



AUTODESK UNIVERSITY 2013

Up and Running with Autodesk® Sim 360™

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SM1879 This class presents a workflow for effectively using the simulation tools in the new Sim 360 cloud-based software, which is very similar to Inventor simulation in terms of ease of use and workflows. After this class, you will be able to confidently apply this technology to your own workplace. The class focuses on the additional benefits to be gained on top of the simulation features that are available in Autodesk® Inventor® Professional software, including cloud computing, Fusion 360, and fatigue analysis. We will demonstrate real life customer examples and how Sim 360 can be effectively used to setup and run analyzes to help you make innovative products.

Learning Objectives

At the end of this class, you will be able to:

- Simplify and Edit models using Fusion 360
- Carry Out Stress Analysis
- Carry out Fatigue Analysis
- Employ top tips and guidance on how to make the most out of Sim 360

About the Speaker

An Autodesk simulation solutions manager with more than 20 years of experience in the manufacturing field, including working at Rolls Royce, British Aerospace and Nuclear Electric. Has been involved with Autodesk simulation software when it was first introduced, and is well-known throughout the Autodesk Simulation community, worldwide. He has authored the Up and Running with Autodesk Inventor Simulation books, which are available worldwide, via Amazon. He also runs a dedicated forum for simulation users on LinkedIn –Up and Running with Autodesk Inventor Simulation.

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About the Co speaker

I have worked for Autodesk for 8 years as a User Experience Designer. I've worked on Autodesk Inventor specializing in the areas of Sketching and Assembly modeling. I have also specialized in Autodesk Simulation products the last 3 years. I have a B.S. in Mechanical Engineering from Oregon State University. I have 9 years of experience designing Off-highway equipment and 7 of those years I used Autodesk Inventor®.

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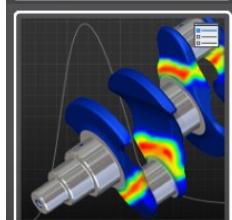
Introduction

Sim 360 is the brand new simulation software with a completely new interface from Autodesk. It is similar to Inventor in terms of ease of use, with the main difference being that the software is completely cloud based. In addition to Stress and Modal Analysis, currently available in Inventor Simulation, Sim 360 also offers following.



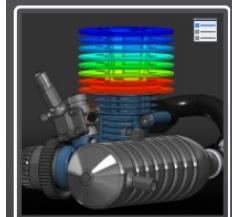
Buckling

This will help to determine the maximum load before the component/product will fail due to buckling.



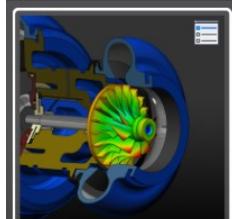
Fatigue

This will help to determine how long a product will last due to repetitive loading. Typically machinery often fails under the action of alternating or fluctuating stresses, even when the calculated stresses are well below the ultimate and yield limit of the material,



Thermal

This will help to understand how a component behaves when subjected to thermal loads.



