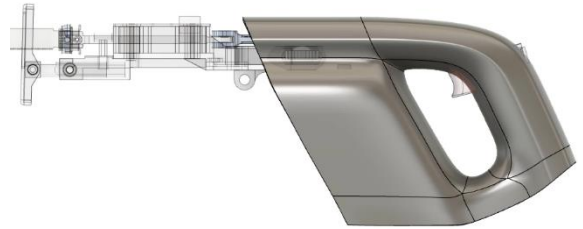


Refine and complete a form body

In this module, you'll use several tools to modify a form body before converting into solid geometry.

Learning objectives:

- Use Flatten.
- Use Mirror.
- Use Thicken.



The completed exercise

1. Continue with the *trigger with mechanics.f3d* file from the previous module.



Figure 1. Continue with the file from the previous module

2. In general, it is a good idea to use the fewest number of faces you need to create the geometry you want. However, sometimes additional faces need to be added to create details. Double-click the edge shown in the image on the right to select the entire edge loop.

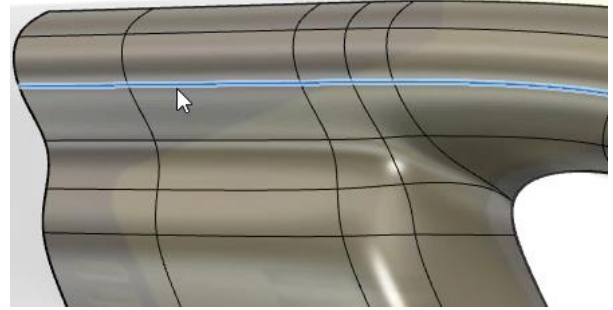


Figure 2. Select the edge loop

3. Click Modify > Insert Edge and use the on-screen manipulator to add the new edge close to the original edge. OK the Insert Edge dialog.

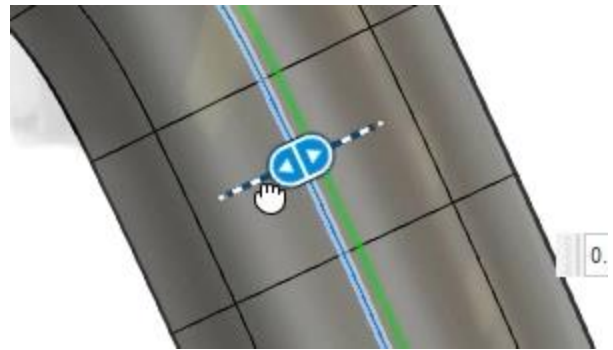


Figure 3. Insert a new edge loop

4. Rotate the model and notice that the transition turns more sharply because of the new edge that you added.

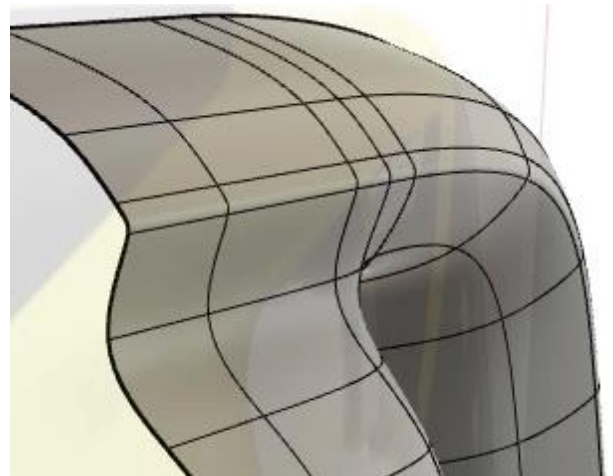


Figure 4. Inspect the result

5. Press Alt+1 to enter Box Display mode and note the faces' geometry. If you want to customize the new edges, the Edit Form tool can be used to customize the geometry.

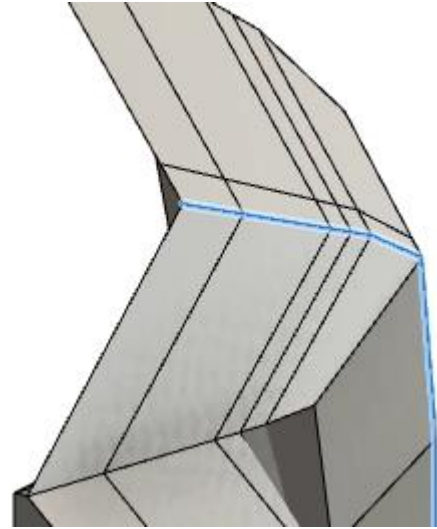


Figure 5. Inspect the form and Box Display mode

6. Select the edge loop shown in the image on the right, then click Modify> Insert Edge.

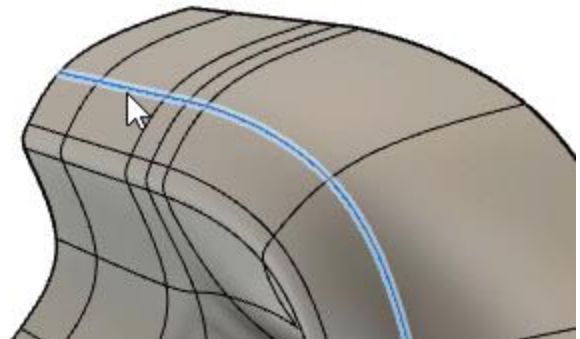


Figure 6. Open the Insert Edge tool

7. Use the on-screen manipulator to position the new edge loop close to the original edge loop. OK the Insert Edge dialog.



