NX Design Simulation: Analysis and optimization in design

NX CAE

Benefits
- Obtain earlier feedback on performance with a design integrated simulation process
- Evaluate more alternatives with faster iterations between design and analysis
- Expand CAE to more users with easy-to-use, geometry-based simulation
- Update analysis results rapidly through CAD-associative simulation models
- Improve designs with embedded optimization engine

Summary

NX™ Design Simulation software delivers design-integrated structural and thermal simulation tools that help design engineers compare design alternatives and optimize performance characteristics of products from the earliest stages of the design process. Complementary and scalable to the NX Advanced Simulation applications suite, these tools are tightly linked with NX 3D design geometry to accelerate simulation modeling, analysis and results evaluation, so that functional performance simulation results can directly influence design. The result is a highly iterative and predictive engineering process that delivers innovative designs, higher quality products and reduced time-to-market.

Basic functionality

NX Design Simulation enables design engineers to understand, evaluate and optimize the structural, thermal and vibration behavior of parts and assemblies. NX Design Simulation includes the integrated NX Nastran® finite element solver, the same solver used by high-end analysts, for quick-turnaround linear structural and thermal evaluations as well as sizing and parametric shape optimization.

Design engineers can quickly perform multiple "what-if" simulations of a product's structural and thermal performance to choose the most promising and innovative conceptual design alternatives. Geometry-based parametric modeling and automated optimization tools facilitate detailed understanding of a product's performance characteristics and definition of an "optimal" digital design prototype earlier in the product development process.

Optimization to aid design

Also integrated into NX Design Simulation are automated sizing and parametric shape optimization and fault tolerant adaptive meshing technologies. Using the embedded optimization engine, NX Design Simulation is

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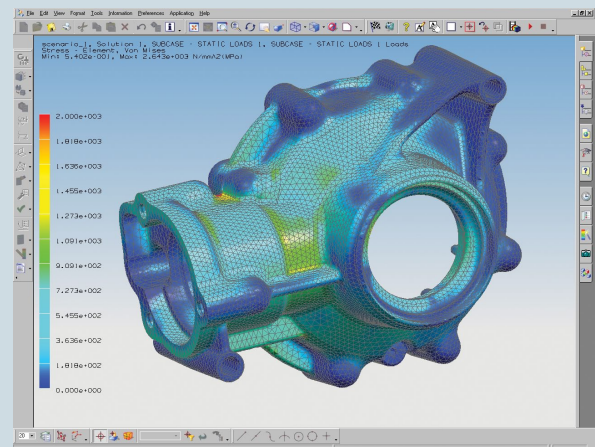
NX Design Simulation

able to automatically predict the best geometric and mechanical parameters for a component or assembly, based on engineering performance simulation results. Optimization goals, engineering constraints and model variables are defined by the user through a simple process guided by NX. Direct optimization and sensitivity studies then provide the maximum amount of guidance for the engineer while fault-tolerant meshing provides a quantitative degree of confidence.

Ease of use

Key ease-of-use features in NX Design Simulation include a simulation navigator that guides new users and increases the efficiency of the more experienced by providing a visual reference to the analysis objects created in the model. Intelligent meshing algorithms incorporate industry best practices and apply knowledge based approaches to successfully mesh complex geometry, reducing element count while increasing element quality. Built-in 'wizards' facilitate vibration and/or stress analyses.
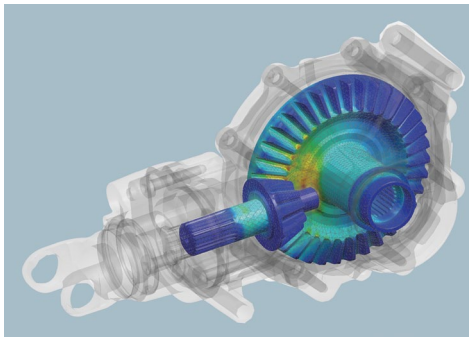
Simulation solutions

Supported solution types include linear statics, normal modes, linear bucking, linear contact, steady-state heat transfer and combined thermo-structural; temperature dependent materials are also supported. While the basis issue of whether a product will fail is critically important, in many instances, engineers need to address other questions as well. In cases where design engineers need to predict when a design might fail, the NX Durability Wizard add-on product is available which guides design engineers through a basic durability analysis.

Communicating results

Validation requires full and complete documentation, a natural process with NX Design Simulation. Report content is controlled and maintained through fully customizable templates ensuring consistency and quality. While much report content can be created automatically, additional content can be added "on the fly," providing the vital flexibility needed to ensure that reports add value to your business and support your collaboration, archival and regulation requirements.

NX Design Simulation		
Model preparation	Geometry construction – access to all NX tools	Access to model feature parameters
	Model simplification tools	Automated mesh mating conditions
	Model feature suppression	
	Automated model idealization	Analysis model to design geometry associativity
	Geometric feature removal	Units manager
	NX Open support	Knowledge Fusion support
Material properties	Isotropic	Temperature dependent
	Orthotropic	Material database
	Anisotropic	
Load types	Force	Hydrostatic
	Moment	Surface-to-surface contact definition
	Pressure	
	Centrifugal and gravitational	Heat flux
	Bearing	Heat generation
	Temperature	Radiation
	Torque	
Boundary conditions	Rotations and translations	Slider
	Enforced displacements	Roller
	Simply supported	Symmetric and anti-symmetric
	Pinned	Thermal constraint
	Cylindrical	Convection
Meshers and element types	Tetra (free)	Automatic geometry abstraction
	3D contact	Mesh mating conditions
	Edit mesh	Mesh point

Product availability

NX Design Simulation is an add-on module in the suite of NX CAE applications available within the NX integrated digital product development portfolio. It requires a core seat of either NX Gateway or NX Design as a prerequisite.

NX Design Simulation is available on 32 and 64-bit Windows and also on 64-bit Linux systems.
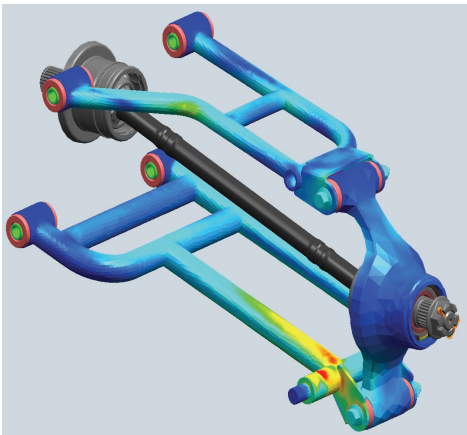
NX Design Simulation		
Integrated solver	NX Nastran	
Supported solution types	Linear static	
	Normal modes	
	Linear buckling	
	Steady-state heat transfer	
	Assembly with linear contact	
	Sensitivity studies	
	Geometry optimization	
	Adaptive meshing and analysis	
Viewing results	Fringe plots	Results at node/element
	Cutting planes	Error estimate plot
	Contour lines	Automatic report writing
	Iso surfaces	Multiple viewports
	Animation	Templates
	Deformed shape	Advanced lighting
	Result comparison	Automatic min/max tags
	Nodal displacements	Dataset selection from navigator
	Element stress	Results import
	Nodal stress	Fly through model with results
	Strain energy	JT2Go lightweight results export
	Strain energy density	Programmable CAE objects
	Annotations	Results measures