PowerSHAPE 2016 R1

Tutorials Manual

Surface Modelling

PowerSHAPE 2016 R1. Published on 15 July 2015

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Surface Modelling Tutorial

Saving a project file

1. Import the model

1   If you are not already running **PowerMILL,** double click on the PowerMILL icon shown below to run the program.

2   Click **File.**

3   Click **Import Model.**
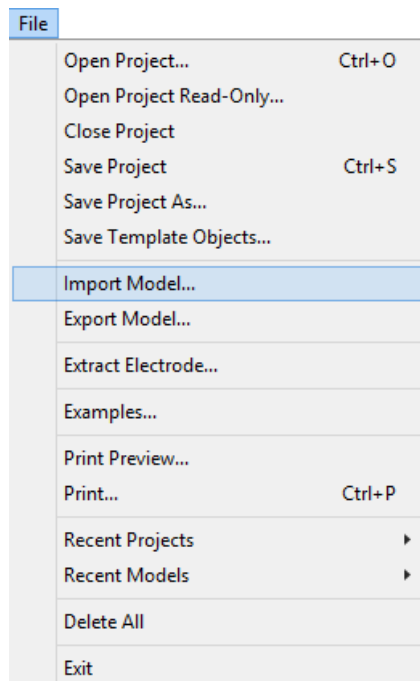
The **Import Model** dialog is displayed.

4   Browse to the following file:

***\PS-TutorialsXXXXX\common_files**

pmill\s_mod\dgk\surface_modelling.dgk

where XXXXX is the version number of the PS Tutorials and * is the drive on which PS Tutorials is installed.

5   Click **Open**.

6   Click **Resize to Fit** .

7   Click **View ISO4** .

2. Save a project

1   Click **File**.

2 Click **Save Project As..**

```
File
    Open Project...                    Ctrl+O
    Open Project Read-Only...
    Close Project
    Save Project                       Ctrl+S
    Save Project As...
    Save Template Objects...
    Import Model...
    Export Model...
    Extract Electrode...
    Examples...
    Print Preview...
    Print...                           Ctrl+P
    Recent Projects                    ▶
    Recent Models                      ▶
    Delete All
    Exit
```
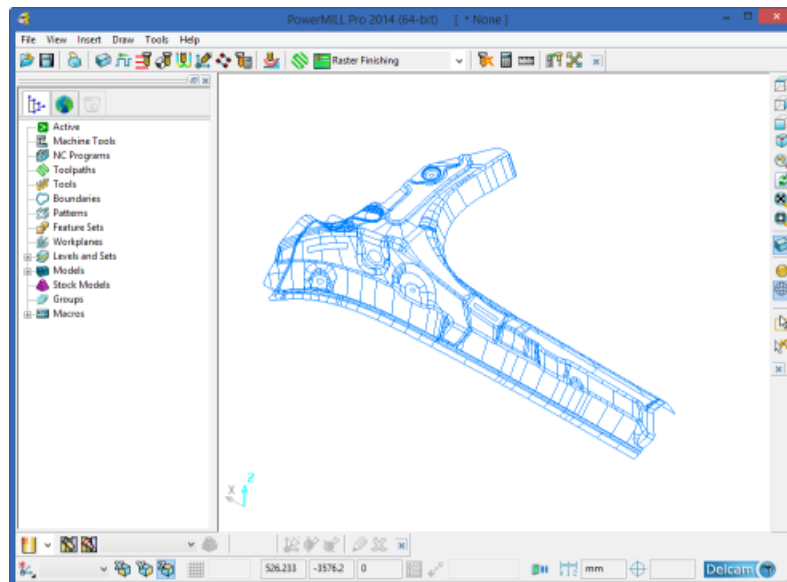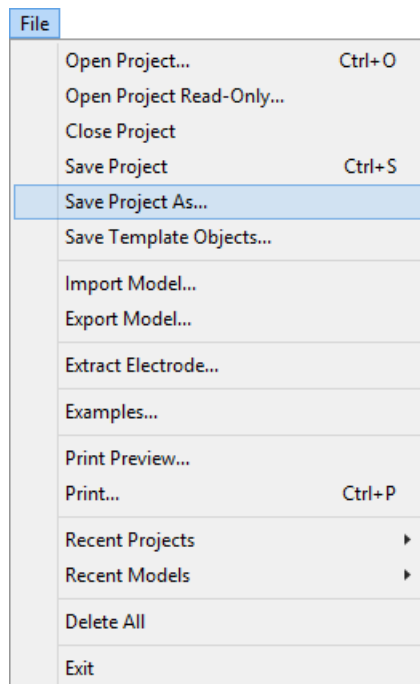
3 Enter **pmillexample** for the name of the project.

4 Click **Save**.

Using surface modelling

3. Start surface modelling

1 From the tree browser click ⊞ to expand **Models**.

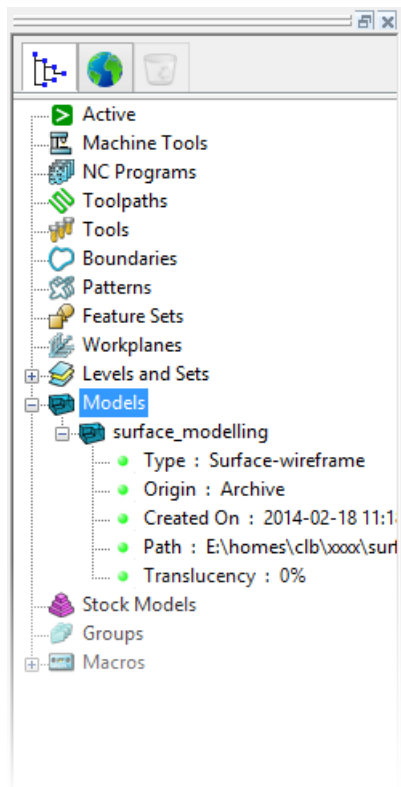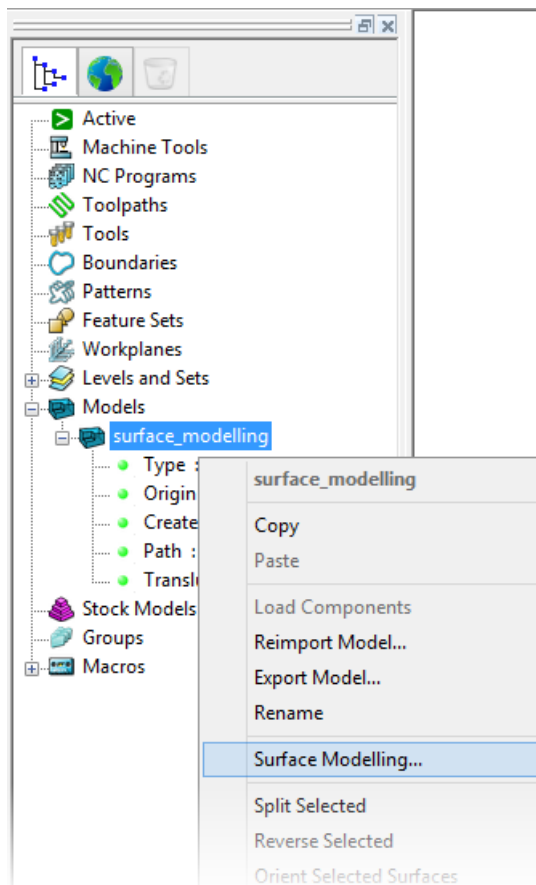**2** The tree should look like the image shown below:

3 Right mouse button click on **surface_modelling**

4 Click **Surface Modelling...** on the popup menu.

5 Click **Yes**.

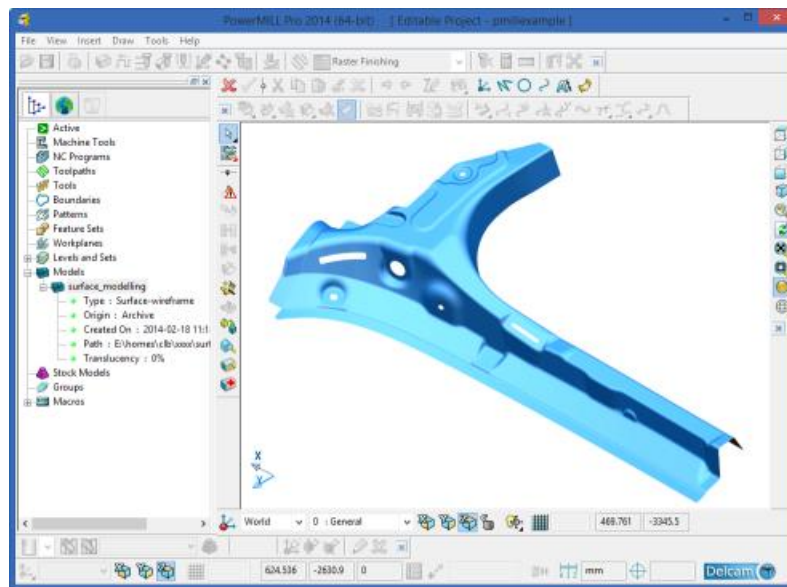The model will now be transferred into the surface modeller.

6 Click **View ISO4** .

7 Click **Shaded View** .

8 Click **Resize to Fit** .

9 Click anywhere in the graphics window to deselect the model.

The model is displayed in the graphics window, shown in the image below:
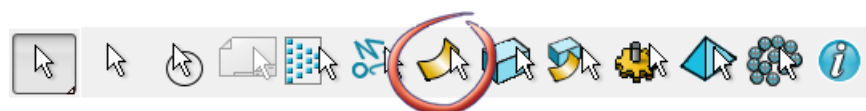

Fixing undercut areas

4. Check for badly trimmed surfaces

1 Click **Select** using the right mouse button.
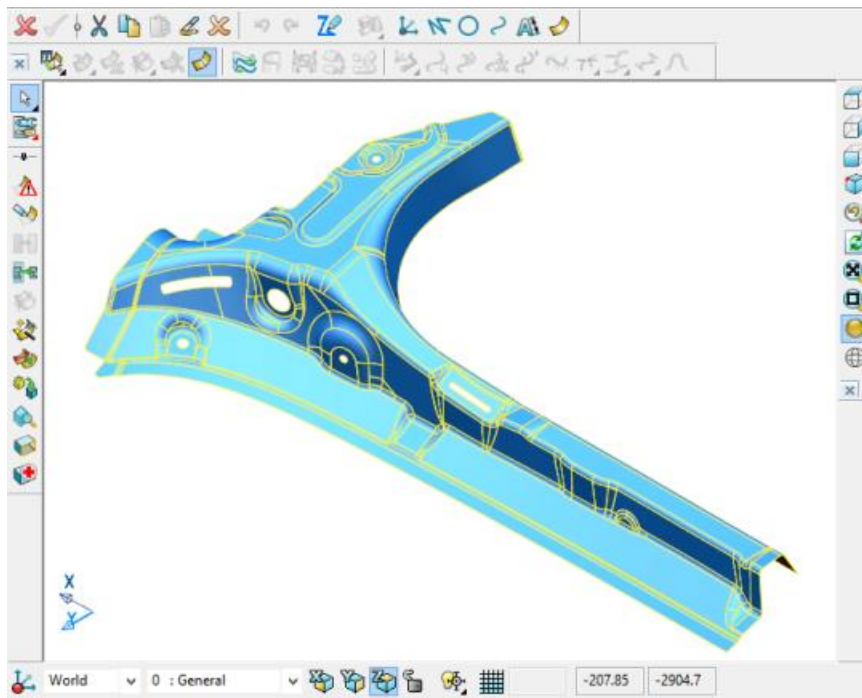
The **Selection** flyout is displayed.

2

3 Click **Quick select all surfaces** .

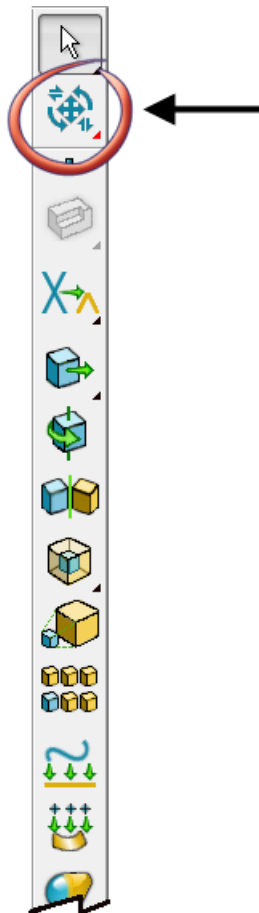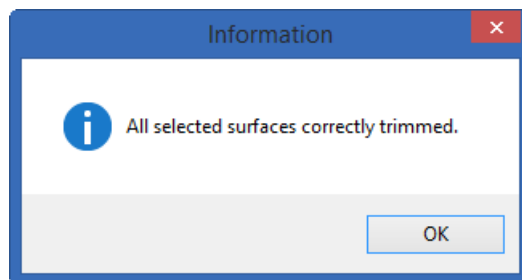The surfaces on the model are selected.

4 Click **Show General Edits Options** using the right mouse button.

The **General Edits** options flyout is displayed.

5   Click **Show the model fixing options** .

The Model Fixing toolbar is displayed.

6 Click **Identify Badly Trimmed Surfaces** .

Information

All selected surfaces correctly trimmed.

OK
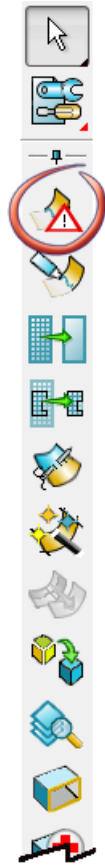
7 Click **OK**.