Figure 7. Position the new edge loop

8. Inspect the new edge and adjust the geometry if you want to further refine the geometry.

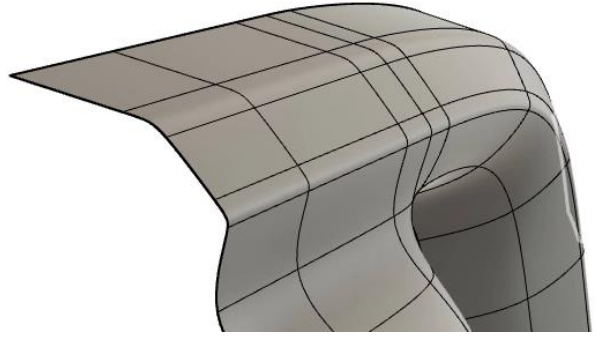


Figure 8. Inspect the result

9. If you decide that you don't like the new look, double-click the edge to select the entire edge loop and press Delete to remove it.

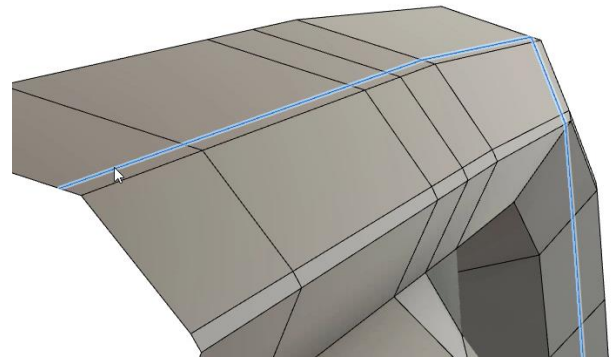


Figure 9. Delete the new edge

- 10.** Select the six edges shown in the image on the right, then click Modify> Insert Edge.

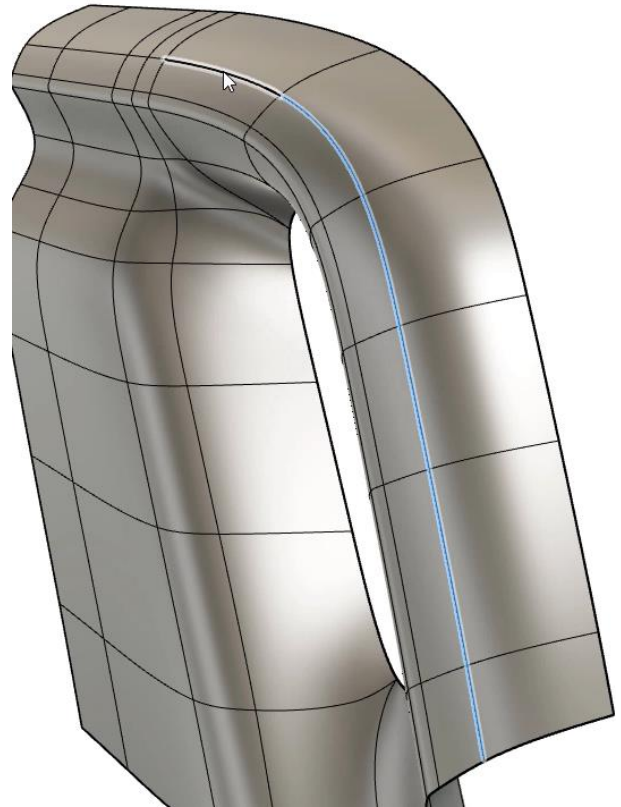


Figure 10. Select six edges

- 11.** Use the on-screen manipulator to position the new edge loop close to the original edge loop. OK the Insert Edge dialog.

