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Solid Edge for simulation and optimization

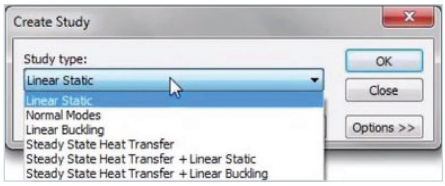
Solution brief

Siemens PLM Software

The Solid Edge® software embedded simulation solution, Solid Edge Simulation, enables engineers to ensure that designs are appropriate for their purpose: strong enough to do the job, but not overbuilt. Solid Edge Simulation offers several different types of simulation analyses, including linear static, thermal, vibration (or modal) and buckling, as well as combinations of multiple study types.

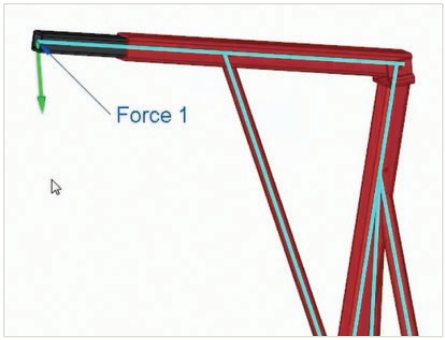
Analyzing beams and frames with a subtype of linear static analysis

Beam analysis is a great tool in Solid Edge Simulation for users who design frame structures. Using beam analysis, you can quickly validate the strength of parts and assemblies, focusing solely on frame elements and eliminating the time and resources required to analyze complex shapes and features. Beam analysis enables you to see if assemblies are overbuilt based on the amount of stress exerted on them, potentially causing manufacturing to spend more money than necessary on stock materials. The user-friendly interface of Solid Edge Simulation, which is completely integrated in Solid Edge, makes it easy to create simulation studies.



When creating analyses in Solid Edge, there is a consistent and intuitive workflow. It consists of defining the geometry that makes up the study, setting appropriate loads the part or assembly will be subjected to and setting constraints to simulate proper reactions from the elements making up the study. This allows you to create real-life scenarios to test your 3D parts.

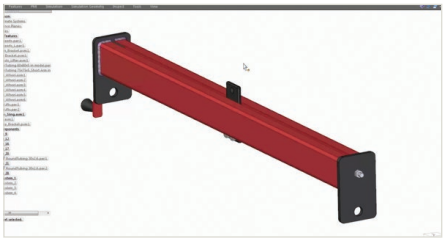
Once the study is set up, running a beam analysis is fast and efficient. With Solid Edge Simulation, you don't need to worry about the exact frame geometry to solve for the reaction forces on its members.



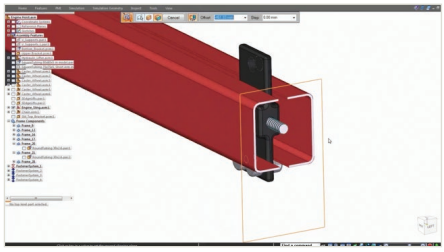
Once solved, Solid Edge provides an easy-to-understand readout of the results. If changes need to be made, Solid Edge allows you to quickly and easily edit the model, and then simply rerun the existing simulation study to review results of the change.

In addition to supporting multiple study types, Solid Edge can be used to leverage several mesh types, including surface meshing, solid meshing or both to optimize speed and accuracy when simulating parts and assemblies.