There are no badly trimmed surfaces in the model.
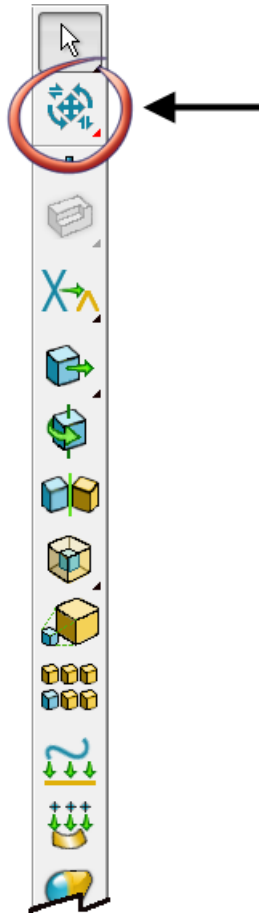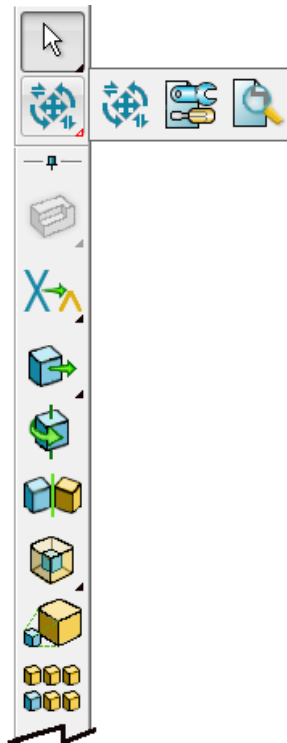
5. Check the model for undercuts

1   Click **Show General Edits Options** using the right mouse button.

The **General Edits** options flyout is displayed.

2   Click **Show the model analysis options** .

The model analysis toolbar is displayed.

3 Click **Undercut shading** .

The shading of the model changes.

The shading now displays all areas of the model where there are undercuts that cannot be machined correctly.
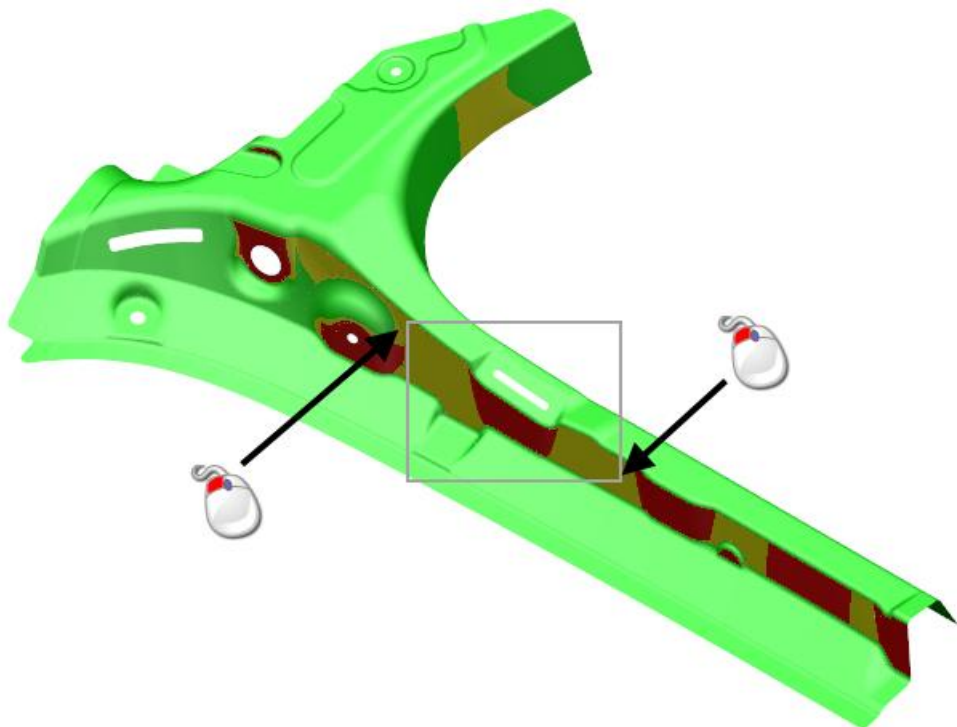
OK

Borderline OK

Undercut - NOT OK

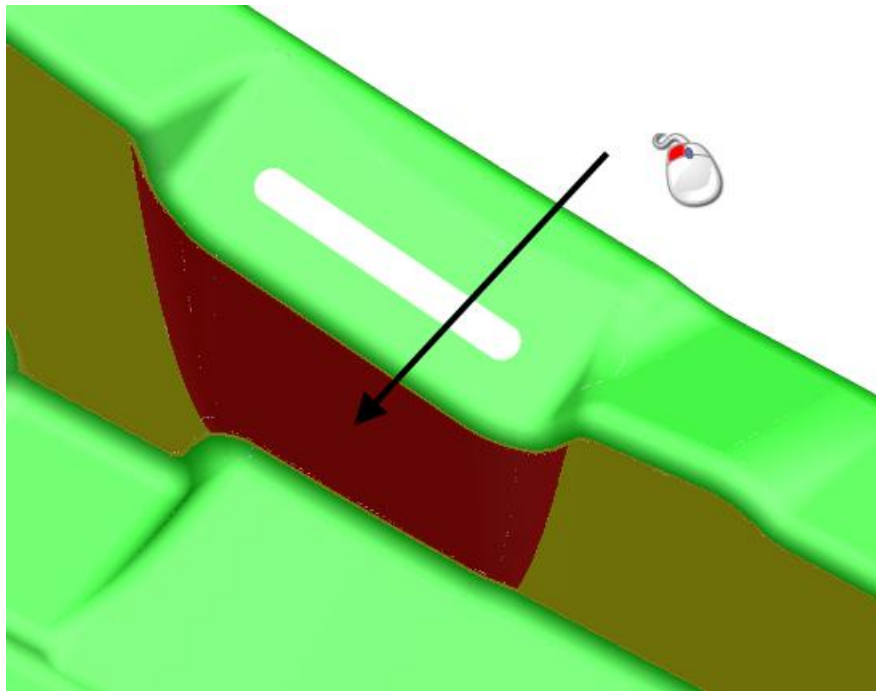The shading scheme can be seen on the image shown below:

4 Click **Zoom to box Mode** .

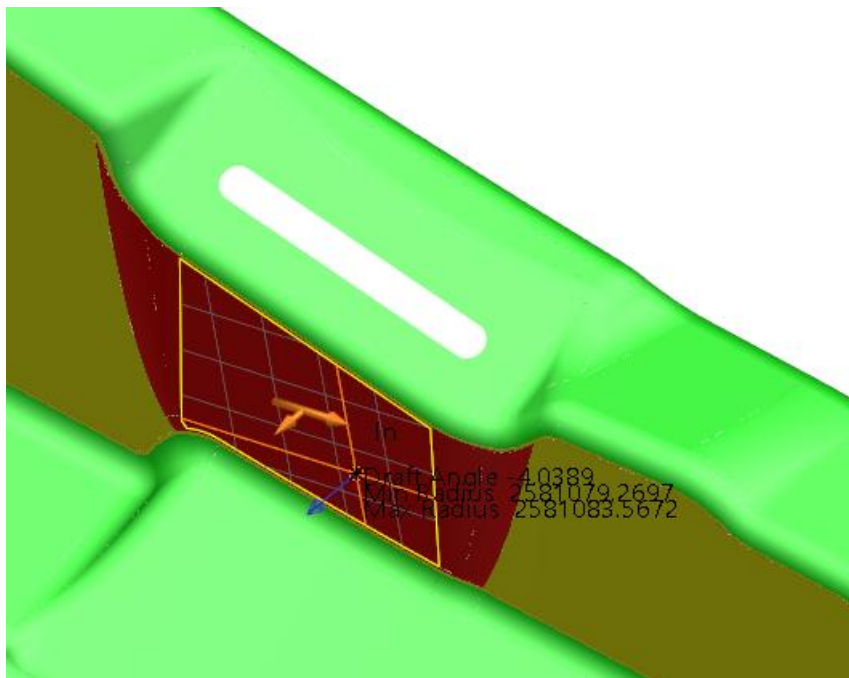Click the left mouse button and drag a box, as shown:

5 Click the surface in the undercut area to select it.

6 Click **Toggle Surface Inspection mode** .

7 Click on the surface again to see the **Draft Angle** of the surface.

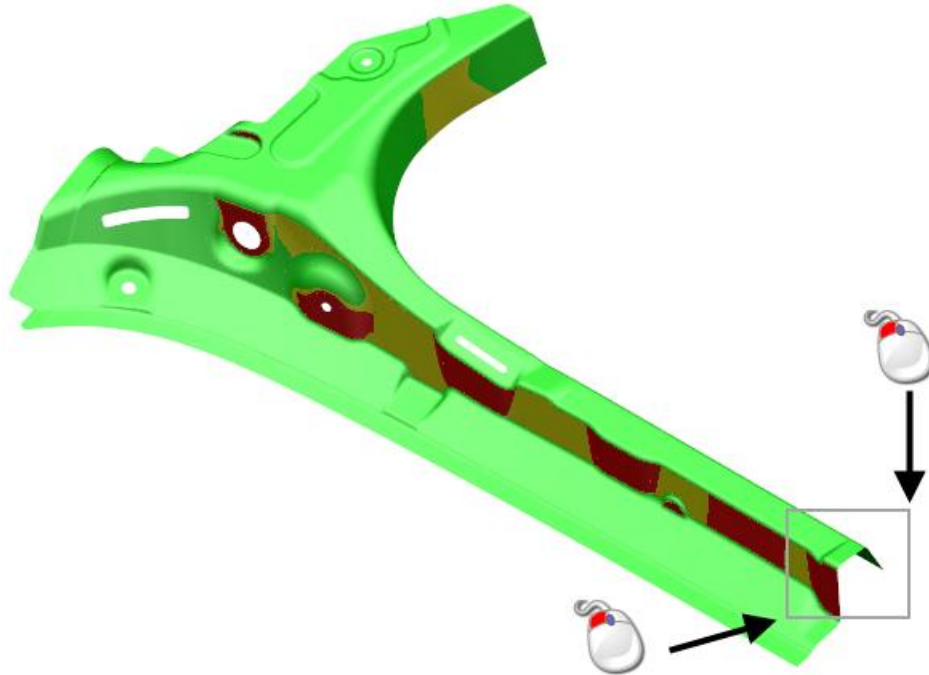**8** Click **Toggle Surface Inspection mode** .

9 Click anywhere in the graphics window to deselect the model.
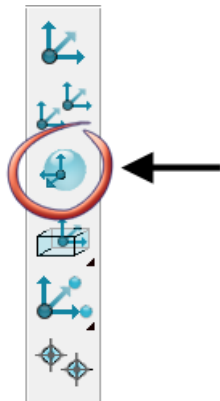
10 Click **Resize to Fit** .

6. Fix the undercut areas

1 Click **Zoom to box Mode** 🔍.

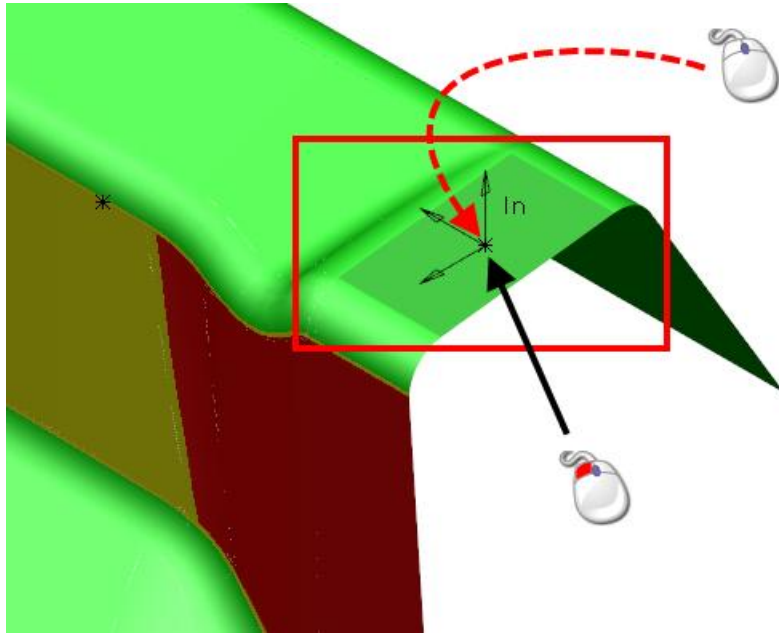**2** Click the left mouse button and drag a box, as shown:

3 Click **Workplane** ⬏.

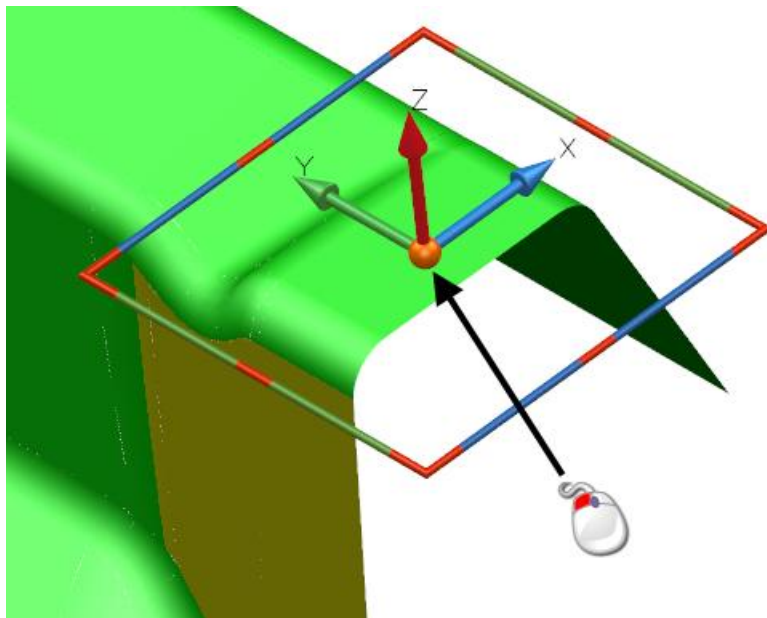**4** Click **Single workplane aligned to geometry** ⬤.