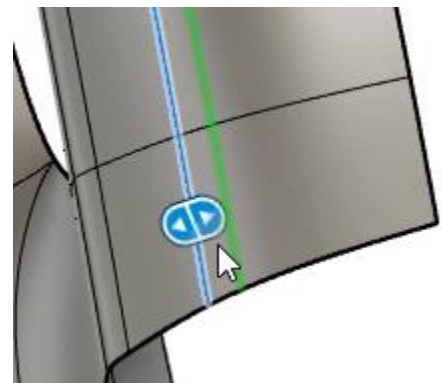


Figure 11. Position the new edge loop

12. Notice that the casing's ridgeline gradually dissolves into the casing's top section.

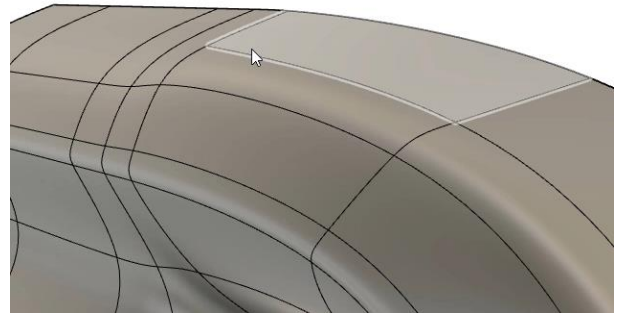


Figure 12. Inspect the result

13. Select the two edges shown in the image on right, then open the Insert Edge tool.

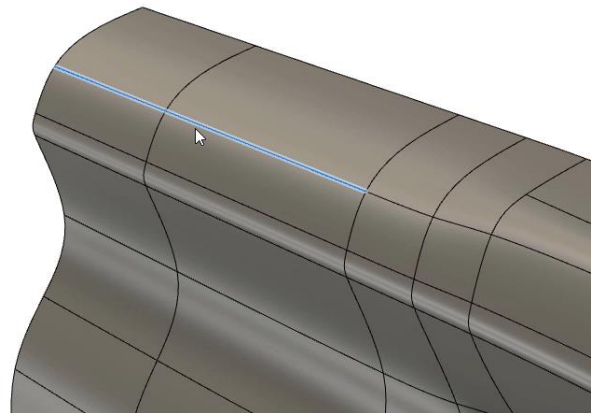


Figure 13. Select two edges and open the Insert Edge tool

14. Position the new edge loop close to the original edge loop.

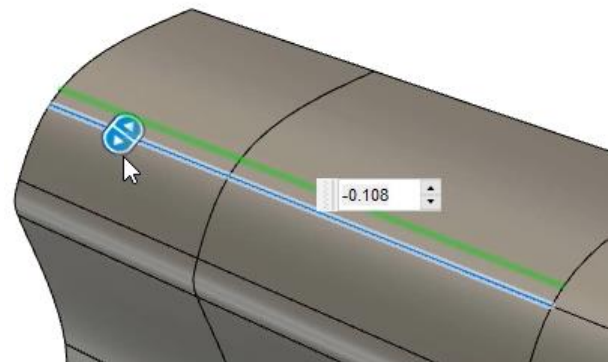


Figure 14. Position the new edge loop

15. Click Modify> Insert Point and select the two vertices shown in the image on the right. This will join the two ridges together. OK the Insert Point dialog.

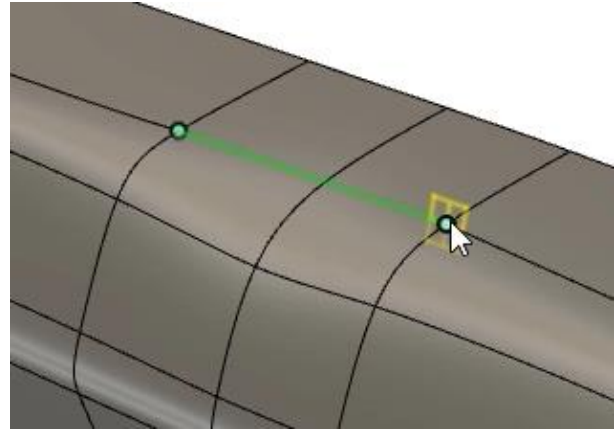


Figure 15. Use the Insert Point tool

16. The options in the Display Settings menu at the bottom of the window can be used to help assess your progress. For example, the edges can be hidden by clicking Display Settings> Visual Style> Shaded. After you finish exploring the various options, press Ctrl+6 to return to the Shaded with Visible Edges Only visual style.

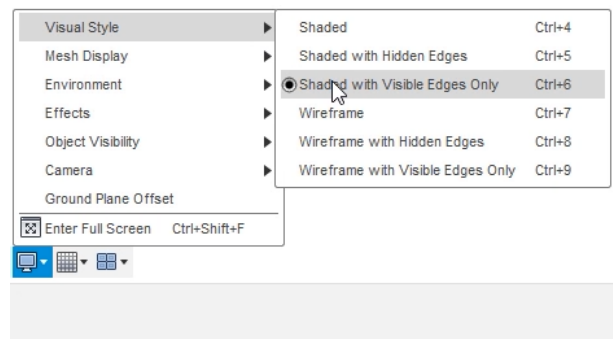


Figure 16. Explore various visual styles

17. Continue to refine the casing's form, then click Symmetry> Mirror - Duplicate.

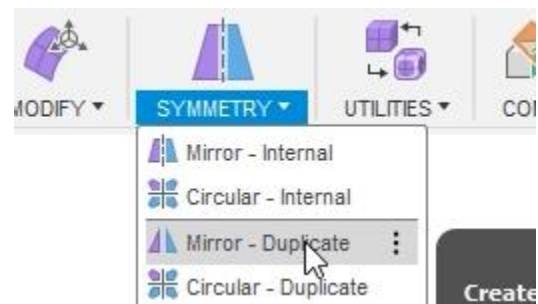


Figure 17. Open the Mirror - Duplicate tool

- 18.** Select the form body as the dialog's T-Spline Body selection, then choose the XY plane as the dialog's Mirror Plane selection.

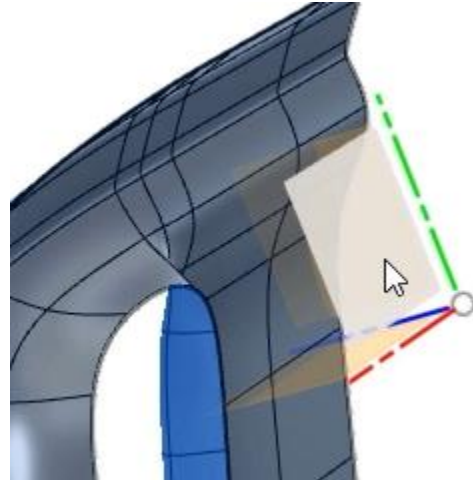


Figure 18. Choose the body and the mirror plane

- 19.** Rotate the model to inspect the result. Press Alt+3 and notice that the model cannot be viewed in the Smooth Display mode.

