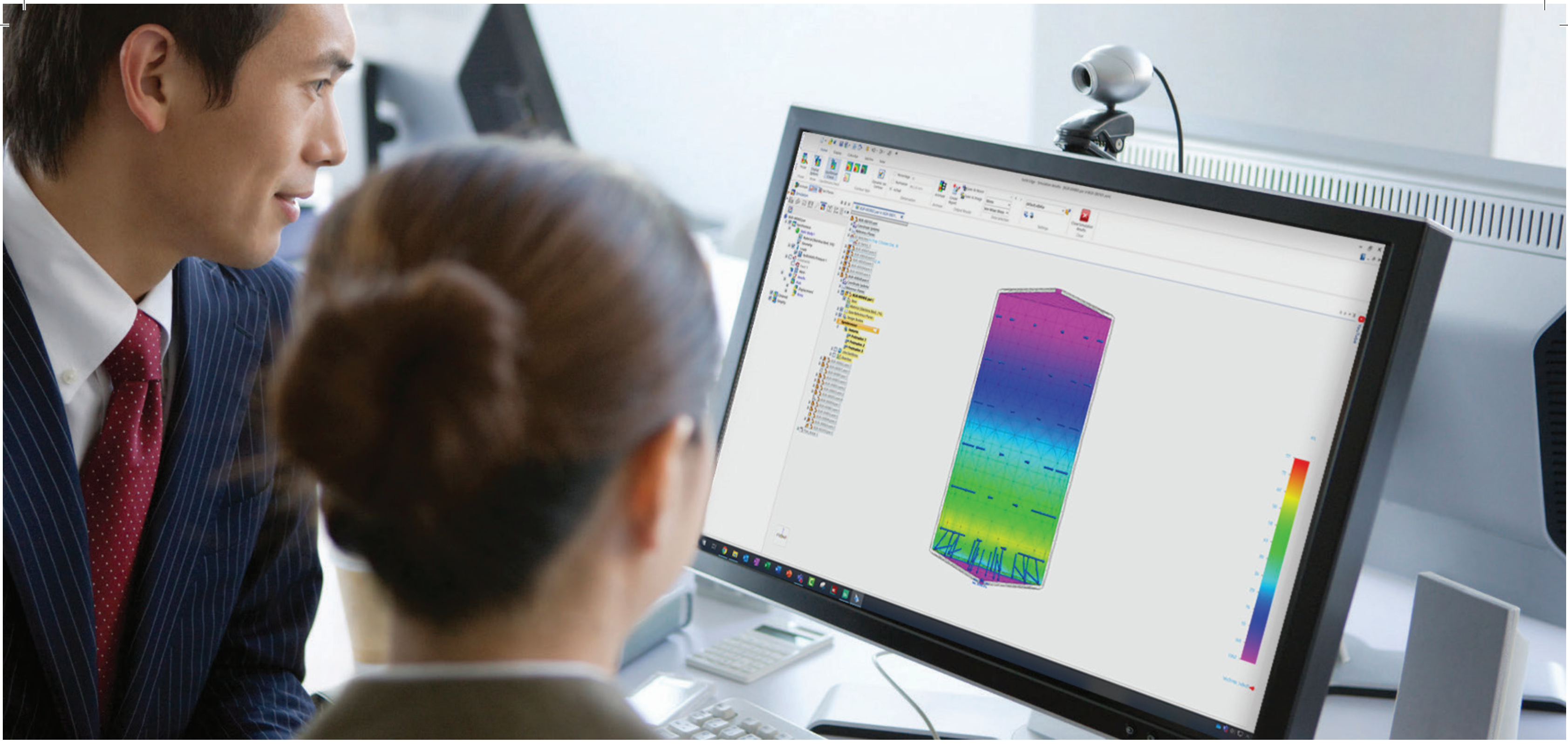

SIEMENS DIGITAL INDUSTRIES SOFTWARE

Solid Edge Simulation

Embedded finite element analysis for design engineers

Benefits

- Enables innovation through virtual design exploration
- Provides immediate feedback on design performance
- Accelerates the speed of simulation studies
- Optimizes material usage and minimizes product weight
- Reduces the need for costly physical prototypes
- Evaluates designs for deformation, stress, resonant frequencies, buckling, heat transfer thermal stress and vibration response

Summary

Siemens Solid Edge Simulation software provides design engineers with powerful tools to digitally validate designs, allowing them to build better products in less time by frontloading the simulation process. A best-in-class simulation tool, Solid Edge Simulation is an easy-to-use, built-in finite element analysis (FEA) tool that enables design engineers to digitally validate part and assembly designs within the Solid Edge environment. Based on proven Simcenter Femap™ finite element modeling technology, Solid Edge Simulation significantly reduces the need for physical prototypes, reducing material and testing costs, while saving design time.