5 Move the cursor over the surface shown below.

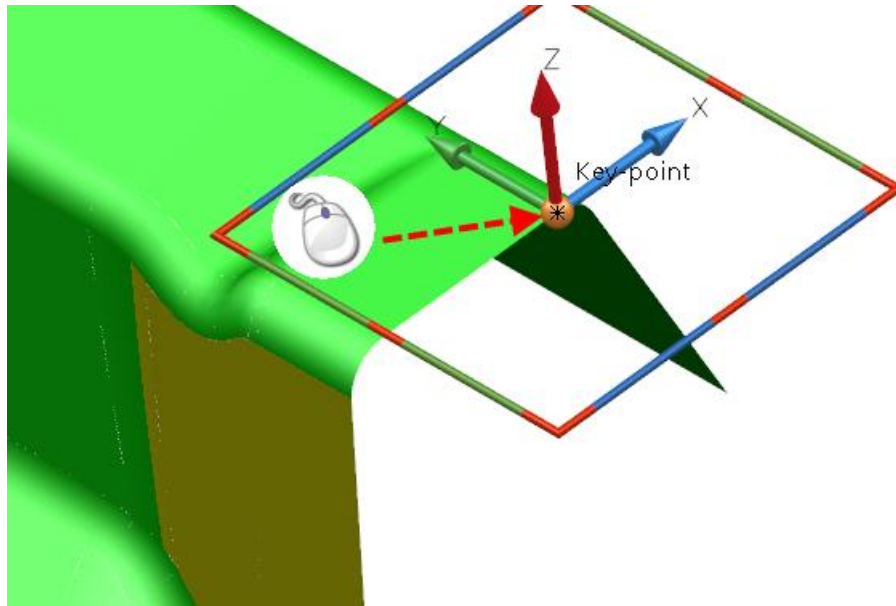**6** when *In* displays, click to position the workplane on the surface.

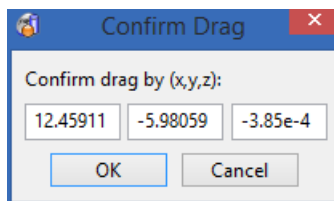**7** Click again on the centre of the workplane and hold down the left mouse button.

8 Drag the workplane to the right corner, shown in the image below, until *Keypoint* displays.
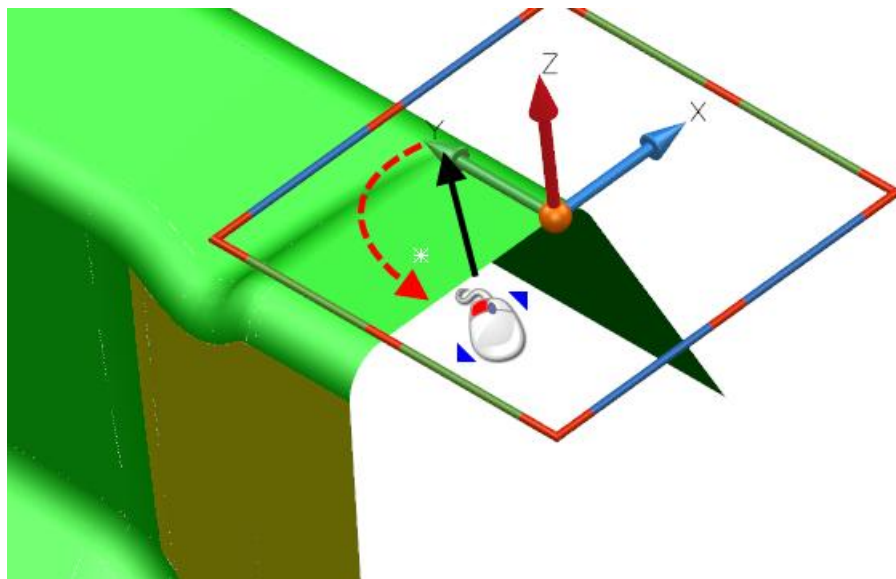
9 Release the mouse button to fix the workplane in the new location.
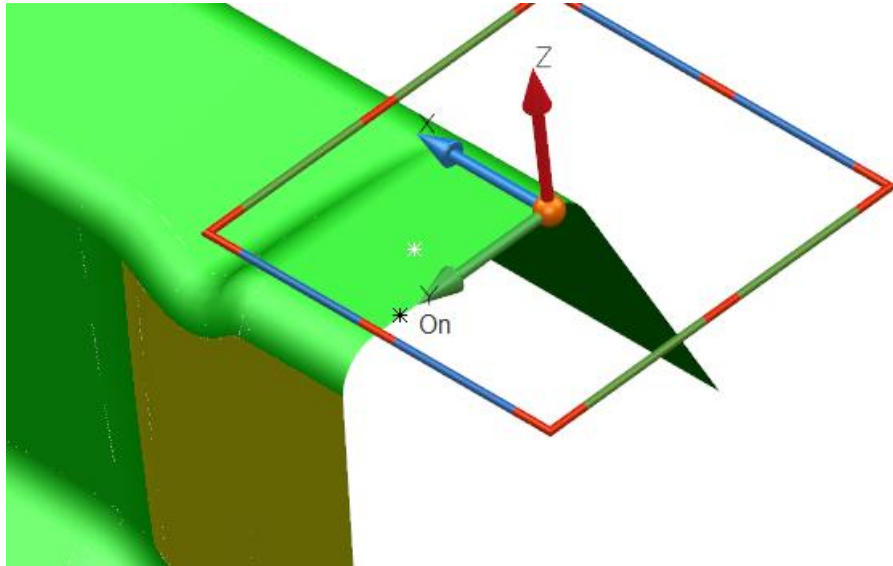

10 Click **OK** on the **Confirm Drag** dialog.

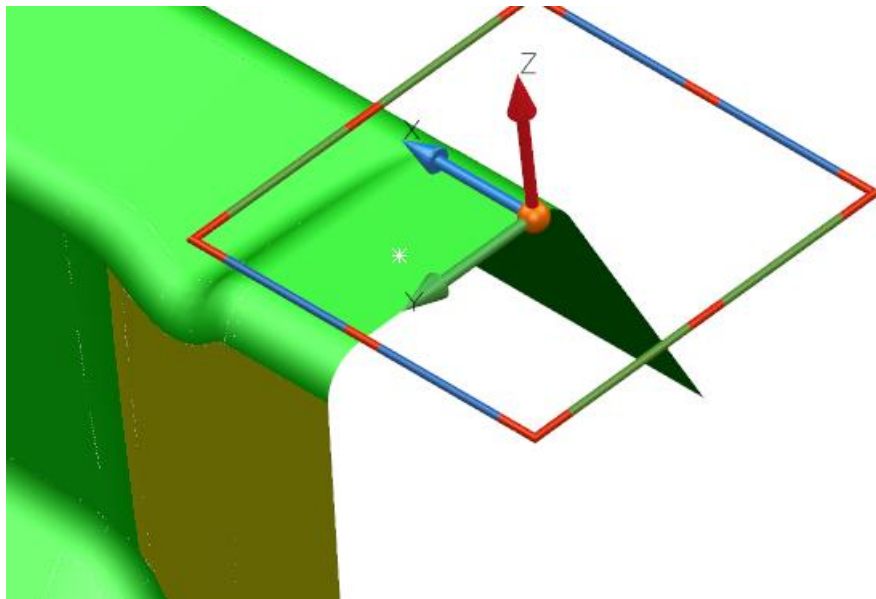**11** Click on the **Y** arrow head of the workplane.

12 Drag the arrow until it aligns with the edge of the surface.

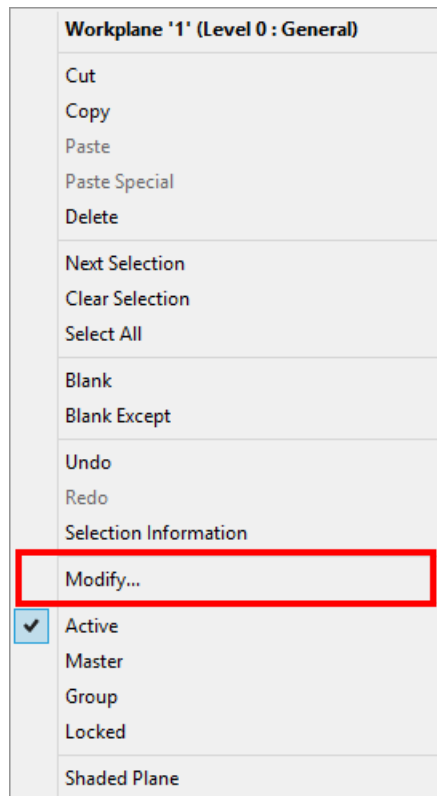When *ON* displays, release the mouse button.

Your model should look like the one shown below:
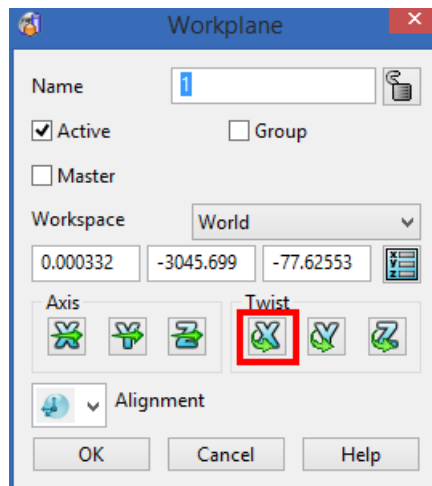
13 Click on the workplane using the right mouse button.
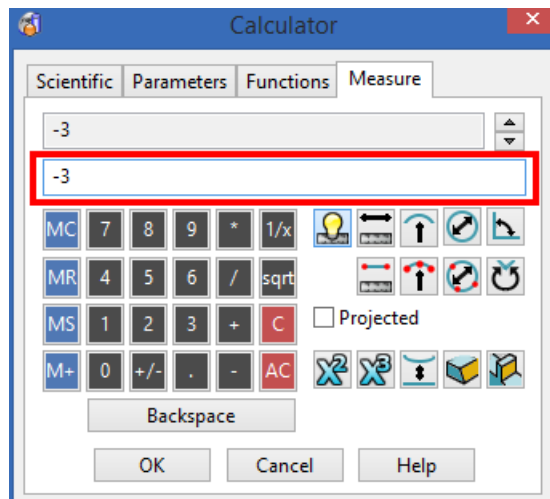
14 Click **Modify**.

15 The **Workplane** dialog is displayed.

16 Click **Twist around X**, shown in the image below:

The **Calculator** is displayed.

17 Enter **-3**.

18 Click **OK**.

19 Click **OK** on the **Workplane** dialog.

20 Click **Resize to Fit** .

21 Click anywhere in the graphics window to deselect the model.

22 Your model should look like the one shown below:
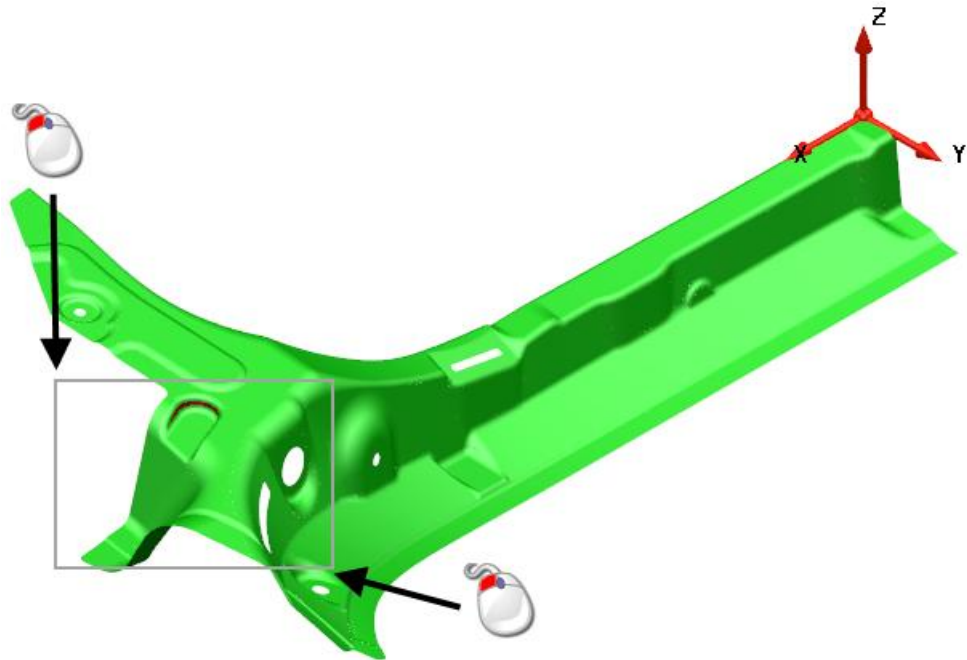

The undercut has now been removed.