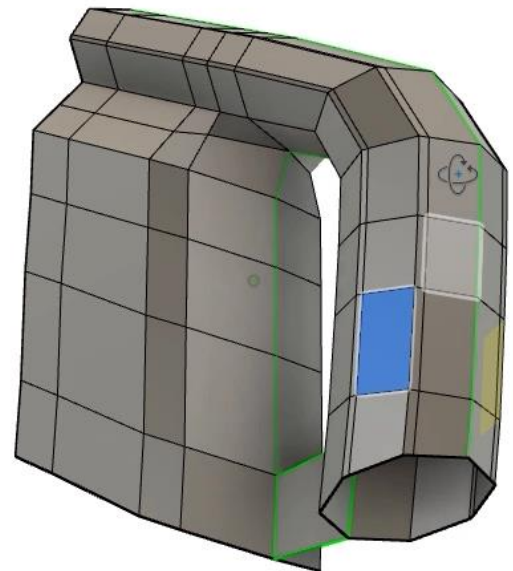


Figure 19. Inspect the result

20. The vertex shown in the image on the right needs to be adjusted.

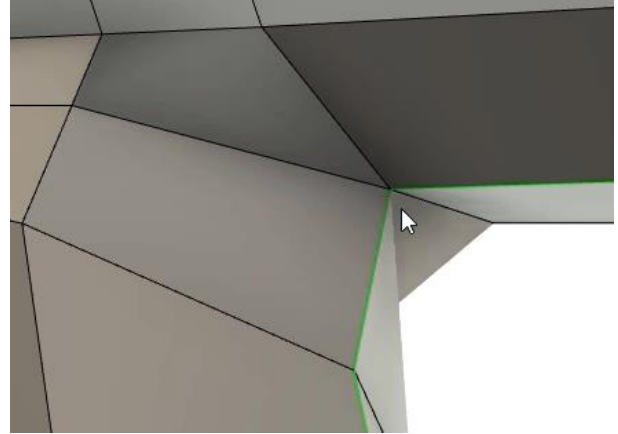


Figure 20. Note the problematic geometry

21. Open the Insert Point tool and choose the two vertices shown in the image on the right as the dialog's Insertion Point selections. OK the Insert Point dialog.

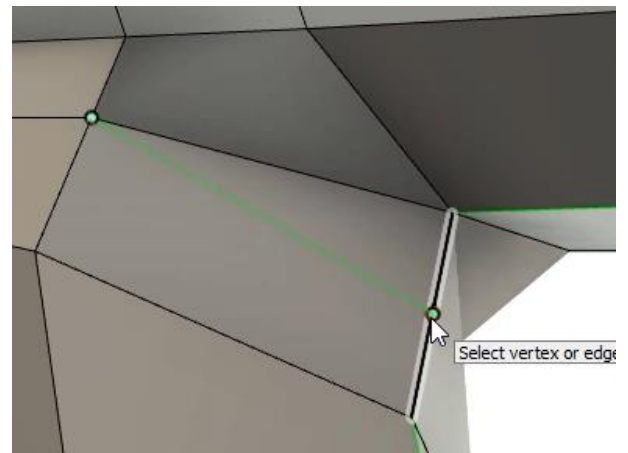


Figure 21. Open the Insert Point tool and choose two vertices

22. Select the edge shown in the image on the right, then press Delete.

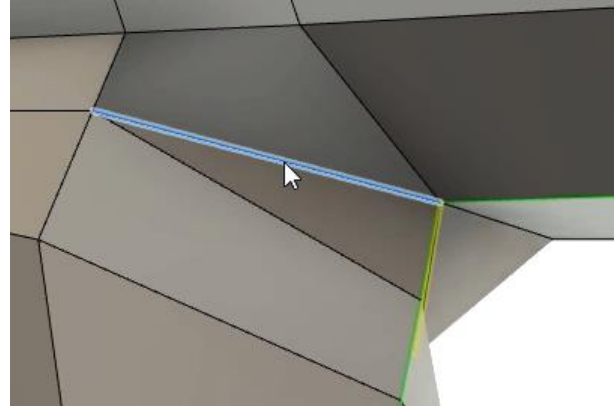


Figure 22. Delete an edge

23. Open the Insert Point tool and create the edge shown in the image on right.

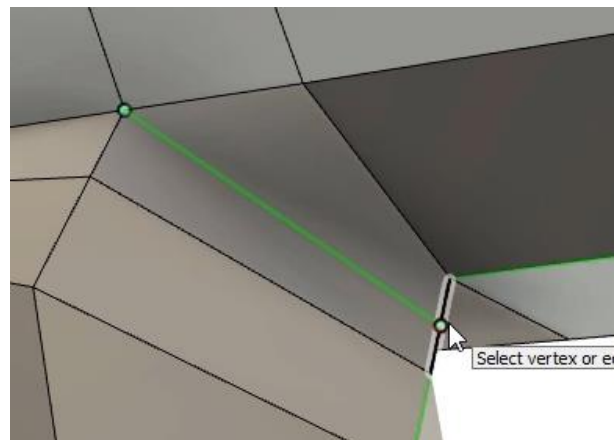


Figure 23. Use the Insert Point tool to create a new edge

24. If the body is not able to be viewed in the Smooth Display mode, click Utilities> Repair Body.



Figure 24. Open the Repair Body tool

25. Select the form body as the dialog's T-Spline Body selection, then activate the AutoRepair option. OK the Repair Body dialog.

