

Product Design Suite 2013

Simulation

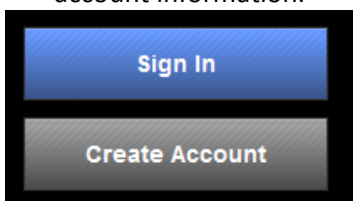
Exercise: Inventor Optimization

In this exercise, you improve the design of a part by using the Autodesk® 360 Optimization functionality from within Autodesk® Inventor® that leverages the cloud for faster calculations.

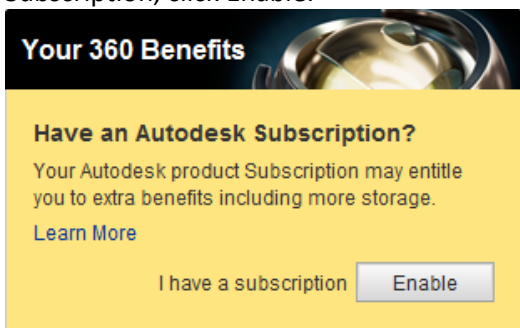
To complete the steps in this hands-on test drive you will need Autodesk® Product Design Suite Premium or Ultimate 2013 and be on subscription.

Along with being on subscription, this hands-on test drive also requires you to have an Autodesk 360 account with subscription enabled. The following steps cover account creation and sign in and subscription enabling for your account.

1. Go to <http://360.autodesk.com>.
2. On the Autodesk 360 page:
 - If you have an account, click Sign In. Enter your ID and password.
 - If you do not have an account, click Create Account. Enter your personal, contact, and account information.

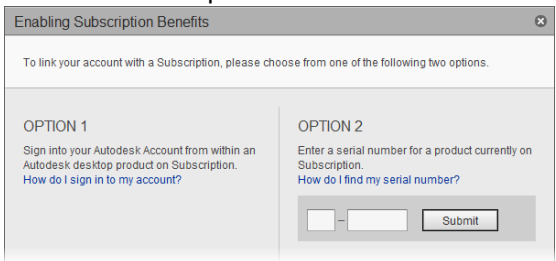


3. Review the section Your 360 Benefits.
 - If it is asking if you have an Autodesk Subscription, click Enable.

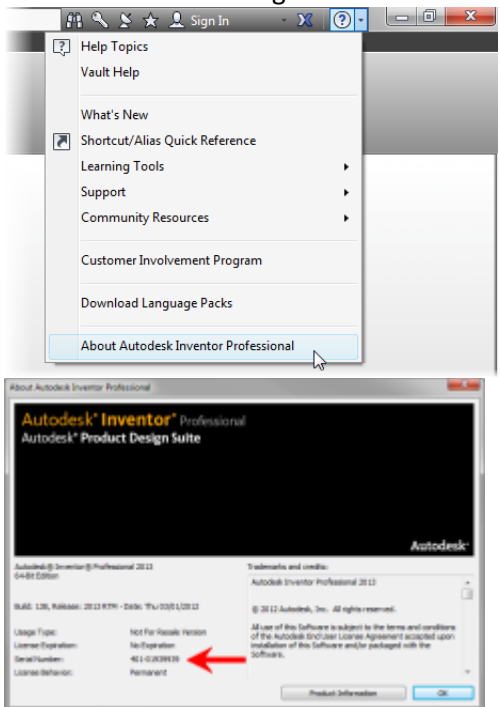


- If you already have it enabled, it should be listed under Other Benefits as shown in step 5.

4. In the Enabling Subscription Benefits dialog box, follow the instructions for Option 1 or Option 2 to enable subscription.



- One way to locate your serial number is to access the About dialog box.

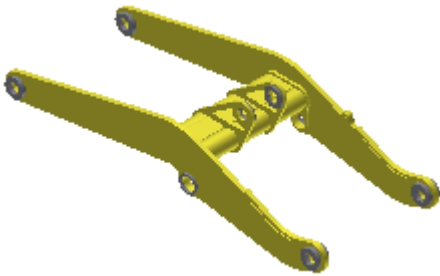


5. When subscription is enabled for your Autodesk 360 account, Autodesk 360 Optimization for Autodesk Inventor will be listed under Other Benefits.