Changing the draft angle of a surface
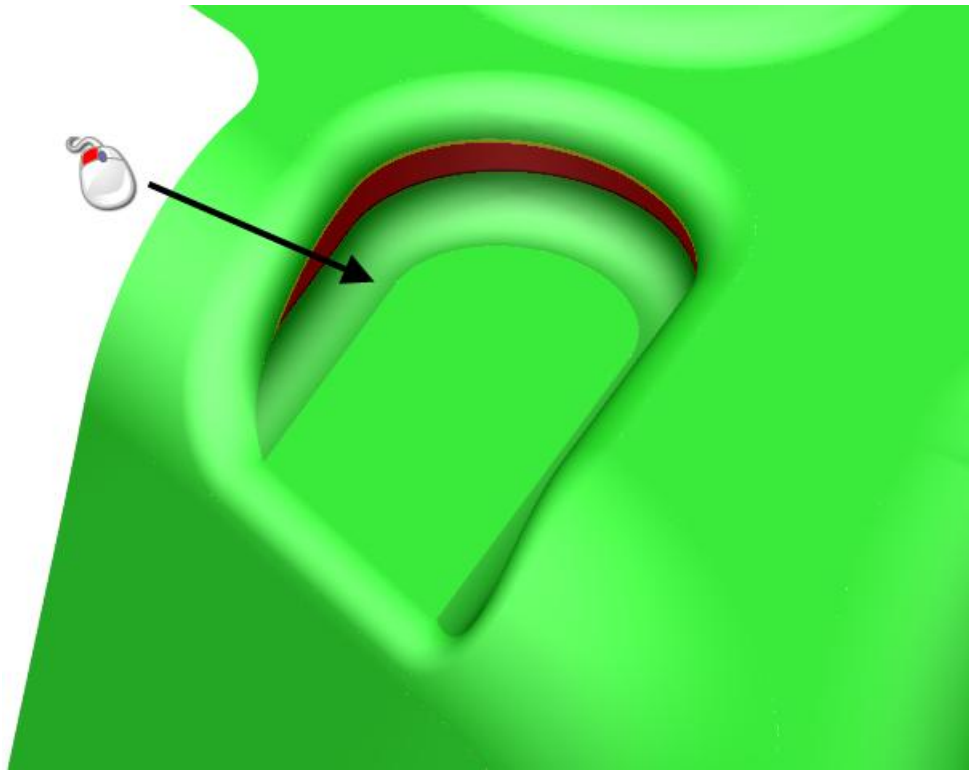
7. Create a draft curve on a surface

1 Click **ISO 3** .

2 Click **Zoom to box Mode** .

3 Click the left mouse button and drag a box, as shown:

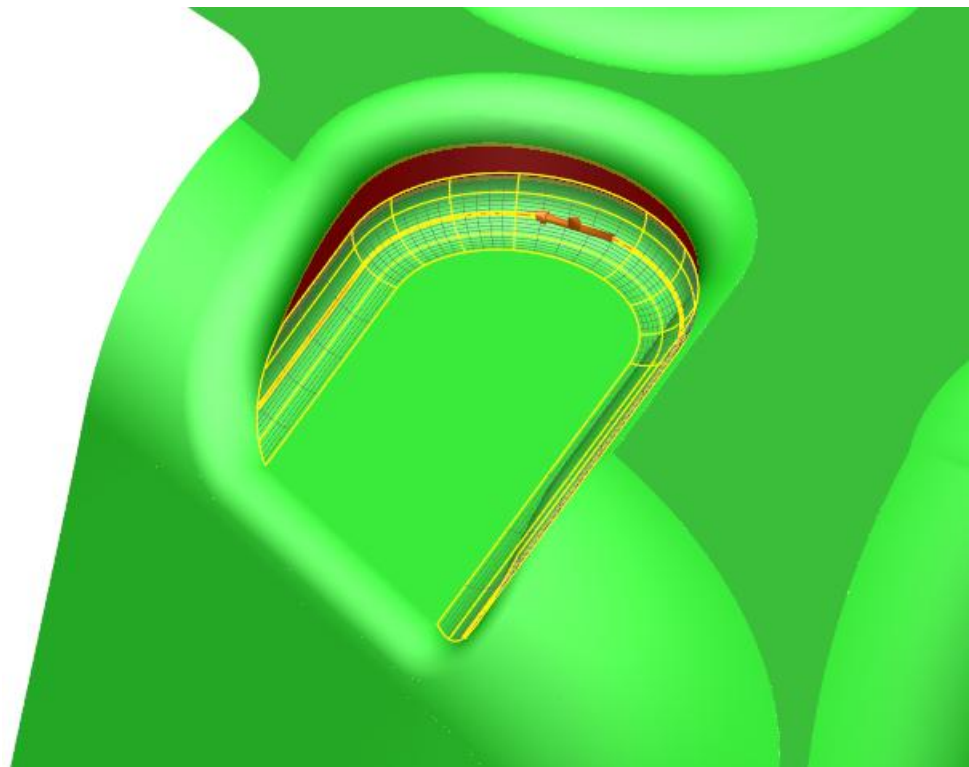4 Move the mouse over the surface shown below, to highlight it.

5 Click on the highlighted surface to select it.

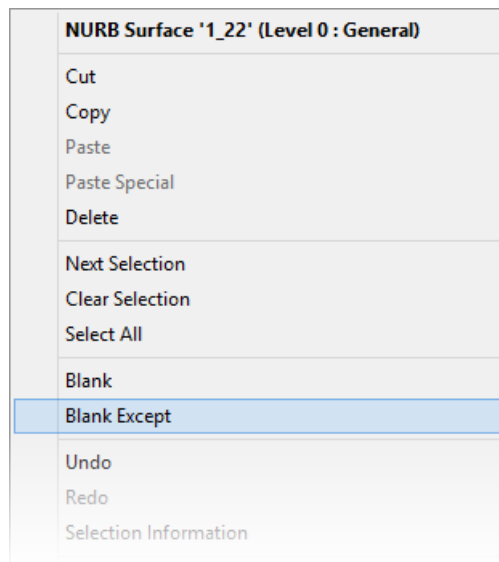The surface is now selected, shown in the image below.

6 Click on the surface using the right mouse button.
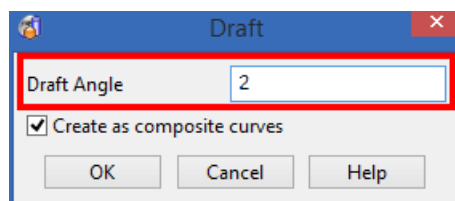
7 Click **Blank Except**.

8 From the **Status Bar** at the bottom of the screen, click the **Z** principal plane.

9 Click **Curve** 🖊.

10 Click **Create a Draft Curve** 🖊.

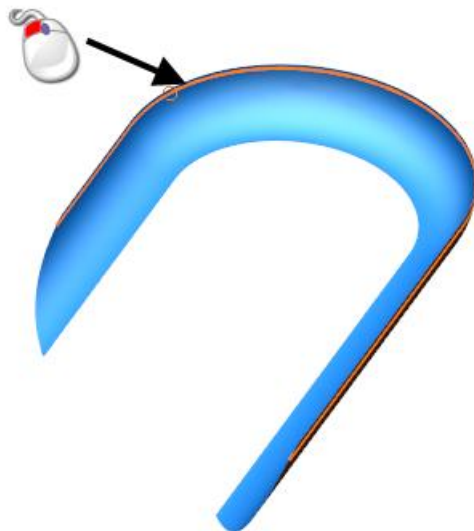**11** Enter a **Draft Angle** of **2**.

12 Click **OK**.

13 Click **Shaded View** 🟡.

Your model should look like the one shown below:
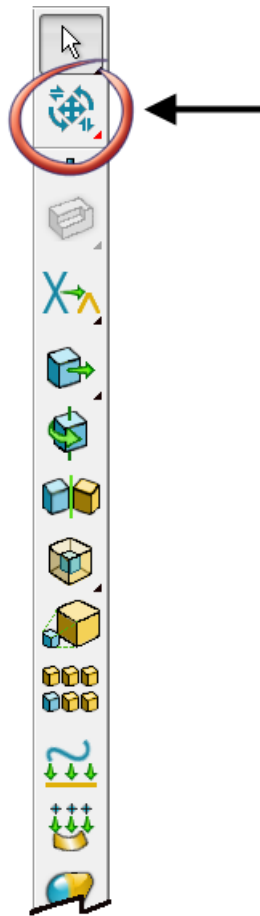

8. Use a draft curve to limit the surface

1 Move the mouse over the composite curve shown below, to highlight it.

2 Click on the composite curve shown below to select it.

3 Click **Show General Edits Options** .

Keep clicking the button until the toolbar shown below is displayed.

4 Click **Interactively Limit Wireframes** using the right mouse button.

The **Limit** flyout is displayed.
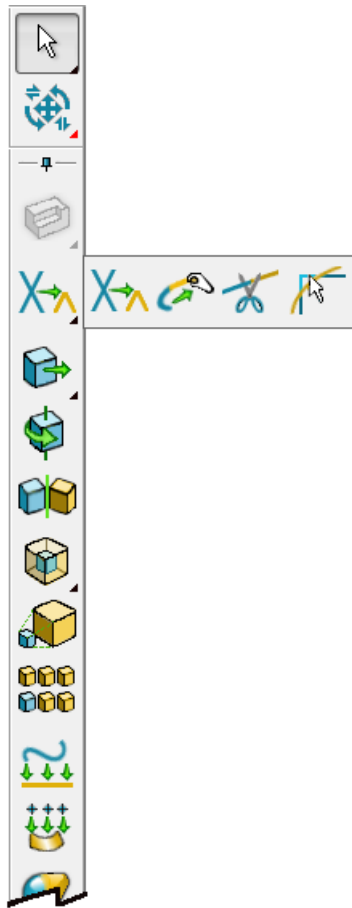
5 Click **Limit selection** [icon].

The **Limit selection** toolbar is displayed.
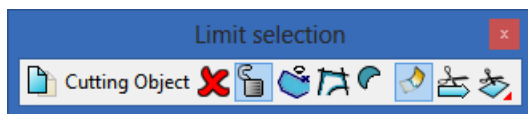
6 Click on the edge of the surface in the position shown below.

7 Click **Select** .

8 Click in the graphics area, using the right mouse button.

9 On the popup menu, select **Unblank**.

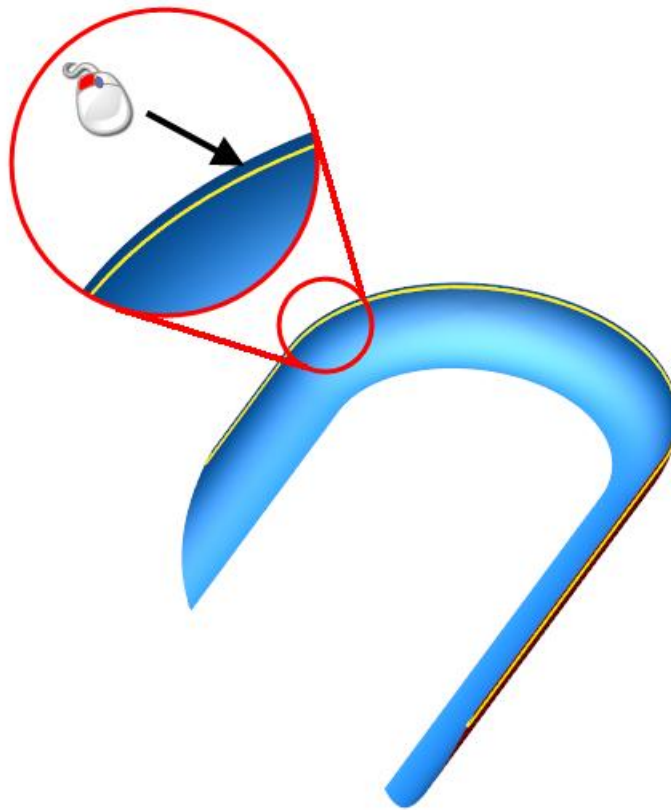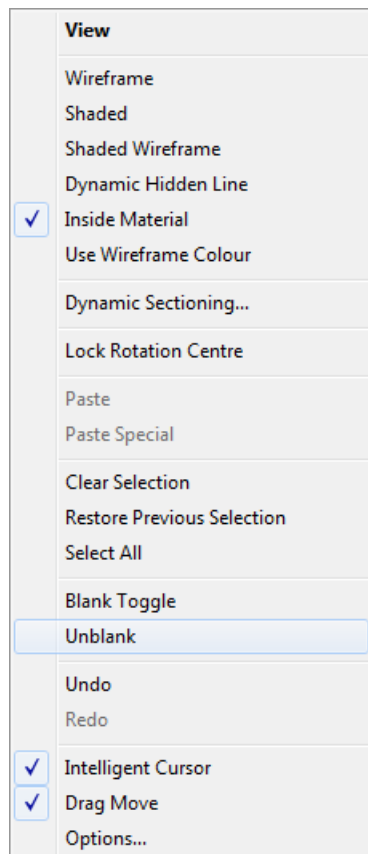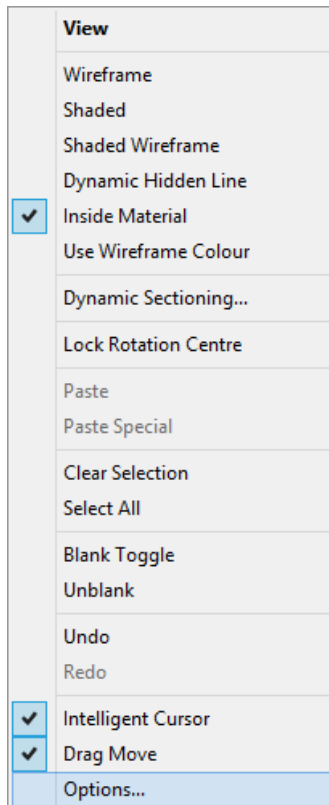| View |
| --- |
| Wireframe |
| Shaded |
| Shaded Wireframe |
| Dynamic Hidden Line |
| ✓ Inside Material |
| Use Wireframe Colour |
| Dynamic Sectioning... |
| Lock Rotation Centre |
| Paste |
| Paste Special |
| Clear Selection |
| Restore Previous Selection |
| Select All |
| Blank Toggle |
| Unblank |
| Undo |
| Redo |
| ✓ Intelligent Cursor |
| ✓ Drag Move |
| Options... |

10 Click **Resize to Fit** .

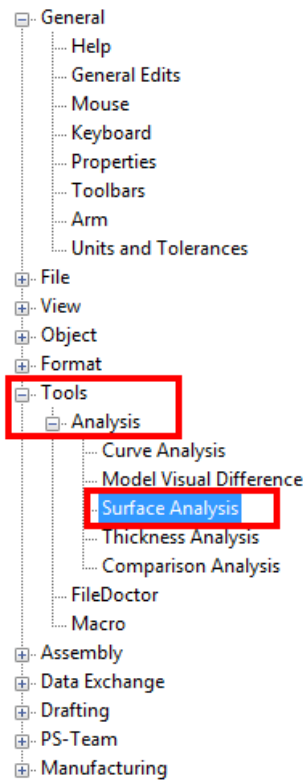**11** Click anywhere in the graphics window to deselect the model.