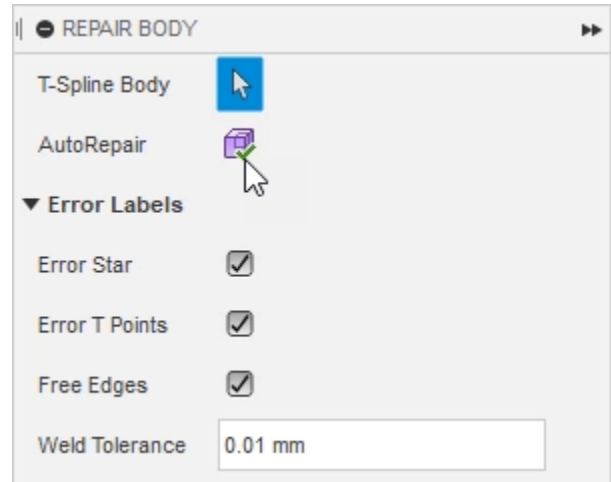


Figure 25. AutoRepair the form body

26. The face shown in the image on the right is another issue that needs to be resolved; select the face and press Delete.

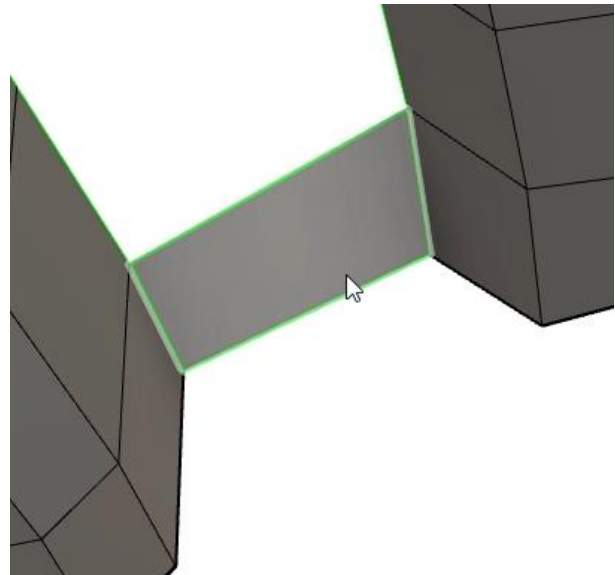


Figure 26. Delete the face

27. After the face is deleted, you should be able to view the model in the Smooth Display mode. Press Alt+1 and Alt+3 to toggle between Box Display and Smooth Display modes.