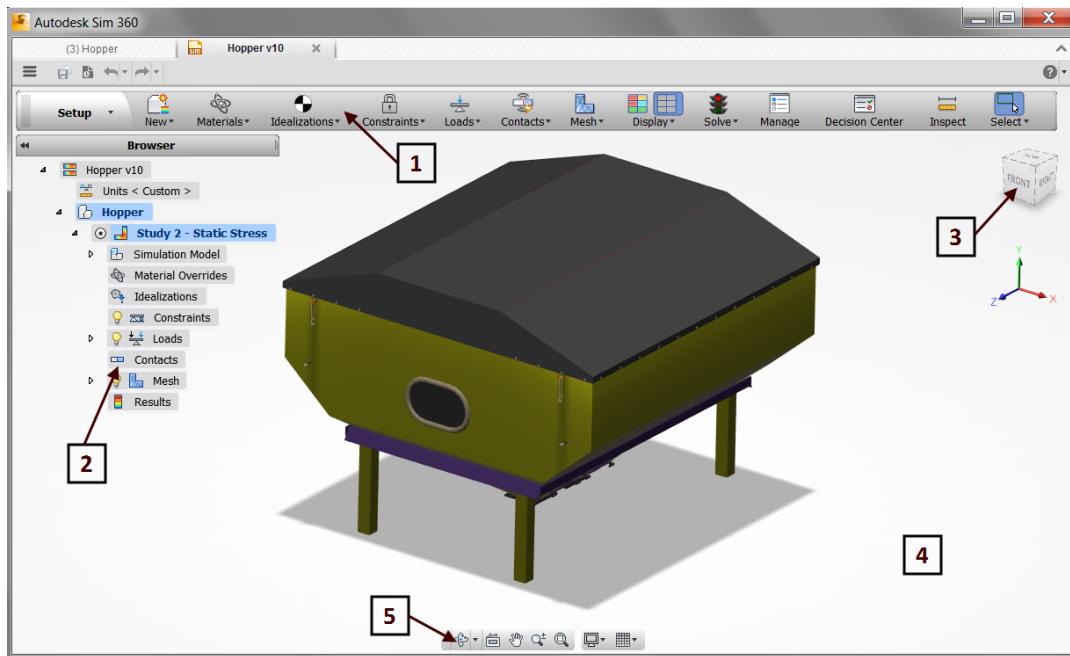
Thermal-Stress

This will help to determine the stresses and deflection in the model due to thermal loading.

The main focus of this class is to illustrate how similar the workflow is to Inventor Simulation with enhanced functionality including.

1. The ability to simplify/suppress features using inbuilt Fusion software
2. Ability to extend mid-surfaces to join connecting surfaces without gaps
3. Results processing
 - a. Slice Place
 - b. Critical Points
 - c. Comparing results side-by-side.

User Interface



1. Workspaces - Within Sim 360 there are the following workspaces
 - a. Setup
 - b. Simplify
 - c. Edit Design
 - d. Results
 - e. Compare
2. Browser
3. ViewCube
4. Graphic Window
5. Navigation panel

Workspaces



This is the default workspace and if the model doesn't need modifying especially in terms of simplifying the model for simulation then this workspace is only what is required to generate results. The workflow is very similar to inventor simulation in that you need to define materials, constraints, loads and contacts before you can hit solve on the cloud



This Simplification workspace is very beneficial if the model contains too much detail, like fillet, holes and chamfers which need to be suppressed from the simulation. In addition if the model contains components made from thin section, typically modeled using sheet metal, then we can make use of creating surfaces that can be in turn can make use of shell elements, which will provide more accurate results for thin structures.



The model workspace can be used for a variety of reasons including.

1. **De featuring** - where the simplification process has failed primarily due to complex feature
2. **Symmetry Analysis** - can be used to create quarter, half or cyclic models.
3. **Redesign** - modify geometry



This workspace allows us to analyze results. Slice Planes, unlike Inventor Simulation, allows us the ability to see internal stresses of a model. Another great feature is the Critical Point which help us to visually analyze high stress areas of the model, as it suppresses the color plot of non-critical areas.

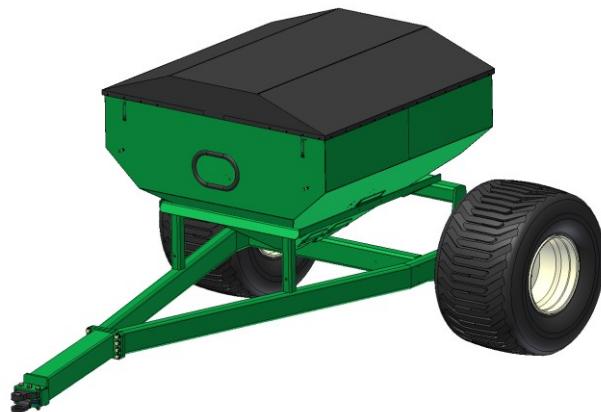


One of the great benefits of Sim 360, over Inventor Simulation, is its ability to compare results of similar or alternative studies side by side within the graphic window. This also includes the ability to synchronize legend results and mouse movements so that all window results look and behave similarly.