9. Check the radius of the fillet surfaces

1 Click in the graphics area away from the model, using the right mouse button.

2 From the popup menu, click **Options**.

View
Wireframe
Shaded
Shaded Wireframe
Dynamic Hidden Line
✔ Inside Material
Use Wireframe Colour
Dynamic Sectioning...
Lock Rotation Centre
Paste
Paste Special
Clear Selection
Select All
Blank Toggle
Unblank
Undo
Redo
✔ Intelligent Cursor
✔ Drag Move
Options...

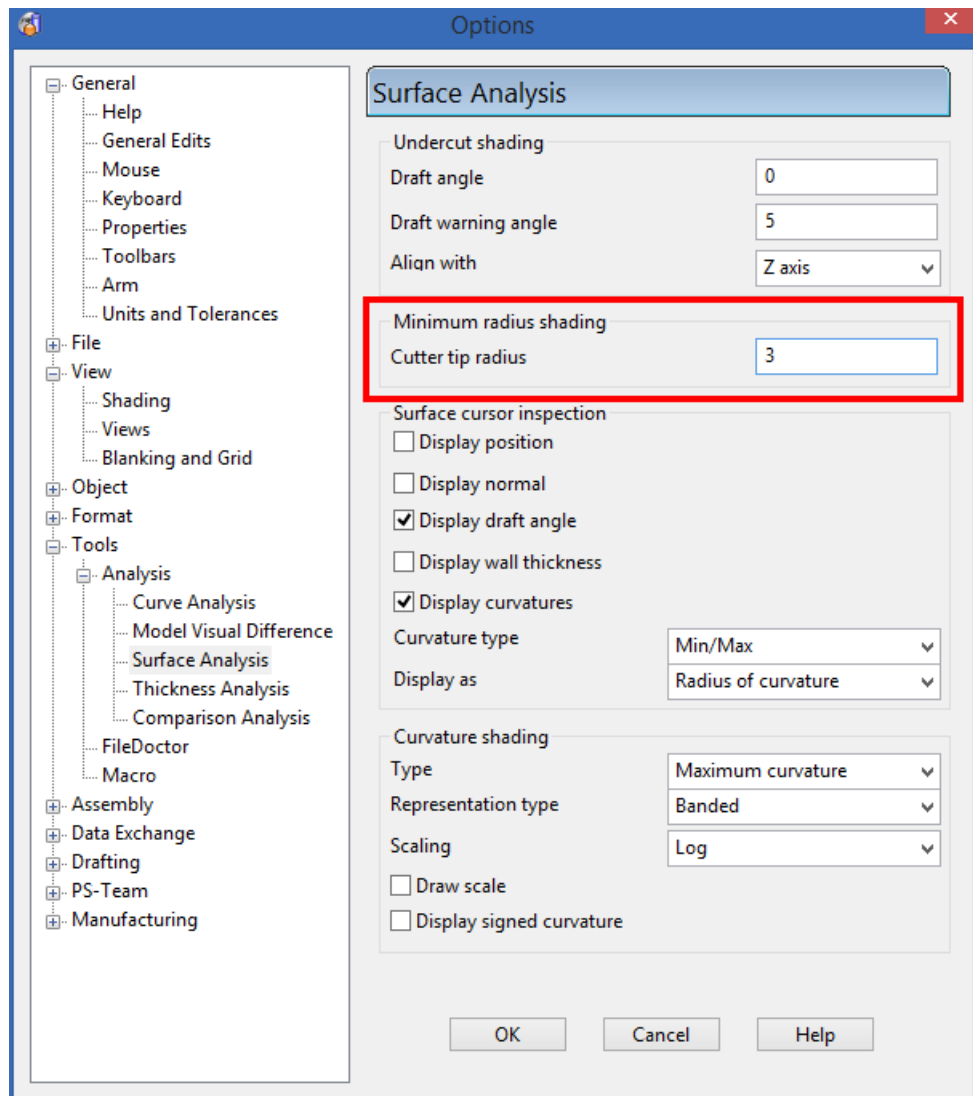The **Options** dialog is displayed.

3 Expand the tree be clicking **Tools** - **Analysis** - **Surface Analysis**, shown in the image below:

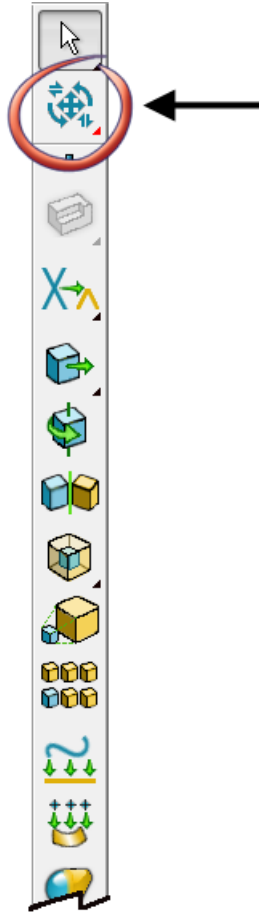The **Surface Analysis** options page is displayed.

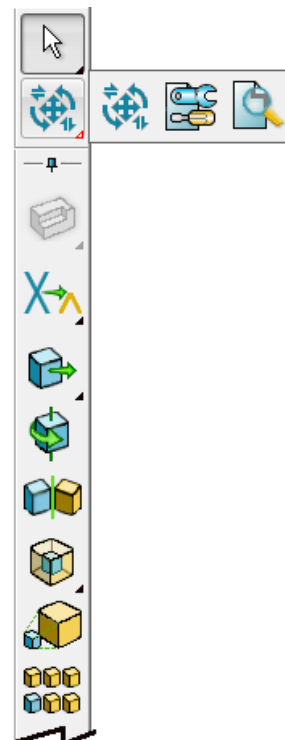**4** Enter a **Cutter Tip Radius** of **3**.

5 Click **OK**.

6 Click in the graphics area away from the model.

7 Click **Show General Edits Options** using the right mouse button.

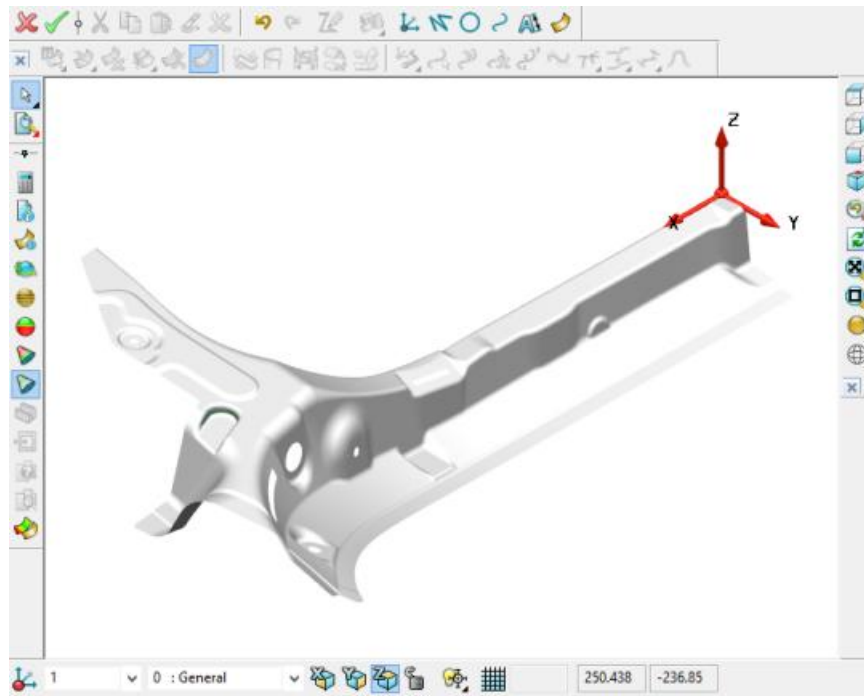
The **General Edits** options flyout is displayed.

8 Click **Show the model analysis options** ![icon].

The model analysis toolbar is displayed.

9 Click **Minimum radius shading** ![icon].

10 Click anywhere in the graphics window to deselect the model.
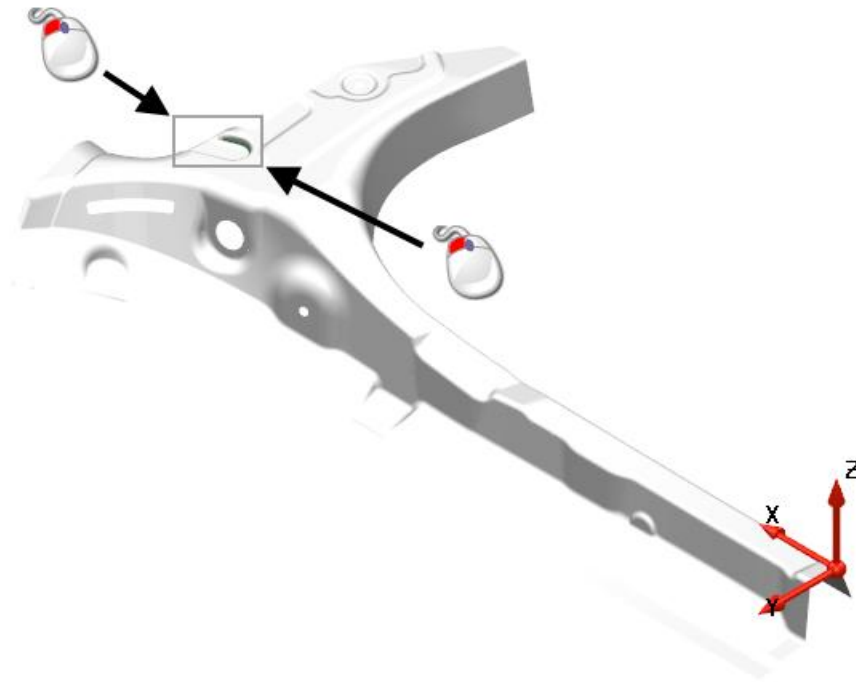

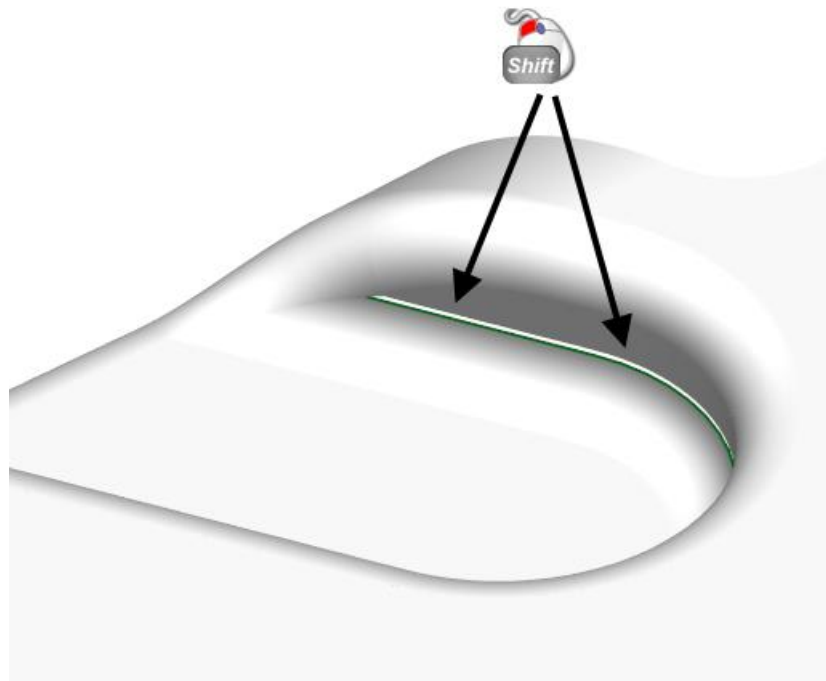You will see that the surfaces are all grey and have a radius of *3*, as specified in the options.