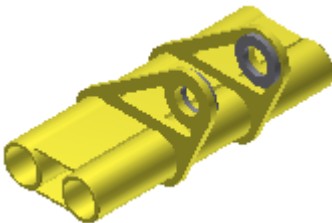


For this exercise, make sure that *PDS2013-Simulation-Optimization.ipj* is set as the active project in Inventor prior to starting the steps.

1. Open *_PK46.25.01.010.iam*.



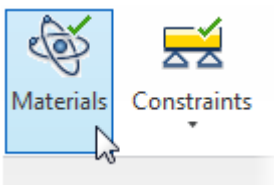
2. In canvas, select the cross subassembly. Right-click. Click Open.



3. On the Environments tab, Begin panel, click Optimization.
4. In the Autodesk - Sign In dialog box:
 - Enter your Autodesk 360 ID.
 - Enter your password.
 - Click Sign In.



5. On the Optimization tab, Optimize panel, click Materials.



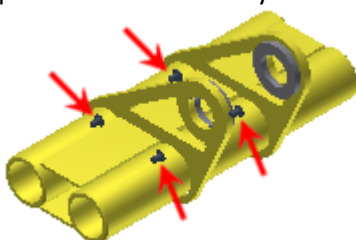
6. In the Materials dialog box:
 - Review the list of components and their original material.
 - In the Override Material column, notice that you have the option to override the material of each component.
 - In the Safety Factor column, notice that you have the option of using Yield Strength or

Ultimate Tensile Strength when determining the Safety Factor.

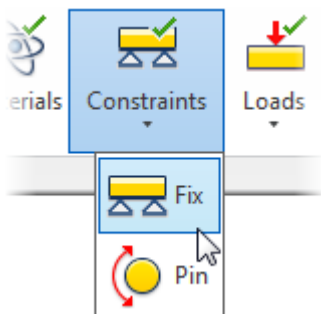
- Click Cancel.

Materials			
Component	Original Material	Override Material	Safety Factor
PK46.25.01.020.iam			
PK46.25.01.005:1	Steel, Mild	(As Defined)	Yield Strength
PK46.25.01.005:2	Steel, Mild	(As Defined)	Yield Strength
PK46.25.01.006:1	Steel, Mild	(As Defined)	Yield Strength
PK46.25.01.006:2	Steel, Mild	(As Defined)	Yield Strength
PK46.25.01.007:1	Steel, Mild	(As Defined)	Yield Strength
PK46.25.01.007:2	Steel, Mild	(As Defined)	Yield Strength
PK46.25.01.009:1	Steel, Mild	(As Defined)	Yield Strength

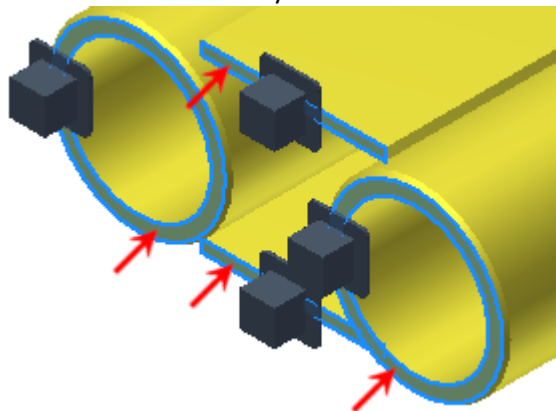
7. In canvas, review the model. Notice that four pin constraints already exist in the design.



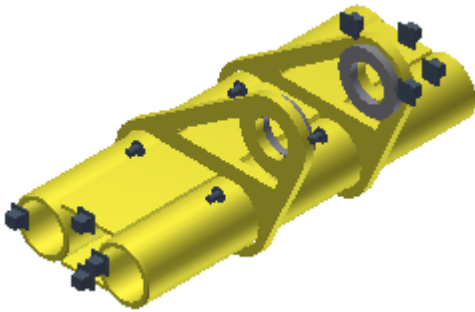
8. On the Optimization tab, Optimize panel, click Constraints > Fix.



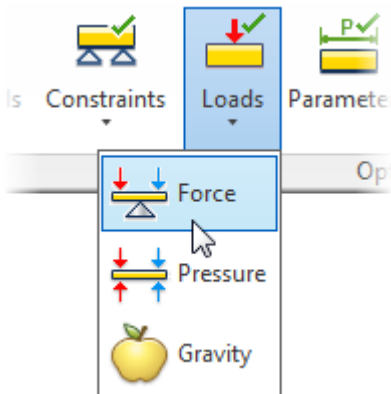
9. To specify which faces on the design are fixed in place, in canvas:
 - Select the identified faces on the end of the assembly.
 - Select the corresponding faces on the other end of the assembly.