Use analysis rather than physical prototypes

Solid Edge Simulation uses the same underlying geometry and user interface as all Solid Edge applications. It's easy enough for any Solid Edge user with a fundamental understanding of FEA principles, yet robust enough to service almost any analysis need. By enabling engineers to perform their own simulation, more analysis can be performed in less time – improving quality, reducing material costs and minimizing the need for physical prototypes – without incurring the high costs of outsourced analysis. The layout of the user interface is designed to guide the user through the entire analysis process, with help available if needed, which makes it easy to learn initially, and revisit if necessary.

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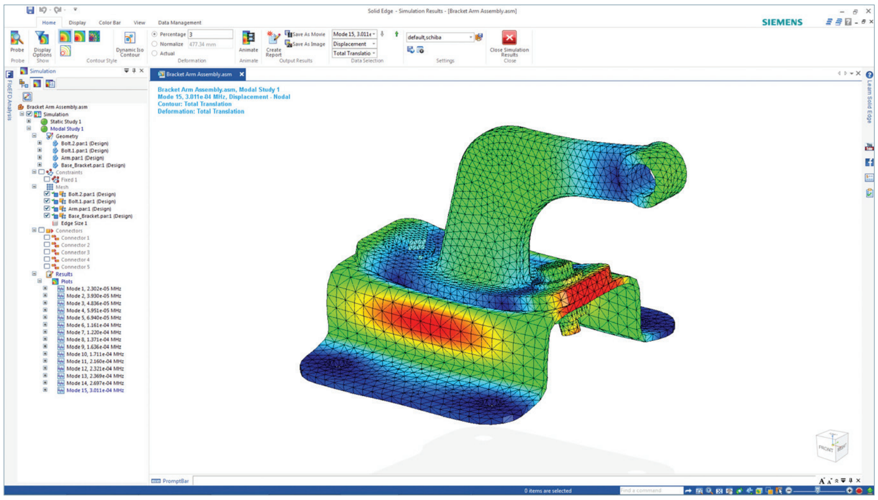
Features

- Automated, high-quality mesh generation controls mesh without need for parameters, allowing structural and thermal simulations to be run on mesh bodies
- Automatic finite element model creation with optional manual override
- Fast performance simulation display
- Automated beam creation for quick and better frame model definition
- Realistic operating environment modeling with full complement of loads and constraint definitions
- Embedded advanced motion simulation



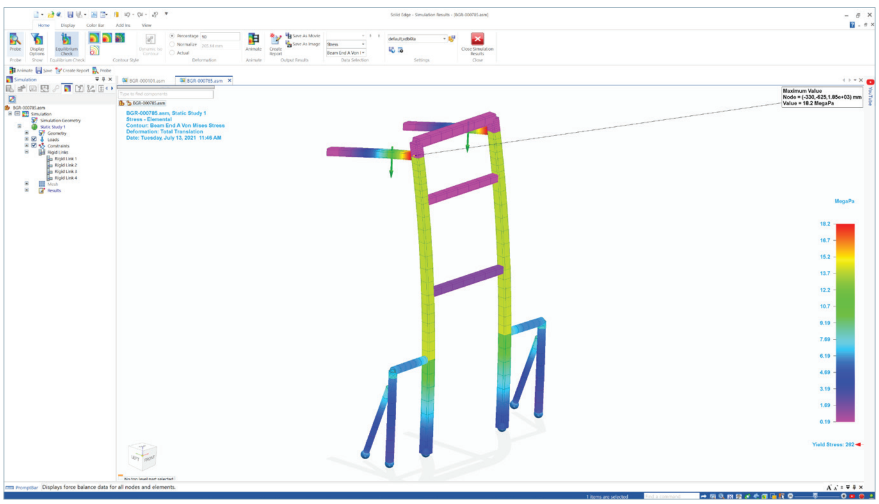
Automatic finite element model creation

Solid Edge Simulation supports solid meshes (using tetrahedral elements), two-dimensional shell element meshes on mid-surfaced sheet structures, hybrid models that contain both 2D shell and 3D solid elements, as well as 1D beam elements for frame structures. Users can create and refine finite element meshes where required to improve accuracy of results.

Automated beam creation enables quick frame simulation definition. Manual rigid link creation and removal are also available to define a specific connection between beams.