10. Delete surfaces

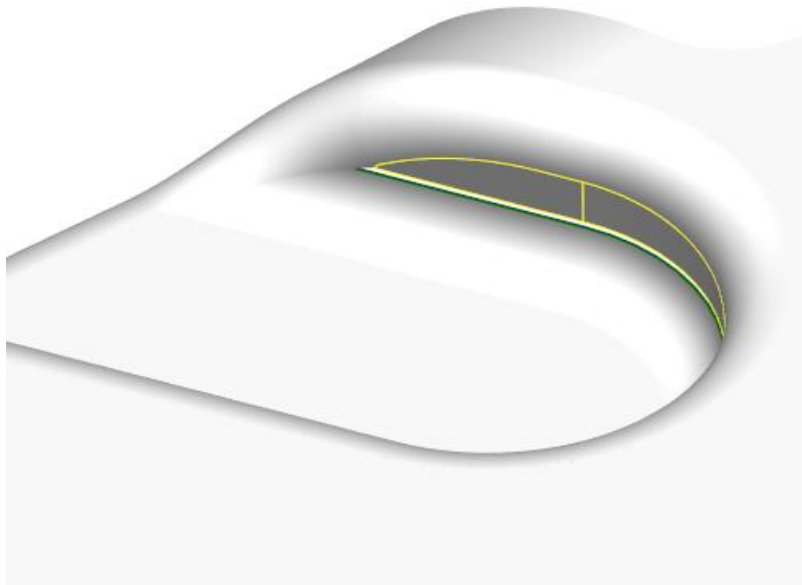**1** Click **View ISO4** .

2 Click **Zoom to box Mode** .

3 Click the left mouse button and drag a box, as shown:

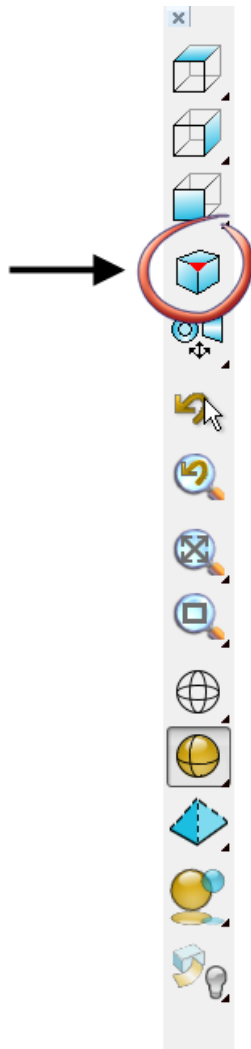**4** Hold down the **Shift** key and click on the two surfaces shown below to select them.

5 Your model should look like the one shown below:

6 Click **Delete** .

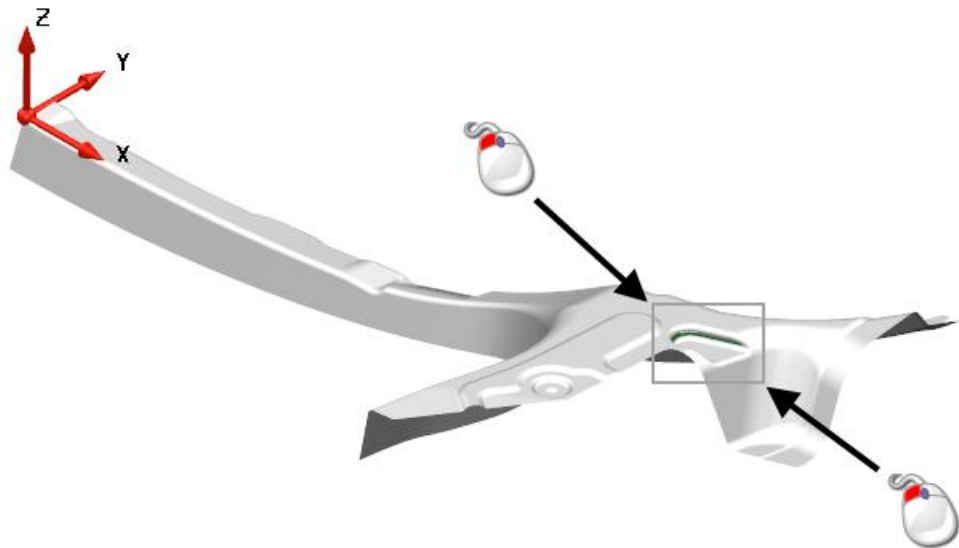**7** Click **View ISO1** using the right mouse button 🔳.

8 From the flyout, click **View ISO2** 🔳.

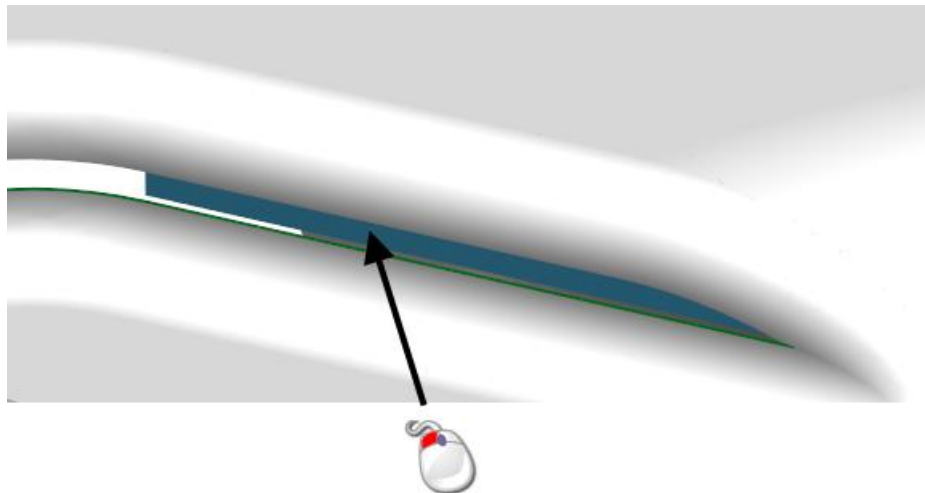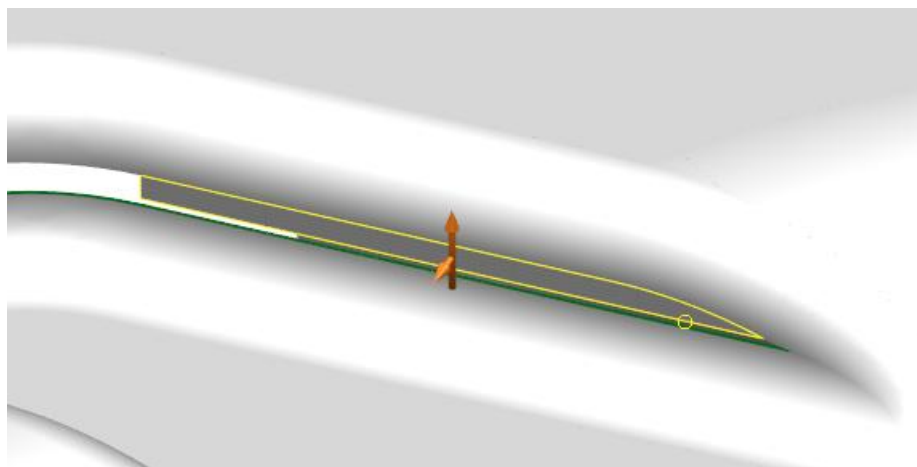**9** Click **Zoom to box Mode** 🔍.

10 Click the left mouse button and drag a box, as shown:

11 Click on the surface shown below to select it.

12 Your model should look like the one shown below:

13 Click **Delete** .

11. Create a workplane
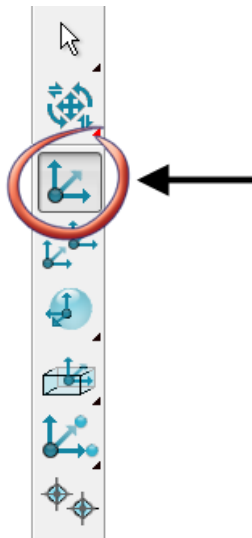
1 Click **View from Front** ⬛.

2 From the **Status Bar** at the bottom of the screen, click the **Z** principal plane.
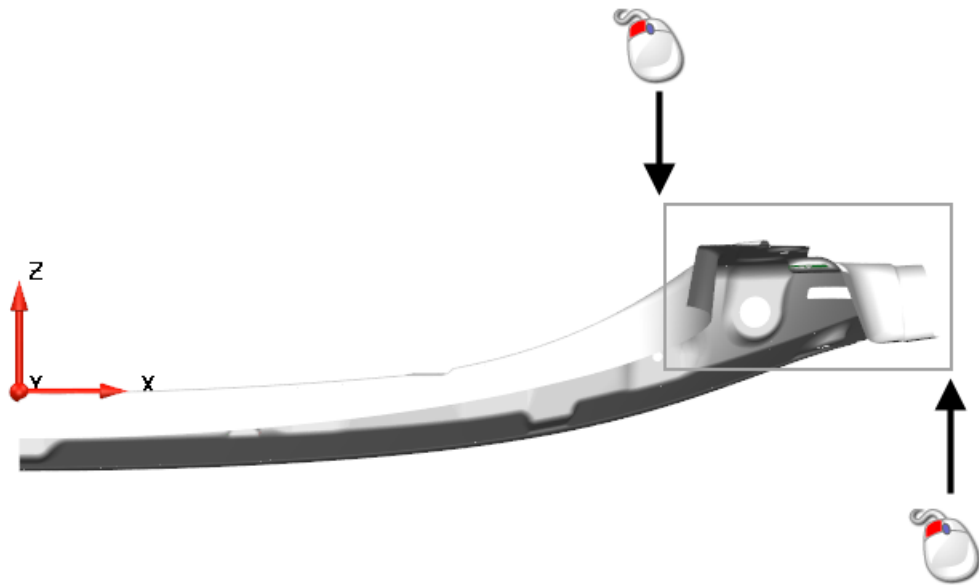

3 Click **Workplane** ⬛.

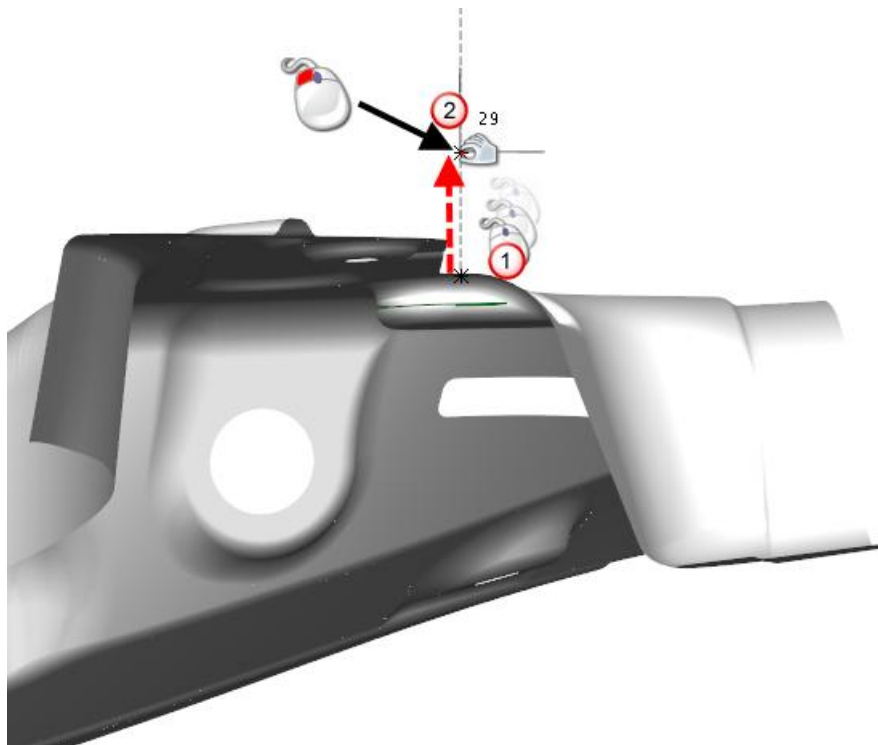**4** Click **Single workplane** ⬛.

5 Click **Zoom to box Mode** ⬛.

Click the left mouse button and drag a box, as shown:

6 Move the cursor around the model.

Construction lines and dimensions activate and display.