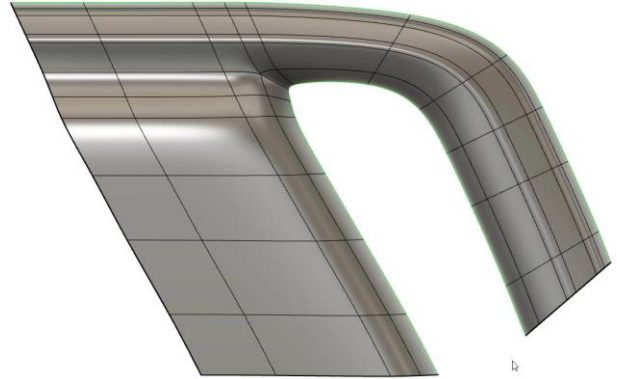


Figure 27. Inspect the result

28. Click Modify> Bridge, then choose the two faces shown in the image on the right as the dialog's Side 1 selection.

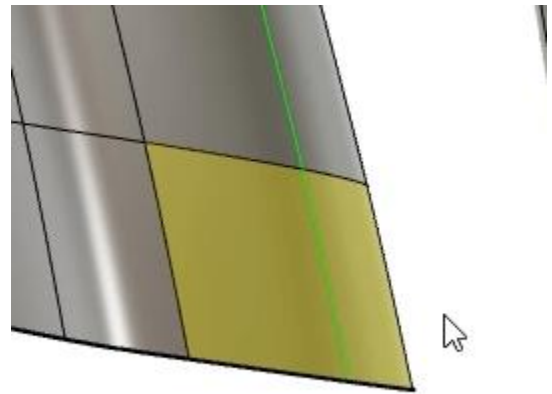


Figure 28. Choose the Side 1 selection

29. Choose the two faces shown in the image on the right as the dialog's Side 2 selection.

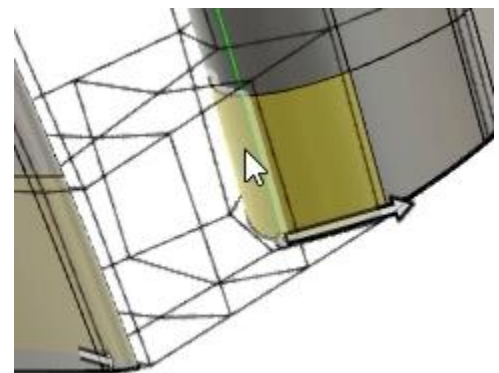


Figure 29. Choose the Side 2 selection

30. Reduce the Faces value to **1**, then OK the dialog.

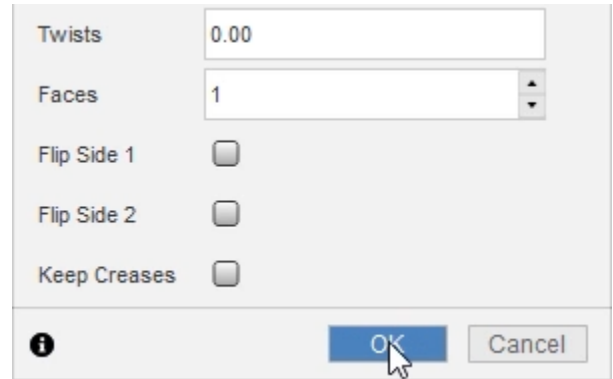


Figure 30. Create the bridge

31. Inspect the result. The two bottom faces are not needed; select them and press Delete.

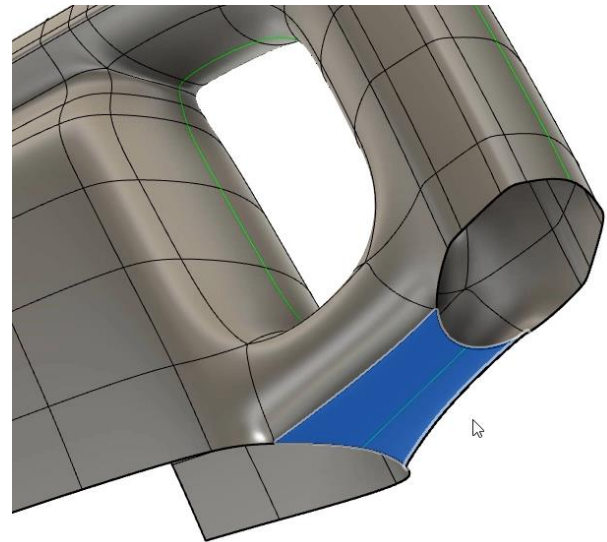


Figure 31. Inspect the result

32. Notice that five edges come together to form a star point. This star point should be moved to a new location so that does not coincide with a changing curvature.

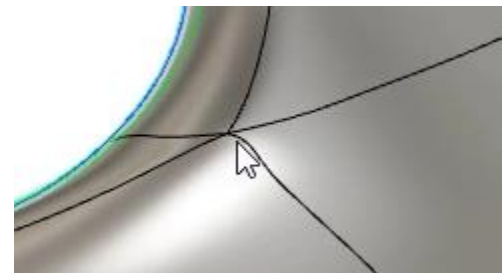


Figure 32. Identify star points

- 33.** Open the Insert Edge tool and use it to insert a new edge similar to the image on the right.

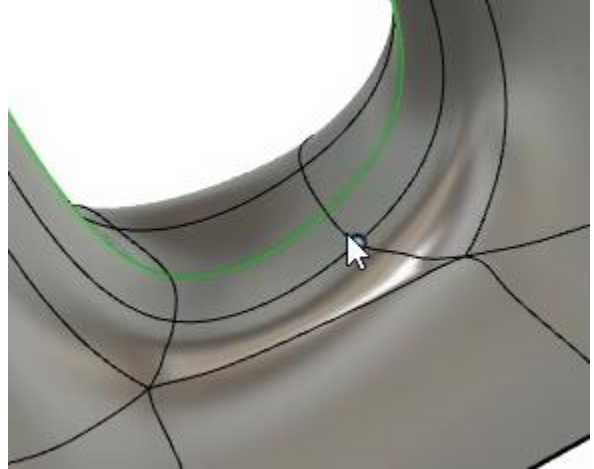


Figure 33. Insert a new edge

- 34.** Double-click the edge loop shown on the image on the right, then use the Edit Form tool's scale function to scale it inwards.

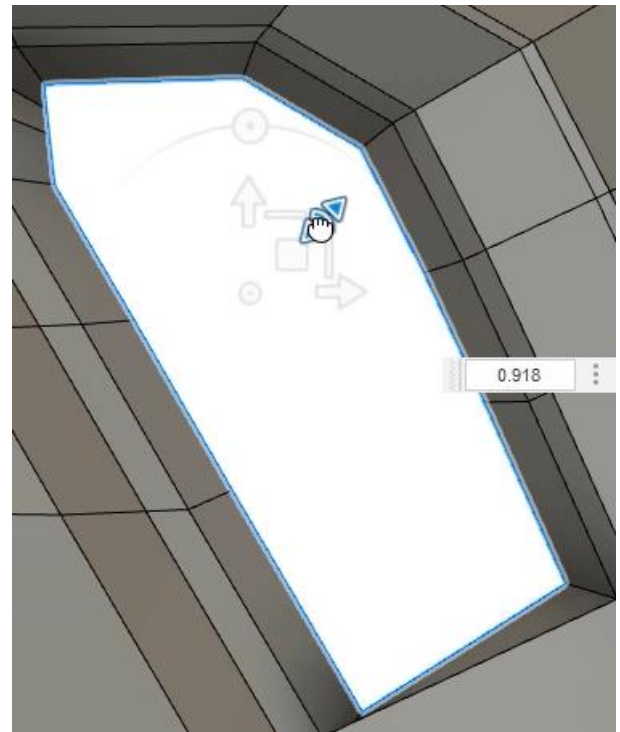


Figure 34. Scale the edge loop

- 35.** Continue to use the Edit Form tool's translate, rotate, and scale functions to smooth the transitions between the faces.