Stress Analysis Demonstration 1

(Design Problem Courtesy of Simba Great Plains Ltd)

On 30th April 2010, Simba International Limited was acquired by Great Plains Mfg., Inc, based in Salina, Kansas, USA bringing together the product innovation, expertise, experience and knowledge of two of the world's leading brands in tillage equipment. Backed by the vast resources of North America's largest non-tractor, privately owned agricultural implement manufacturing company, the future for Simba, now rebranded Simba Great Plains, looks brighter than ever



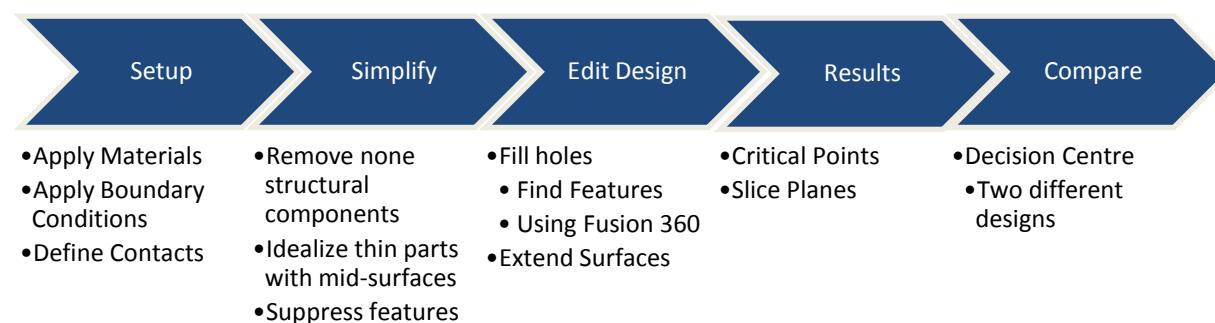
Simba Great Plains products mainly cater for the agricultural industry and a typical product is a seed hopper as illustrated in the above image.

The main requirements of this design problem are to determine:

1. Whether hopper can withstand 3000Kg
2. Maximum Stress and Displacement.

Workflow

This demonstration will illustrate the following workflow



Fatigue Analysis Demonstration 2

(Design Problem Courtesy of British Waterways Ltd)



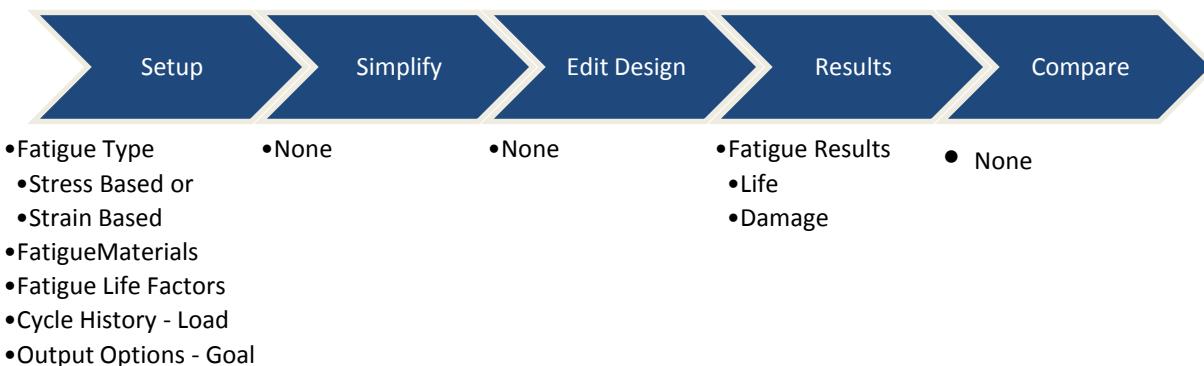
In this design problem British Waterways team were involved in designing a new Jack mechanism to open the canal bridge, as illustrated . The Jack force of **28,729N** was determined, using Dynamic Simulation, and will be used to validate the structural integrity of the new structure, which is to be incorporated into the existing structure beneath the bridge.

The main requirements of this design problem are to determine:

1. Maximum stresses in the structure
2. Fatigue life

Workflow

This demonstration will illustrate the following workflow (Stress Analysis has already been performed)