7 Move the cursor up the construction line until *ON* displays.

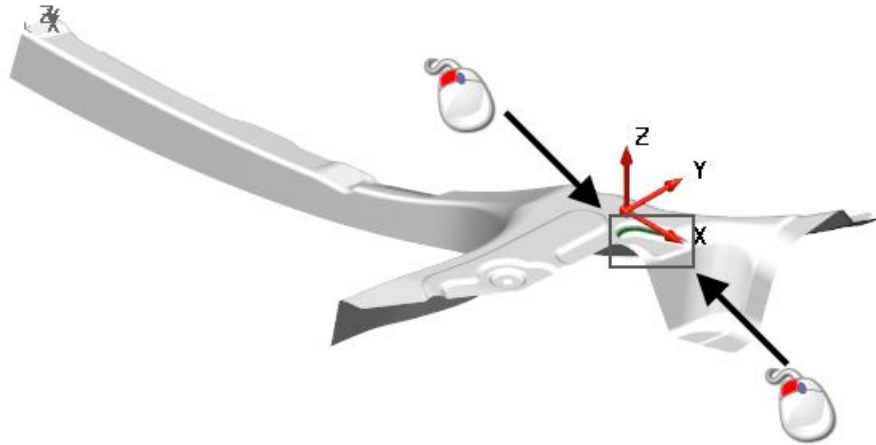**8** Click when the cursor is in the position shown below.
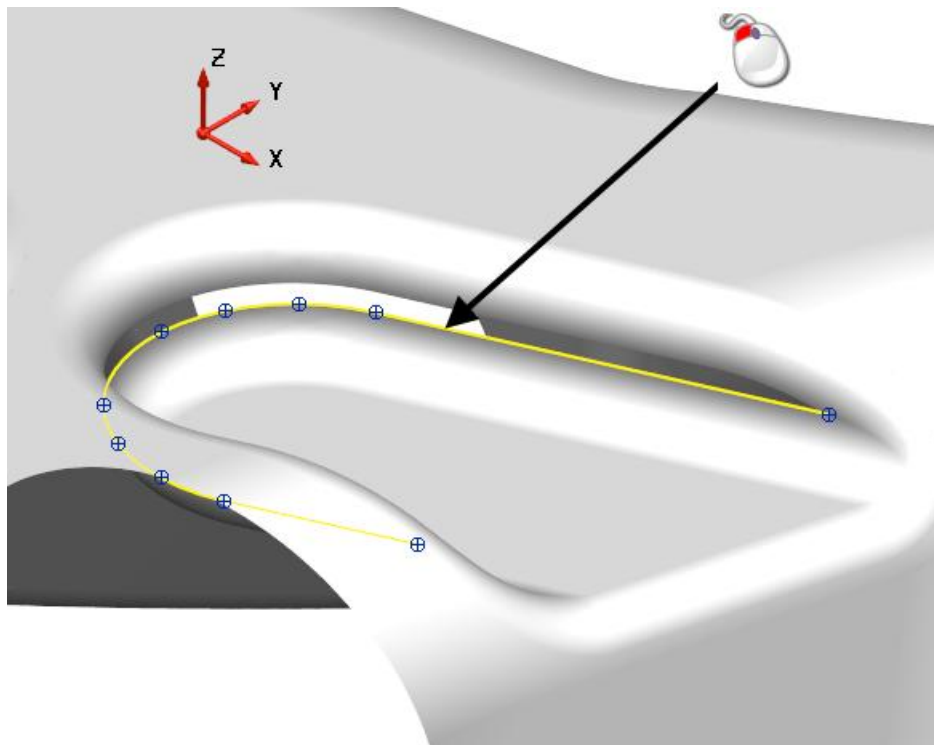

12. Create a draft surface

1 Click **ISO 2** .

2 Click **Zoom to box Mode**.

3 Click the left mouse button and drag a box, as shown:

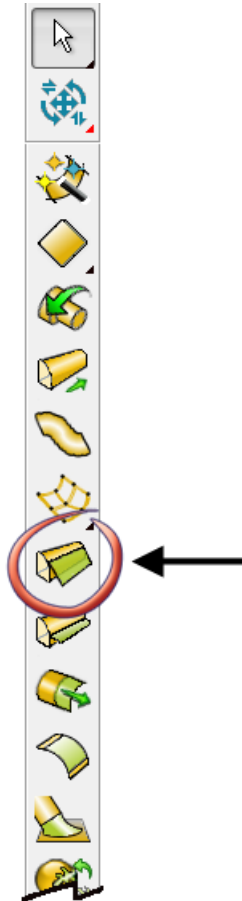**4** Click on the composite curve shown below to select it.

5 From the **Status Bar** at the bottom of the screen, click the **Z** principal plane.
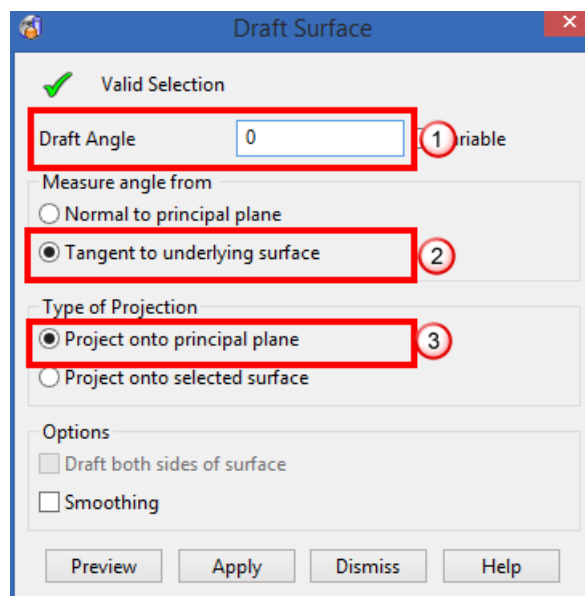
6 Click **Surface**.

7 Click **Draft Surface** .

The **Draft Surface** dialog is displayed.

8 Make the following changes:

① Enter **0** for the **Draft angle**.
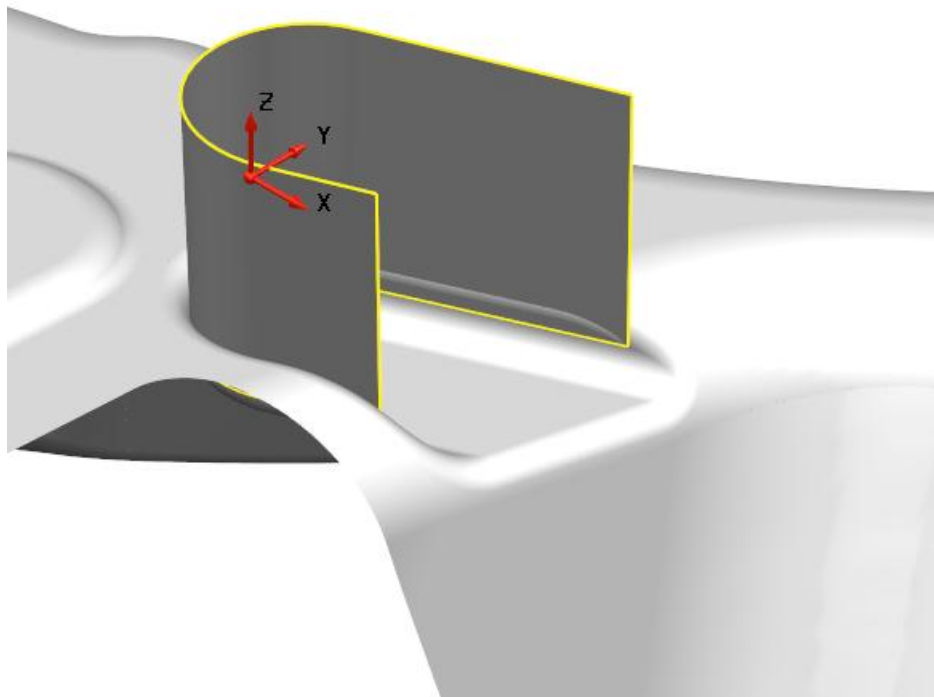
② Click **Tangent to underlying surface**.

③ Click **Project onto principal plane.**

9 Click **Apply.**

10 Click **Dismiss.**

11 Your model should look like the one shown below:

13. Create a fillet surface

1 Click **Surface** .
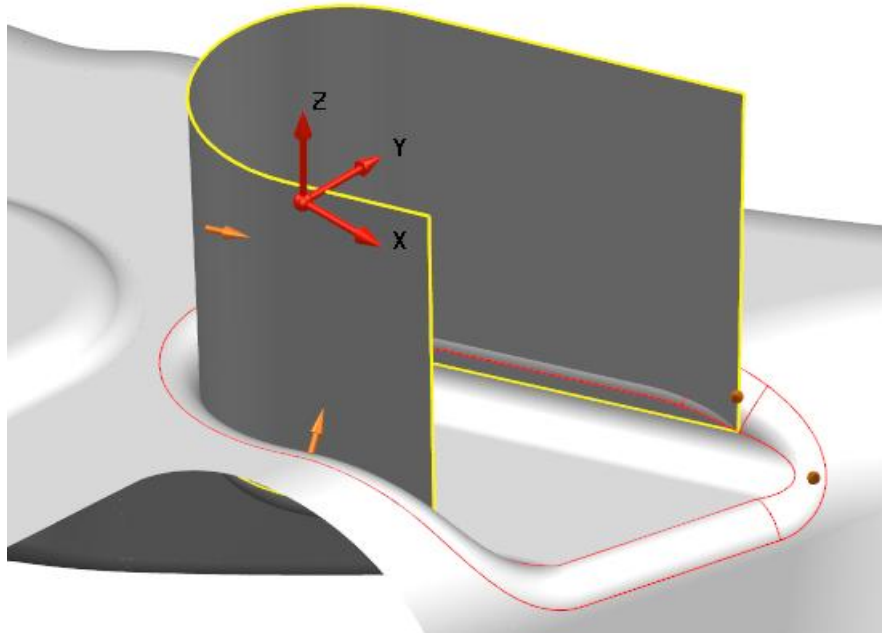
2 Click **Fillet Surface** .

The draft surface should still be selected and becomes the primary selection.

The **Fillet Surface** dialog is displayed.

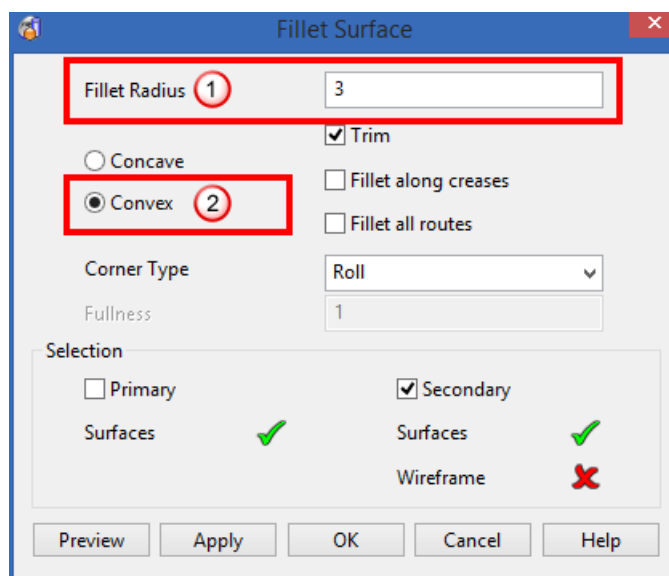**3** Hold down the **Shift** key and select the fillet surfaces shown below:

You may need to box select the surfaces instead of using a single click.
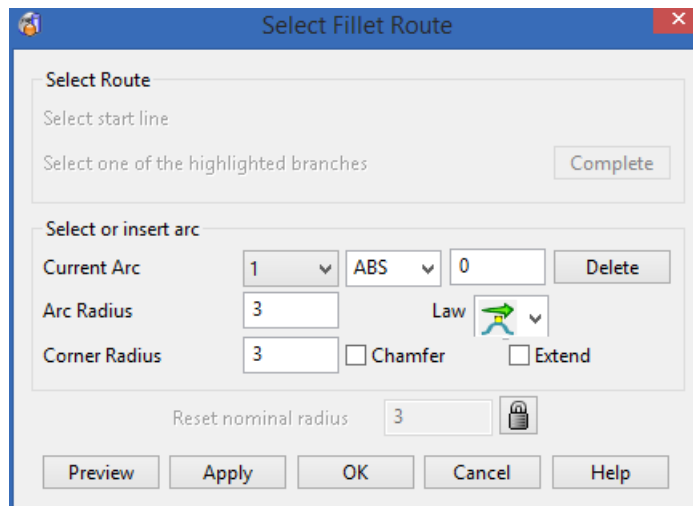

4   Make the following changes:

① Enter a **Fillet Radius** of **3**.

② Click **Convex**.

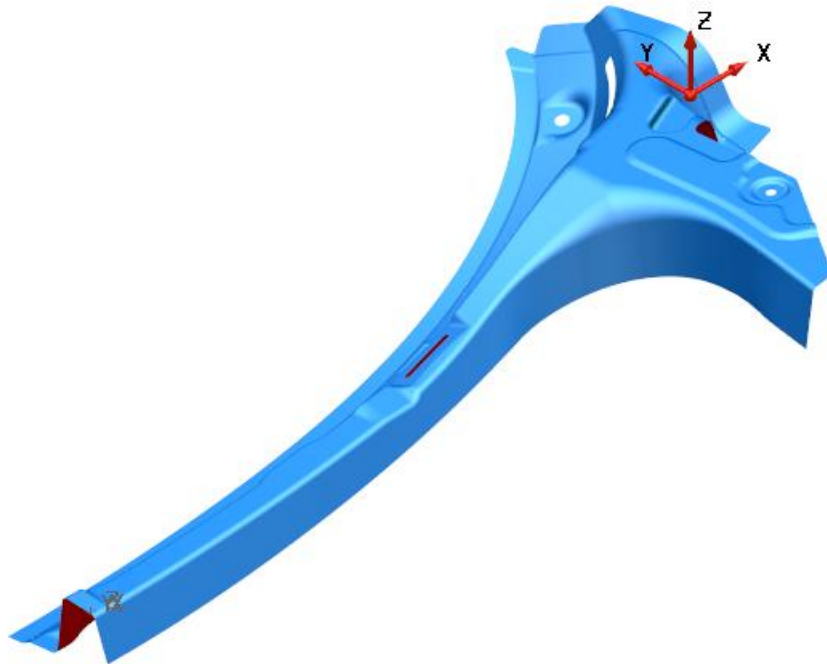5   Click **OK**.

The **Select Fillet Route** dialog is displayed.