Automated processes validate design performance

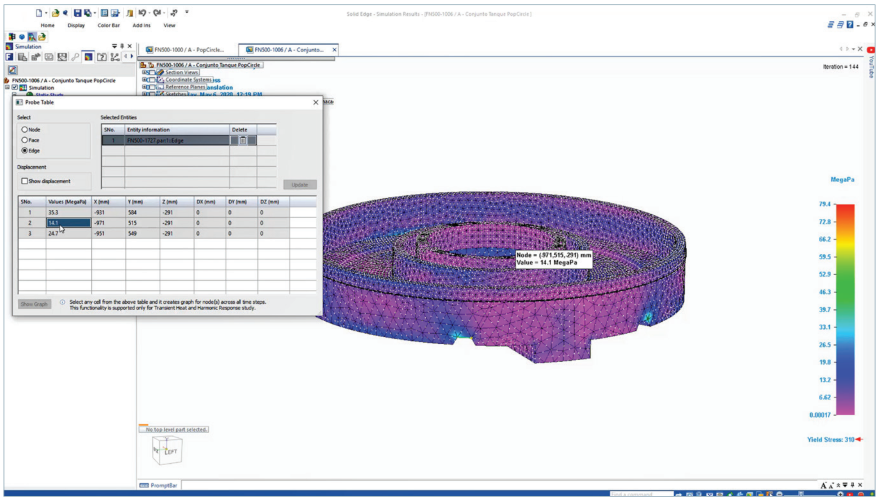
Simulation-driven design helps designers get immediate feedback on design performance by embedding simulation into the CAD environment and designers' processes. Solid Edge Simulation includes an automated high-quality mesh generation process that accelerates the speed of, and provides confidence in, simulation studies. The new, industry-unique Body Mesh process provides a high-quality mesh with minimum effort, controlling mesh without the need for parameters, which allows structural and thermal simulations to be run on mesh bodies.



A mesh size slider bar that makes element size adjustments to the overall finite element mesh is available with additional control of the number of elements on individual edges and faces. With Solid Edge Simulation, you can leverage a mapped mesh capability to take advantage of certain geometry topologies and create a more orderly and well-shaped mesh. In addition, the mesh size will automatically adjust to accommodate detailed model features. You can fine-tune the mesh with manual edge and face element sizing to generate an efficient simulation model that will deliver accurate results. Prior to creating the finite element model, you can prepare and simplify the geometry model quickly and easily with synchronous technology and its ability to make history-free model changes. Solid Edge synchronous technology combines the speed and simplicity of direct modeling with the flexibility and control of parametric design.

Full complement of load and constraint definitions

Solid Edge Simulation provides all boundary condition definitions needed to define realistic operating environments. The constraints are geometry-based and include fixed, pinned, no rotation, symmetric and cylindrical variations. The loads are also geometry-based and include mechanical as well as temperature loading for thermal analyses. Mechanical loads include forces, pressures, hydrostatic pressure and effects caused by body rotation and gravity. Solid Edge Simulation facilitates load and constraint applications with Quick Bar input options and handles for direction and orientation definition.



Analyzing assemblies

Assembly model components can quickly be connected, and interaction can be a glued connection between components or surface contacts based on an iterative linear solution.

Contacts between components can be detected automatically, or connectors can be defined individually through manual face selection. Assembly materials and properties can be applied manually, selected from a material library or inherited from the geometry model by default. The included Simcenter™ Nastran® solver assures realistic assembly/component interaction to facilitate robust solutions.

Solid Edge Simulation offers complete control of the management of geometries in a simulation study. Components can easily be suppressed or removed from a study to maximize efficiency, improving user experience.

Analysis types
Using the industry standard Simcenter Nastran solver, Solid Edge Simulation delivers structural simulation results, such as deformation, stress and strain, etc. caused by a static loading, finding the natural frequencies of vibration or determining buckling loads of a design. Both steady and transient heat transfer analysis validate cooling performance by evaluating the temperature distribution of the model. In addition, the coupled thermal and structural analysis can be applied to determine thermal effects to the structural stress/strain.

Fluid pressure and temperature results can be imported from Simcenter FLOEFD™ for Solid Edge as structural loads for analysis. FLOEFD for Solid Edge delivers the industry's leading computational fluid dynamics (CFD) analysis tool for fluid flow and heat transfer. Integration between the two simulation solutions is seamless and easy, as both are fully embedded in the Solid Edge environment.

Harmonic response analysis, modes based dynamic response analysis in frequency domain, is also available to simulate the actual vibration level. Re-use of finite element model loads and constraints is as easy as dragging and dropping from one study to another.

	Solid Edge	Solid Edge Simulation	
	Premium	Standard	Advanced
Simulation modeling and results evaluation	•	•	•
Linear static	•	•	•
Advanced motion	•	•	•
Optimization (Shape/parameters)	•	•	•
Normal modes		•	•
Buckling		•	•
Heat transfer – Steady state			•
Heat transfer – transient			•
Harmonic response			•

Scalable solutions for every user.
Powerful, scalable solution offerings allow you to select the best simulation tools for your individual requirements.