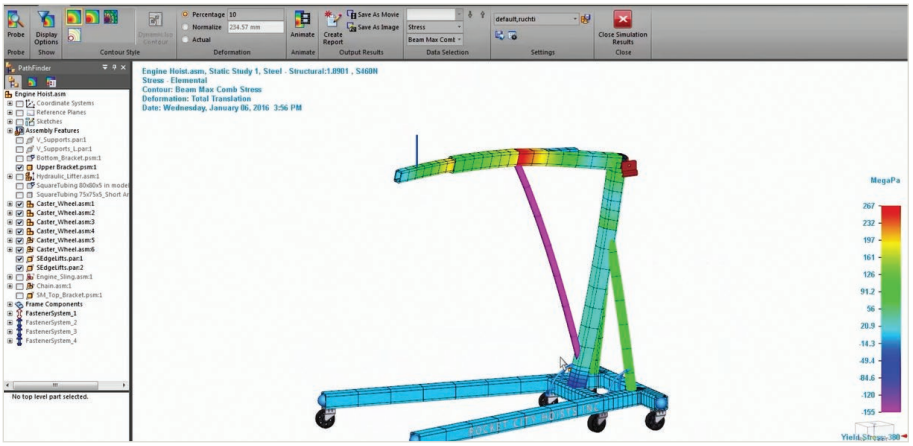
Take, for example, a leveler, made up of a threaded bolt running through an adjustment bracket (used to control the balance of the suspended engine).

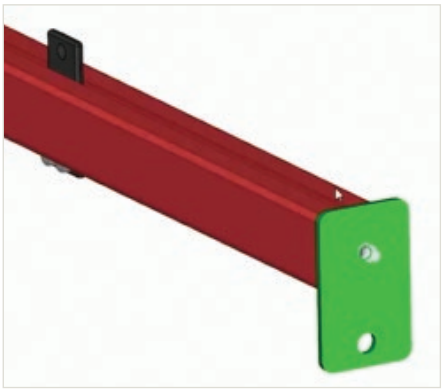


Imagine there is a requirement that the bolt can't bend more than 1 millimeter (mm) because the adjustment bracket won't work properly.



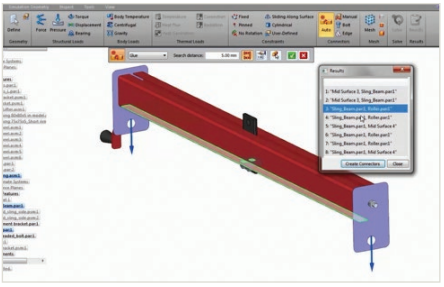
To optimize the simulation analysis, you can represent sheet metal end caps as surfaces, a much more lightweight representation for the study. Mixing surface and general body meshes is a great way to simulate sheet metal bodies along with formed parts.



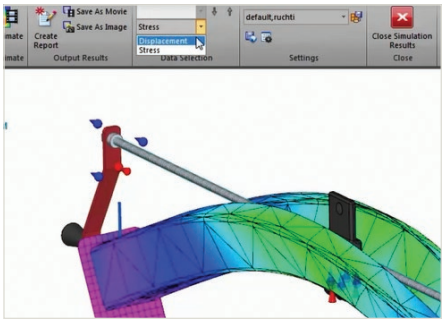


With the end caps defined, you can then set up the study. No matter the type of study being run, common steps are used to set them up. You have geometry, loads and constraints – just like in beam analysis – but in the assembly study you need to define how the parts connect (this was done automatically in the beam analysis based on the proximity of the beams to one another).

Solid Edge Simulation provides great connection creation tools such as options for bolted, edge and manual definitions. However, one of the best time-saving options is the auto connection command, which allows you to quickly create all connectors automatically.

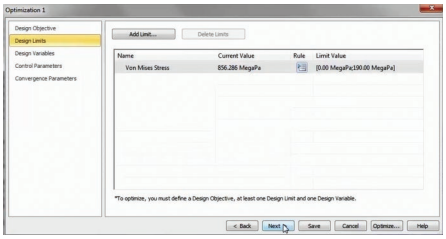


Once everything is set up, you can mesh and solve the study. Solid Edge gives users complete control over the mesh settings for both solid and surface meshes. You can easily change your view of results; for example, from stress distribution to displacement using a dropdown.



If you don't get your desired results the first time – such as if our beam from the previous example has a displacement of more than 1 mm – Solid Edge synchronous technology allows you to easily make changes to your design depending on your objectives. However, rather than manually making time-consuming changes to reach the appropriate results, Solid Edge provides simulation optimization to automate and optimize your design.

