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
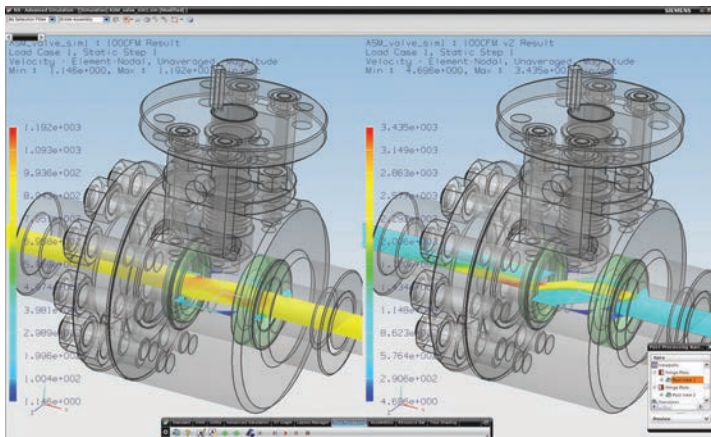
delivers capabilities for boundary layer meshing and CFD General Notation System (CGNS) import and export.

Using associative analysis models for rapid design-analysis iterations

CFD models created and solved in NX CAE are associated to the base geometry. When the underlying design geometry changes, NX CAE 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.
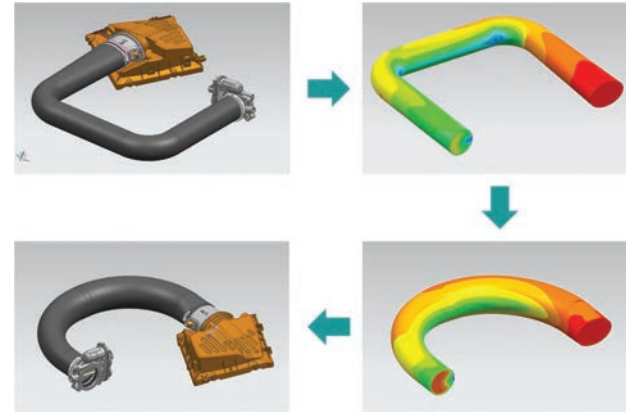
Solving multiphysics problems

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

Optimizing airflow

As part of the NX CAE platform, NX 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.

Optimize design geometry based on flow simulation results.

Use NX Flow to simulate internal flow within valves and pipes.