- Linear Static - Calculate deformation and stress of a structure based on specified loads and constraints in order to validate the strength of the designed structure. Loads and constraints remain constant as the static state is simulated. The maximum value of the deformation and stress, along with the location, may be assessed by referring to the required specification to the product.
- Advanced Motion - Simulate the kinematic behavior of a mechanical system assembled with parts and connectors based on the applied enforced motion to validate the integrity of the mechanical assembly design.
- Optimization - Automatically calculate the optimum parameter of the design variables (e.g., the length of a certain portion of design geometries) under specified design constraints (e.g., allowed maximum deformation value) to meet the design objective, such as minimizing the weight.
- Normal Modes - Obtain the natural frequencies of a structure along with respective mode shapes using the eigenvalue calculation. Comparing the obtained natural frequencies to the frequencies of the stational excitation forces can help avoid resonance issues.
- Linear Buckling - Compute a load's magnification factor to determine if a designed structure will buckle under specified load and constraint conditions. This analysis assesses the maximum possible load that can avoid structural buckling.
- Steady State Heat Transfer – Calculate the temperature distribution under a steady state condition based on applied heat loads, considering different heat energy exchanges, such as the heat conduction, convection and radiation. Thermal stress can be analyzed if the linear static analysis is done using the temperature distribution result as a temperature load.
- Transient Heat Transfer - Simulate temperature changes and temperature distribution under transient conditions based on applied heat loads by considering different heat energy exchanges, such as heat conduction, convection and radiation, in order to assess cooling/heating performance.
- Harmonic Response - Calculate the stationary vibration level along the frequency range based on applied excitation forces. Calculations based on the modal representation are used to compute the dynamic response, quickly providing results. The absolute vibration magnitude may be assessed by this analysis.

Designs in motion

With dynamic motion simulation, Solid Edge Simulation allows you to evaluate and visualize how parts will interact in an assembly. The easy-to-use solution simulates how a product will perform throughout its operational cycle, allowing you to see how it would function in the real world and measure the forces and loads on the design.

Solid Edge Simulation offers you the ability to create motion models from existing Solid Edge assemblies. Mechanical joints can easily be created by either automatically converting them from assembly constraints, or by using the intuitive builder which walks you through the process step-by-step. Motion characteristics can then be added, including motors, actuators, gravity, realistic contact between bodies, springs, friction, damping and other generated forces as needed. Additionally, motion results, such as forces, can be utilized as load conditions for structural simulation.

Design updates

With Solid Edge Simulation, you can quickly and easily make any required design update during post analysis. History-free, feature-based model changes with synchronous technology significantly accelerates the model refinement process. In addition, Solid Edge Simulation maintains associativity between the CAD and finite element models, while making sure that applied loads and constraints are maintained for all geometry model changes.

Scalable solutions for every user

Powerful, scalable solution offerings allow you to select the best simulation tools for your individual requirements.

Analysis scalability

Simulation functionality scales from application to individual parts to analysis of large assemblies, all the way to Femap with Nastran, enabling you to define and analyze complete systems. This complete line of products provides a scalable upgrade path for users who need to solve more challenging engineering problems. Complete geometry and finite element models with boundary conditions and results can be seamlessly transferred from Solid Edge to Femap, where more advanced analyses can be employed if desired.

Result evaluation

Solid Edge Simulation allows you to interpret and understand the resulting model behavior quickly with comprehensive graphical result viewing tools. With optimized load times, simulation results are returned faster than ever before. They can be displayed in various forms, including color and contour plots, which can be continuous, displayed as distinct contour bands or by element and displacement and mode shapes that can be animated. Minimum/maximum stress markers and a probe tool with results displays are also available. The probe tool can select nodes, faces and edges.

In the frame simulation, factor of safety based on von-Mises stress can be used to assess the frame simulation results. In addition, beam diagram is also supported as the result display format.

With Solid Edge Simulation's comprehensive results evaluation functionality, you can quickly identify problem areas for potential design revision and generate HTML reports of simulation model information and final results.

Extending value

The Solid Edge portfolio is an integrated set of powerful, comprehensive and accessible tools that advance all aspects of the product development process. Solid Edge addresses today's complexity challenges with automated digital solutions that cultivate creativity and collaboration.

By harnessing the latest innovative technologies in mechanical and electrical design, simulation, manufacturing, publications, data management and cloud-based collaboration, Solid Edge dramatically shortens time-to-market, provides greater production flexibility and significantly reduces costs with its collaborative and scalable solutions.

Minimum system requirements

- Windows 10 Enterprise or Professional (64-bit only) version 1809 or later
- 16 GB RAM
- 65K colors
- Screen resolution: 1920 x 1080
- 8.5 GB of disk space required for installation

Siemens Digital Industries Software

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00 800 70002222

Asia-Pacific
001 800 03061910

For additional numbers, click here.

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