Sim 360 Top Tips

-  The icons exposed in the toolbar are actually commands. Hover over them to see the command name.
-  You can customize the toolbar by moving commands into or out of the toolbar. Do this by clicking the drop-down on a panel, then click the “Add to” or “Remove” button next to any command you want to move.
-  To easily Orbit, hold the Shift key and middle-mouse button at the same time. When selecting multiple geometries you can just hold the Shift key down while Orbiting with the middle mouse button, zooming in/out with the mouse wheel, and selecting with the left mouse button.
-  Inventor Simulation user may notice a new command called “Prescribed Displacement”. This functionality was lumped into the Fix Constraint in Inventor Simulation. It’s a separate command in Sim 360 which allows you to create pre-stressed conditions caused by a known displacement.
-  Creating manual contacts is now insanely simple but maybe not so intuitive. Now, when the command is activated, you select the two components you want to apply the Contact to first. Then first component you select is in focus (you can only select geometry on that component) and you can click through the other component. Once you click the geometry where the Contact should be placed on the first component, then they switch states. Now the second component is in focus. Click the geometry on the second component and BAM! You’re done.
-  You can generate the Mesh, change the Settings, and regenerate the Mesh as many times as you want without getting charged Cloud Credits. The only time you get charged Cloud Credits is when you click the Solve button and Results are downloaded.
-  The DOF and Groups Views commands can greatly assist you in making sure your model is set up correctly before solving. The DOF View will show you components that are not constrained properly. The Groups View will show you how components are grouped/welded together. If you have multiple groups then you better have some type of Contact between the groups. If not, you have some components that are ‘free floating’.
-  The Adaptive Mesh Refinement setting now has an Automatic control so you don’t have to manually enter values for each of the settings involved. Just use the slider and we’ll enter appropriate values for you. As you move the slider farther toward the right you will get more refinement iterations and a more accurate result if it converges. Use the Convergence Plot in the Results workspace to see how the Result converged.



Most of the settings in the Study Settings dialog have a tooltip to explain what they do. Just hover your mouse over the name of the setting to see the tooltip.



In the Simplify workspace, if you need to suppress a bunch of the same item, such as a bunch of bolts, there are couple of nice ways to do this. One way is to use the “Select by name” command if they all the names contain a common word. Another way is to just right-click on one of the parts in the canvas, then choose “Select all occurrences”. If your assembly model came from a source for which Sim 360 was able to preserve the assembly structure, then this command works great. However, if your source model was translated in a way in which every part became a unique definition then don’t panic. You can use the “Select similar occurrences”. This command will find all parts with similar size, shape, and topology. It actually works quite well.



If you are in the Setup workspace and you want to work on simplifying a specific part or group of parts, you can simply select them in the canvas (double-click them), then right-click and select “Simplify”. This will take you into the Simplify workspace with those parts isolated.



You can easily set the centerpoint for Orbit by holding the Shift key and then clicking with your middle mouse button in the location you want to place the centerpoint. To reset the centerpoint to default, just hold the Shift key and double-click the middle mouse button.



If you haven’t discovered it already, you can easily change the number of increments on the Result legend by just left-clicking and dragging vertically on the color bar. Also, you can quickly override the min/max values on the legend by simply double-clicking on it.



In the Dashboard Activity Feed, click on the little people icon under the item thumbnail to see who the item is shared with and where it is stored.



If you want to move an item from one Folder or Group to another within your Hub, you need to go to the item detail page. In the Recent Data tile, click the name of an item to open it in a detail page. You can also get there by clicking the “xx days ago” link next to the little people icon in the Activity Feed. When you are on the item detail page, go to the lower-left “Stored in” tile and click “Move”. Using the breadcrumbs in the Move tile, go back to “All” to see all of the groups and Folders available.



Let’s say you have been working on a Simulation for quite a while and realized you made a mistake some time ago, but now you can’t undo everything after a certain point in time. What you can do is promote an older version of the Simulation to be current. Open the Versions tile from a Simulation detail page. Find the version you want to promote and click the Promote button to the right of the version. Now when you open the Simulation you’ll be working with that older version going forward. You haven’t overwritten the previous version you were working on, it’s just been demoted.

Other Useful Information/Resources

Sim 360 Help - <http://simhub.autodesk.com/resources>

Welcome to Sim 360 Learning

Learn the essentials of Sim 360 with videos, tutorials, and Quick Start. Get started by simply clicking a video or link or by navigating the panel on the left.

Videos

Quick Start Videos The Process Essentials How to Import a Model How to Create a Simulation

New User Quick Start

- Start Here
- Watch the Quick Start Videos
- Do a Quick Start Tutorial
- Explore the Quick Start Tour

Resources

- What Is Autodesk 360?
- Sim 360 Technology Overview
- User Interface
- Workflow

SimTV - <http://vp.telvue.com/player?s=autodesk>

AUTODESK SIMULATION TV

Search: enter search text

Playing Videos Playlists

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- Editing a Simulation Sim360
- Creating a Simulation with ... Sim360
- Autodesk. Simulation CFD