Simulation optimization is a wizard-based tool that allows users to define objectives of simulation studies and customize how their parts can be changed in order to converge on the most optimized version. In this case, simply set your objective to a maximum displacement of 1 mm.

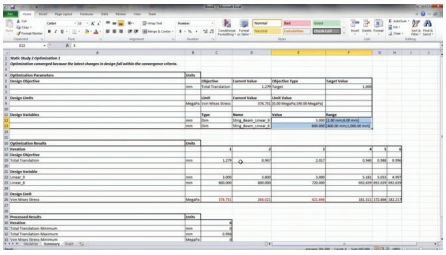


Next, define the limits of the parts, such as stresses they cannot exceed, and define what changes you want Solid Edge to make, such as thickness and length of components.

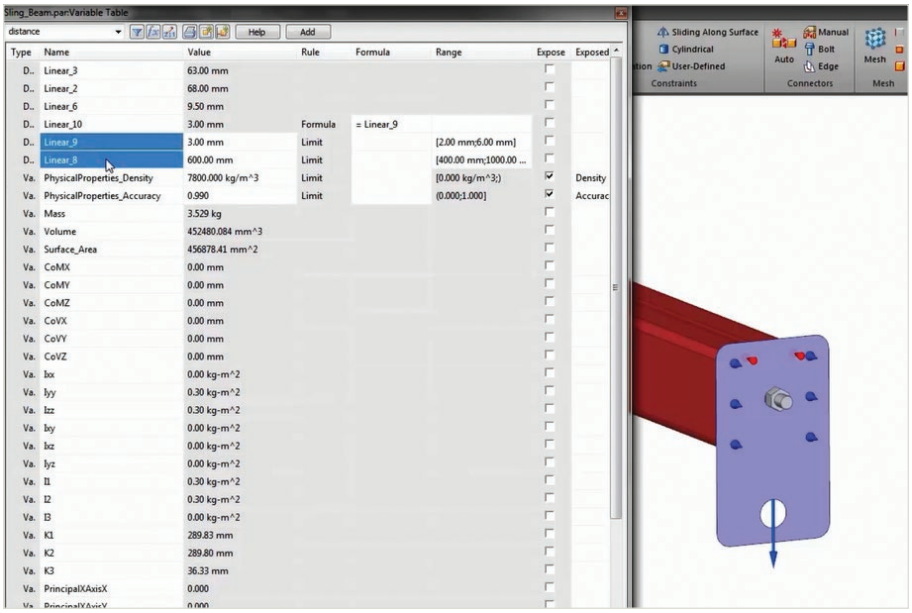
The remainder of the options in the study define what is considered solved.

The optimization function iterates, taking the values of each subsequent study to make closer approximations to what the most optimized condition will be in much less time than it would take to run each of these studies independently. In the end, Solid Edge provides you with a comprehensive summary of all of the studies and their associated values.

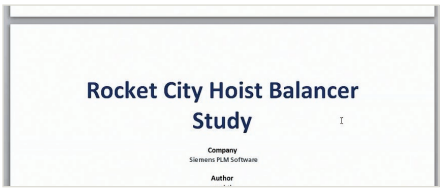
The optimization summary is produced in Excel spreadsheet software, allowing you to easily customize the output if desired.



Once optimized, you can save and output results, including animations, for use in design reviews, marketing materials, etc. Generating study reports from



Solid Edge Simulation is easy; by using Solid Edge, you can automate the creation of screen captures of study results and other pertinent information with multiple options for output formatting.



As you can see, Solid Edge Simulation is well suited for design engineers: from making sure your designs are appropriate for their purpose and providing a simple and intuitive method for setting up studies, to a full optimization capability that automates solving multiple variables with minimal designer input. You can do this by leveraging Femap™ software and Nastran® software, industry-leading simulation technology.

To see simulation and optimization in action, check out the video below:

https://youtu.be/515un5vL-2Y?list=PL1m1vu8_quoDNRgX4We5aFJJOsORatflT

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