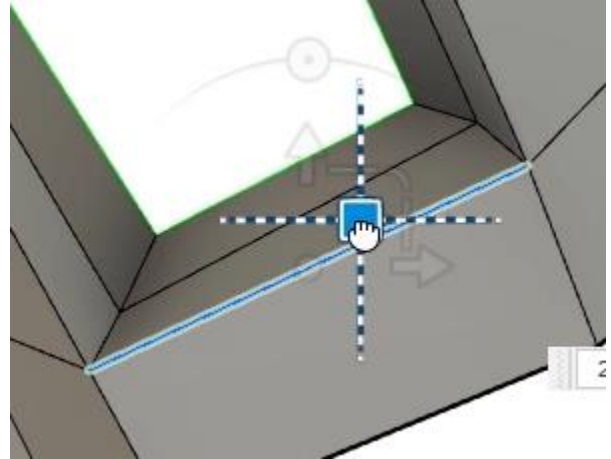


Figure 35. Adjust the geometry to create smoother transitions

- 36.** Periodically check your progress by toggling between Box Display and Smooth Display modes.

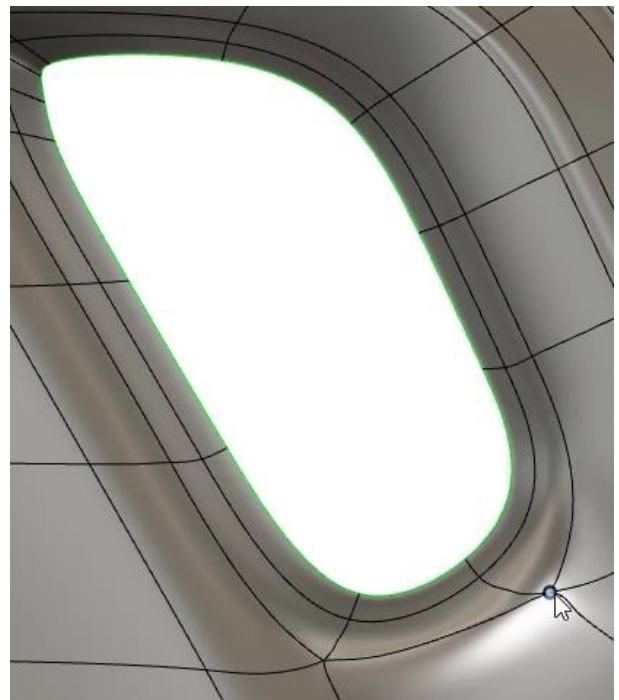


Figure 36. Check your progress in Smooth Display mode

37. Select the edge loop shown in the image on the right, then open the Insert Edge tool.

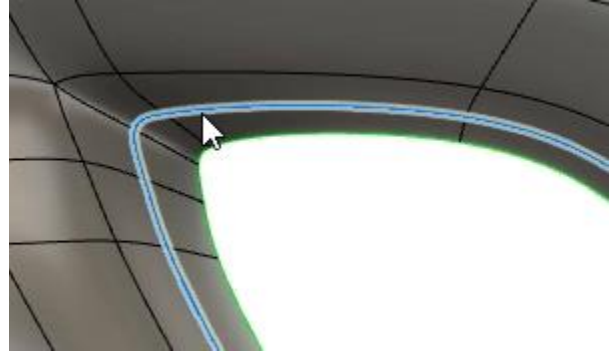


Figure 37. Open the Insert Edge tool

38. Choose the Exact option from the dialog's Insertion Mode menu. OK the dialog and notice that Fusion 360 was able to maintain the exact shape while it added to the new edge. Fusion 360 adds any additional edges needed to maintain the original shape. Undo this Insert Edge feature.

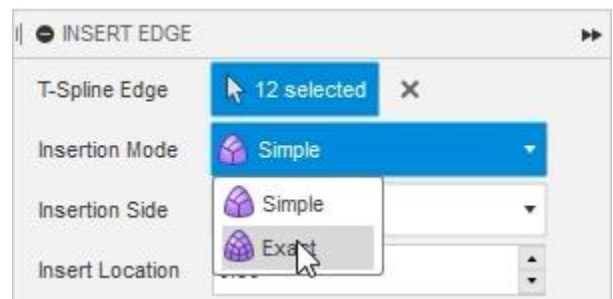


Figure 38. Choose the Exact mode

39. Click Modify > Flatten.

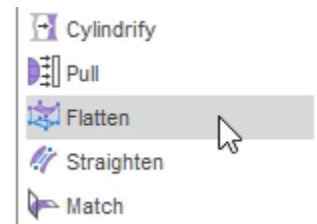


Figure 39. Open the Flatten tool

40. Select the vertices shown in the image on the right, then OK the dialog. The vertices' positions are averaged and the vertices are moved.

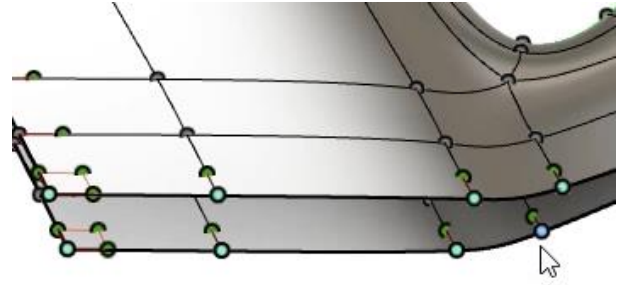


Figure 40. Use the Flatten tool

41. The form body can be converted into solid geometry by thickening it either in the Design workspace or in the Form environment. Click Modify> Thicken.