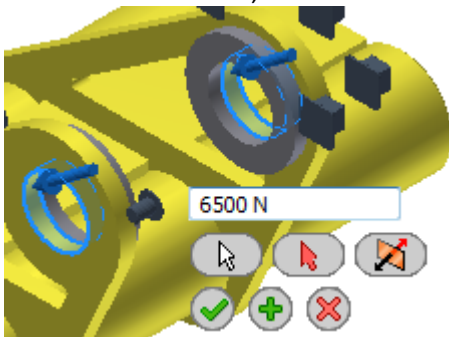
10. After selecting the faces, on the in-canvas toolbar, click OK (green checkmark).



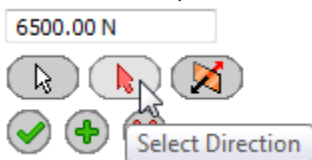
11. On the Optimization tab, Optimize panel, click Loads > Force.



12. To specify the location and amount of force, in canvas:
- Select the inside cylindrical faces as indicated.
 - In the value field, enter **6500 N**.

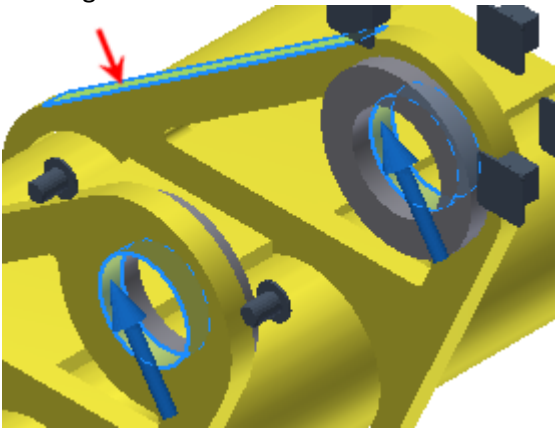


13. To begin to add a force to the part, on the in-canvas toolbar, click Select Direction.

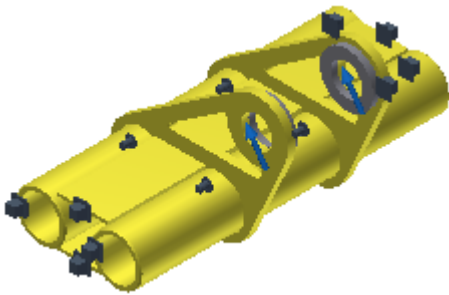


14. To set the direction of the force:

- Select the identified flat face of the part.
- On the in-canvas toolbar, click Flip Direction to get the results as shown.



15. Click OK.



16. On the Optimization tab, Optimize panel, click Parameters.

17. In canvas, select the feature as shown.



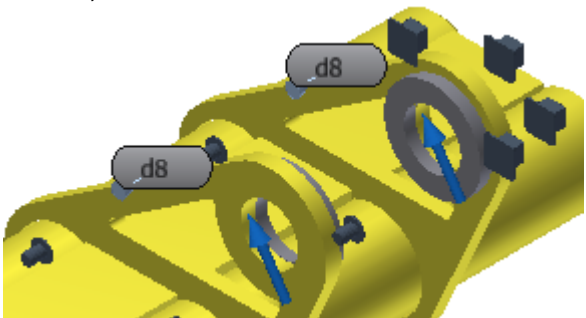
18. Select the check box for the d8 parameter.



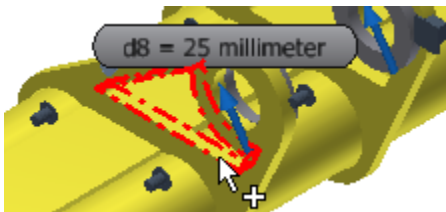
19. To edit the list of possible values that can be used during optimization:
- Click the identified down arrow.
 - Edit the list of parameters so it has values of **12, 14, 20, 25**.
 - Click OK.



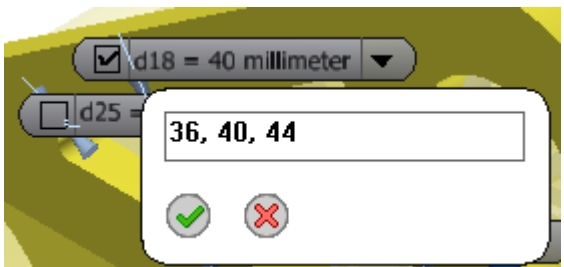
20. To accept this as a parameter with its additional values as one to optimize, on the in-canvas toolbar, click OK.



21. To begin to specify another part parameter from a different feature that can be used during optimization:
- On the Optimize panel, click Parameters.
 - Select the feature as shown.



22. To specify the parameter and review its values:
- Select the check box for the parameter d18.
 - Review the list of parameters.
 - Click OK.



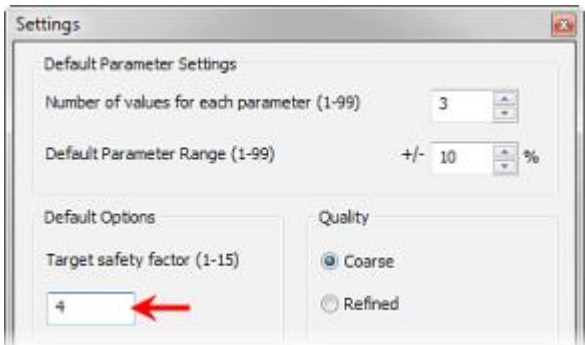
23. On the in-canvas toolbar, click OK.



24. On the Optimization tab, Optimize panel, click Settings.

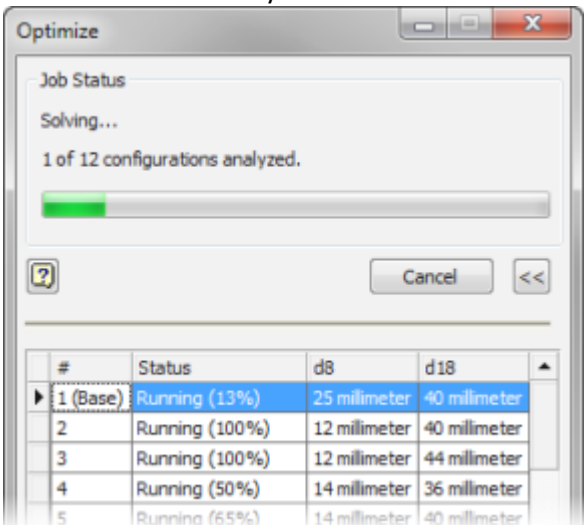
25. In the Settings dialog box:

- Review the values in the Default Parameter Settings area. These settings controlled how many numbers were initially listed for a selected parameter and their value.
- In the Target Safety Factor field, enter 4.
- Click OK.

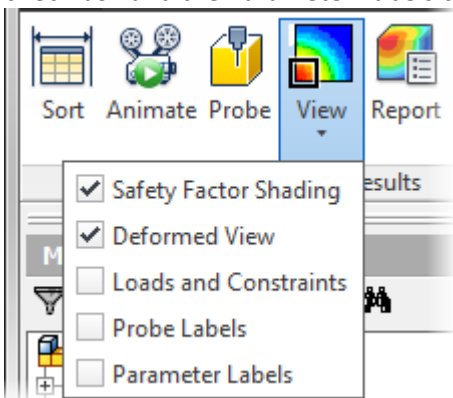


26. On the Optimization tab, Optimize panel, click Optimize.

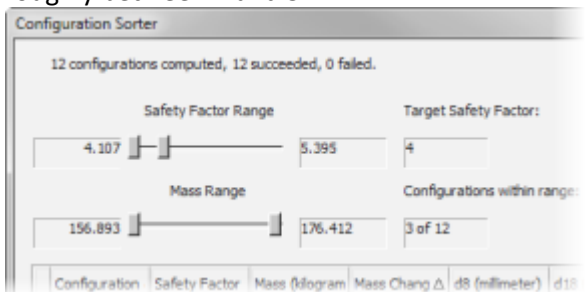
27. In the Optimize dialog box, in the Job Status area, notice that 12 configurations are being analyzed using the computing power of the cloud. The time to complete the calculation will vary. In the video it took approximately 5 minutes before the results were calculated and downloaded and ready to be reviewed.