Figure 41. Open the Thicken tool

42. Select the form body as the dialog's T-Spline Body selection, then enter **2 mm** into the Thickness box. OK the Thicken dialog to thicken the form body.

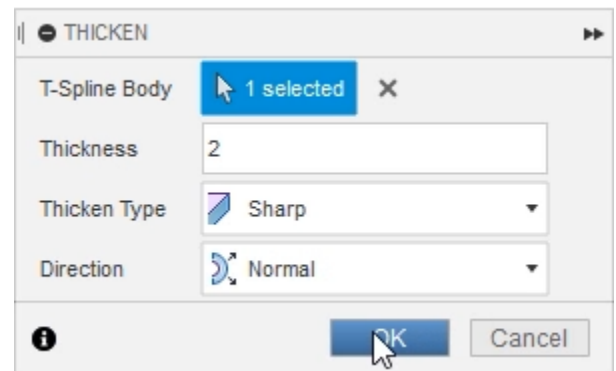


Figure 42. Thicken the form body

43. Inspect the result and notice that the form body now has a consistent 2 mm wall thickness. One of the advantages to thickening the form body inside the form environment is that you can individually control the faces, edges, and vertices on the inside and outside of the thickened body.

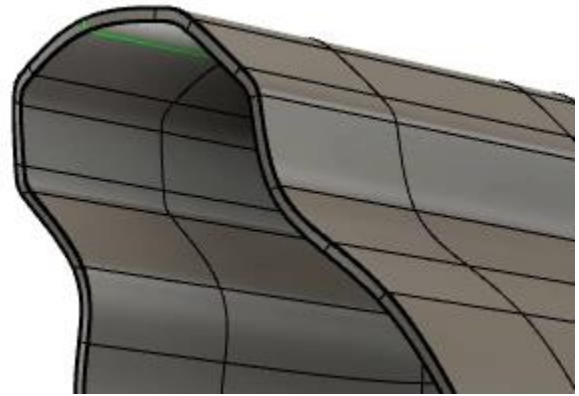


Figure 43. Inspect the result

44. To convert the thickened the form body into a solid body, click Finish Form> Finish Form.



Figure 44. Exit the form environment

45. The second form body is converted to a solid body and is added to the Saw Casing component's Body's folder.



Figure 45. Inspect the solid body

46. If you need to modify the form body, right-click the timeline's Form feature and choose Edit.

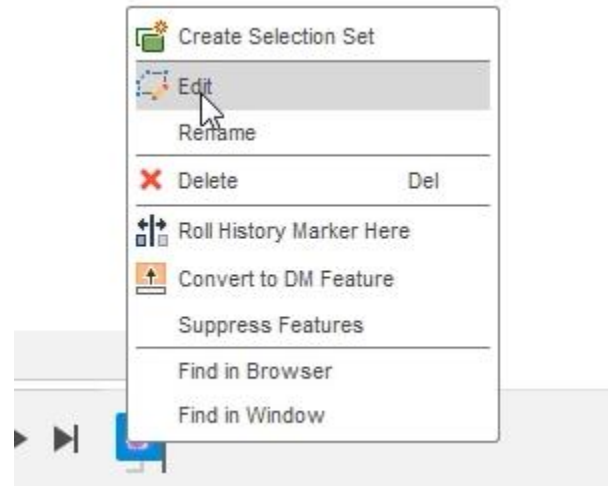


Figure 46. Edit the form body

47. Finish the form body by clicking Finish Form> Finish Form, then use the Browser to turn on the visibility for the Internal_Mechanics and Trigger Model components.

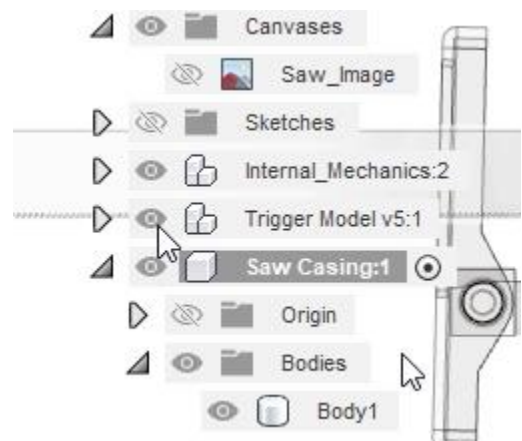


Figure 47. Show the design's components

48. Note that the design needs to be modified slightly so that the mechanics don't pass through the casing. Save the file and continue to the next module.

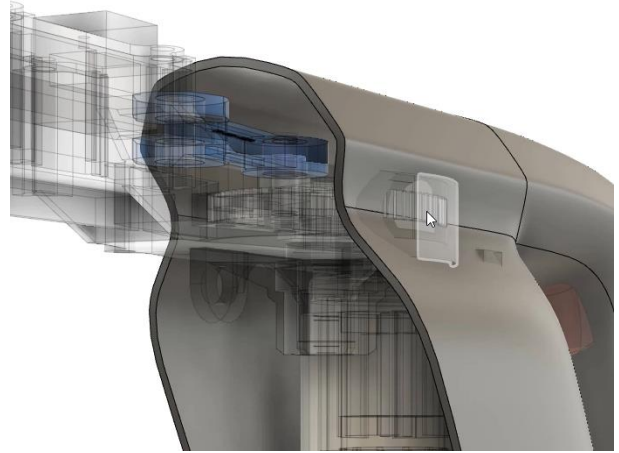


Figure 48. Inspect the result