28. To adjust the information that is shown in canvas, on the Optimization tab, Results panel, in the View list, clear the Loads and Constraints check box and the Parameter Labels check box.



29. To begin to narrow the list of optimized iterations to those that fall within a set safety factor, on the Optimization tab, Results panel, click Sort.
30. In the Configuration Sorter dialog box, under Safety Factor Range, drag the right slider to the left approximately as shown. The range is roughly between 4 and 5.



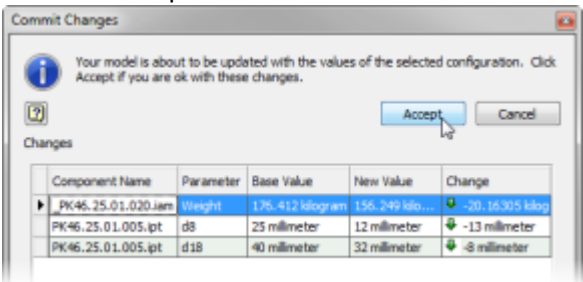
31. Review the list of configurations within the range. Of the twelve configurations analyzed, three have a safety factor within this range. Notice that one is labeled as the optimal configuration. That configuration uses 12 mm thick plate stock, weighs 11% less than the original design, and still has a safety factor in the range of 4.

Configuration	Safety Factor	Mass (kilogram)	Mass Change Δ	d8 (millimeter)	d18 (millimeter)
1 (Base)	9.384	176.412	0.0%	25	40
12 (Optimal)	4.107	156.893	↓ 11.1%	12	36
2	4.826	157.492	↓ 10.7%	12	40
4	4.807	159.704	↓ 9.5%	14	36

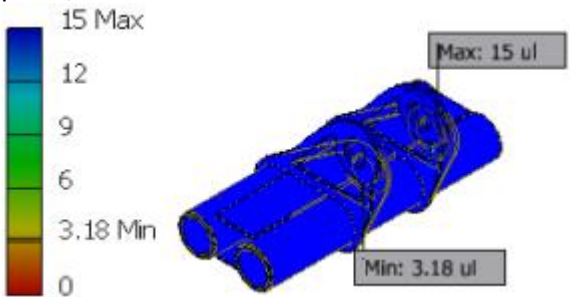
32. With the optimal configuration selected in the list, click Commit.

33. In the Commit Changes dialog box:

- Review the list of changes that will take place.
- Click Accept.

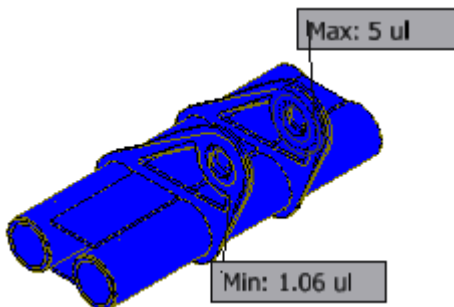


34. To begin to review the analysis results for this revised part, on the Optimization tab, Optimize panel, click Results.



35. To view an animation of the analysis results:

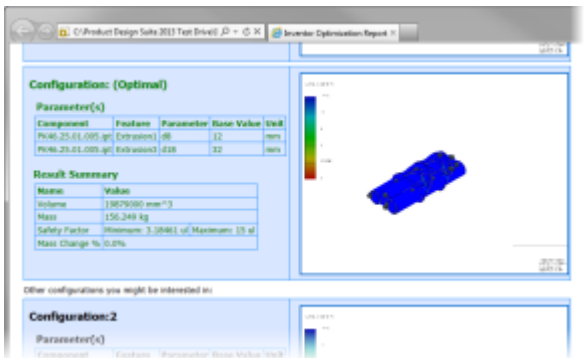
- To start the animation, on the Results panel, click Animate.
- As the animation is playing, review the change in the minimum and maximum safety factor values and the magnified distortion of the part.
- To stop the animation, on the Results panel, click Animate.



36. To generate an HTML report of the optimization and analysis, on the Results panel, click Report.

37. In the Optimization message box, click Yes.

38. In your web browser, review the report information.



39. Click an image in the report to see a larger view of it.

40. Close the web browser.

41. On the Optimization tab, Exit panel, click Finish Optimization.

42. Close all files. Do not save changes.