6 Click **OK**.

7 Click **ISO 1** .

8 Click **Shaded View** .

9 Click anywhere in the graphics window to deselect the model.

The undercut areas have now been corrected, shown in the model displayed in the graphics window.
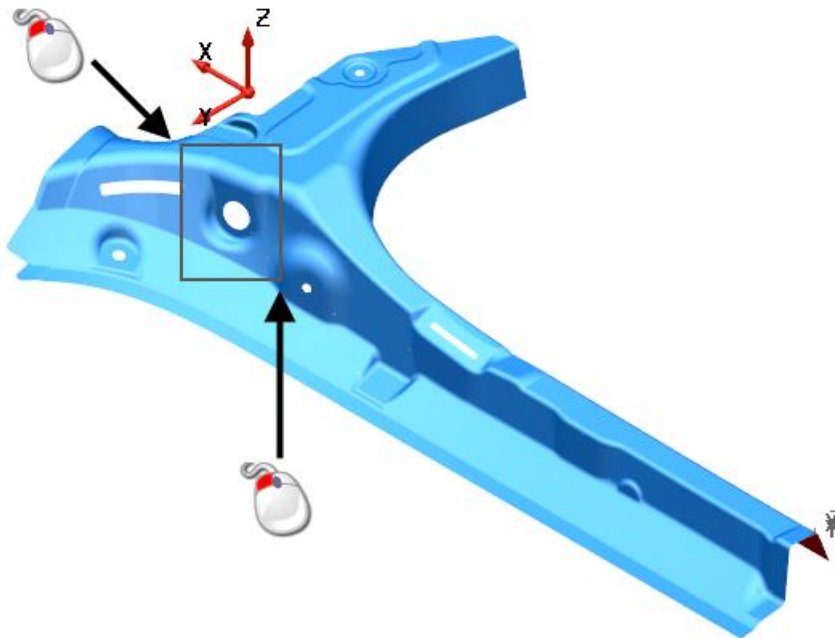
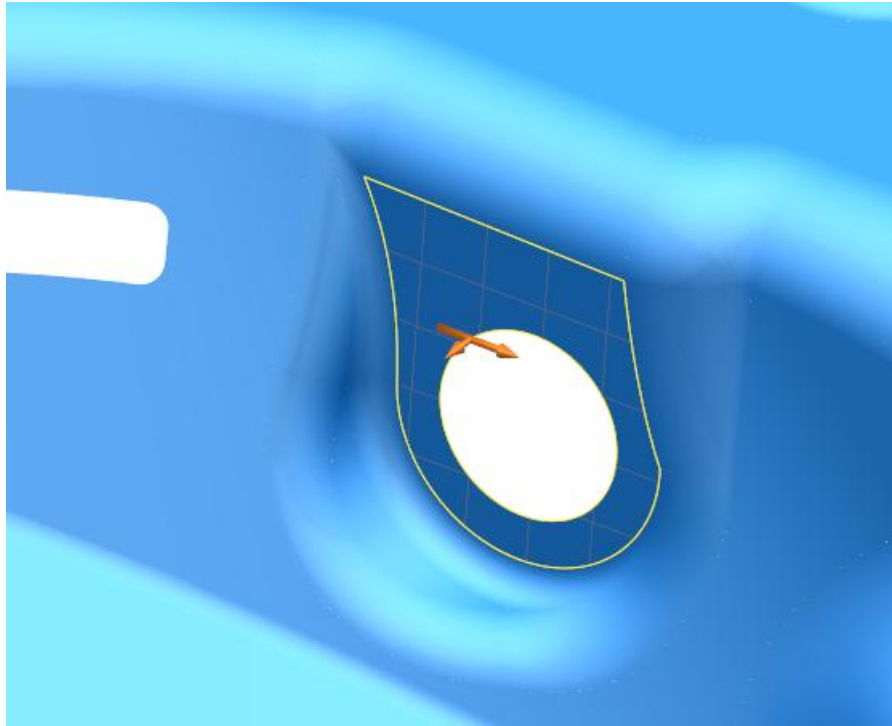# Removing the holes from the model
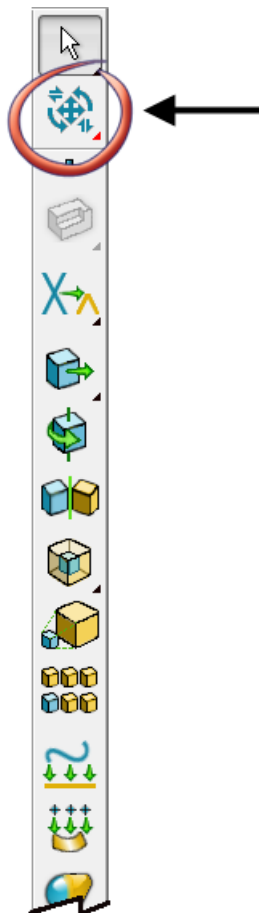
14. Blank the large circular holes

1   Click **View ISO4** .

2   Click **Zoom to box Mode** .

3   Click the left mouse button and drag a box, as shown:
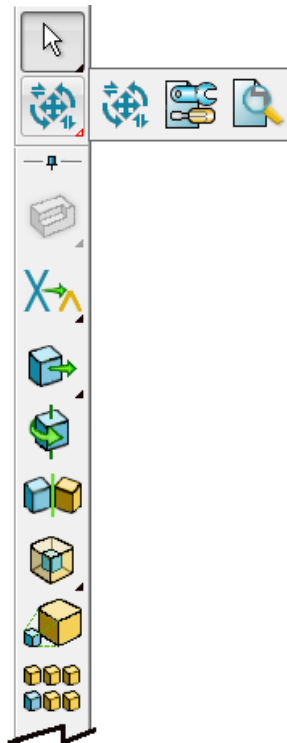
4 Click the surface to select it, shown in the image below.

5 Click **Show General Edits Options** using the right mouse button.

The **General Edits** options flyout is displayed.

6 Click **Show the model fixing options** .

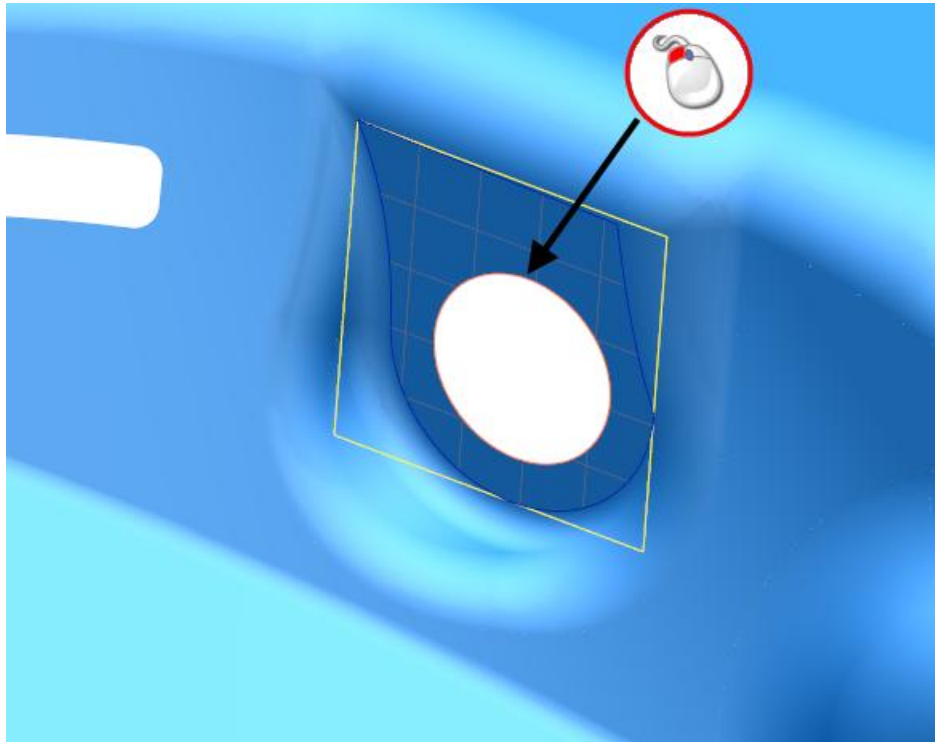The Model Fixing toolbar is displayed.

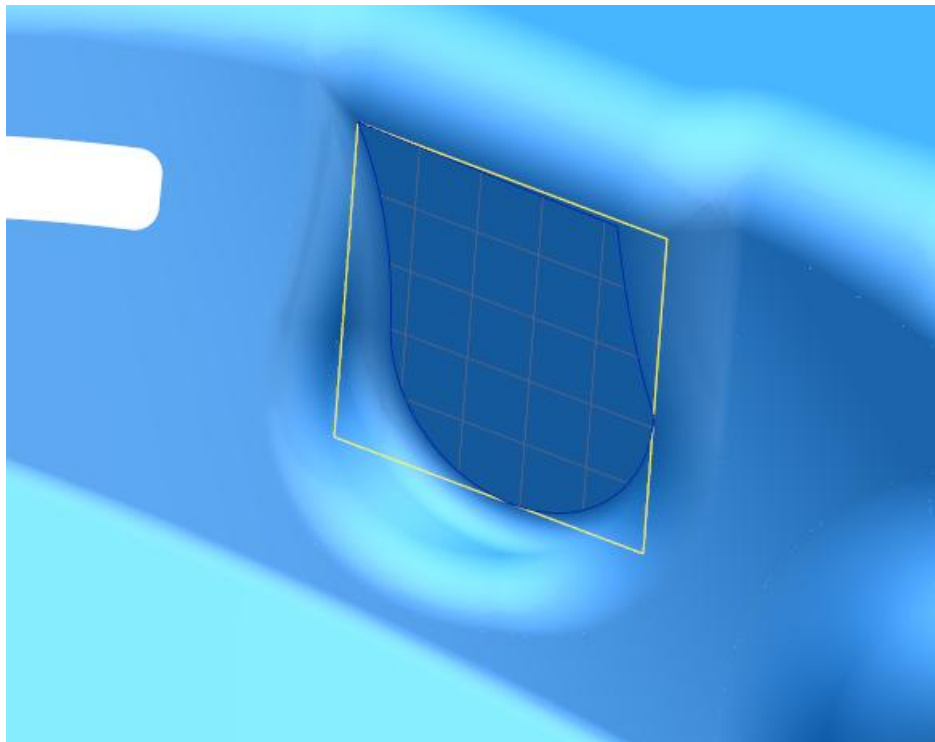**7** Click **Surface trim region editing** .

The **Trim region editing** toolbar is displayed .

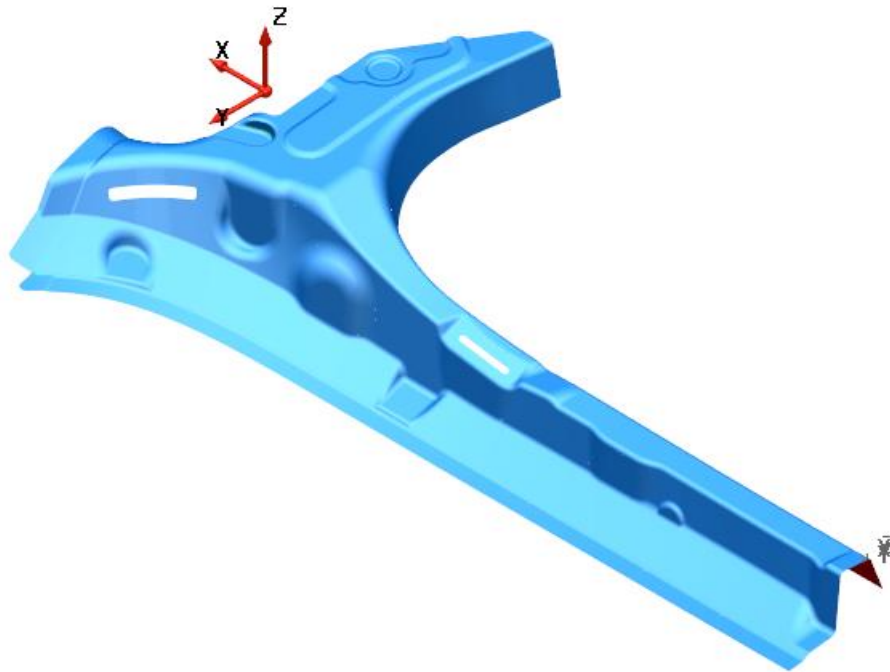**8** Click the Boundary curve on the surface as shown below..

9 Click **Explode** .

10 Repeat for the other three circular holes.
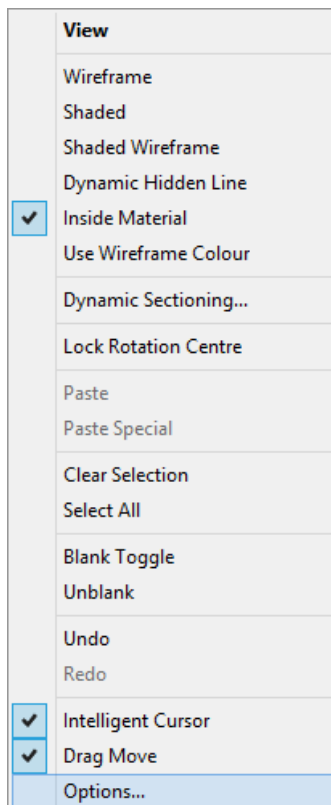
11 Click **Surface trim region editing** .

12 Your model should look like the one shown below:

15. Use Make watertight to close gaps

1 Click in the graphics area away from the model, using the right mouse button.

2 From the popup menu, click **Options**.

The **Options** dialog is displayed.

3 Expand the tree in the Options dialog, **Object > Solid.**

4 Click **Version 8 solids**.

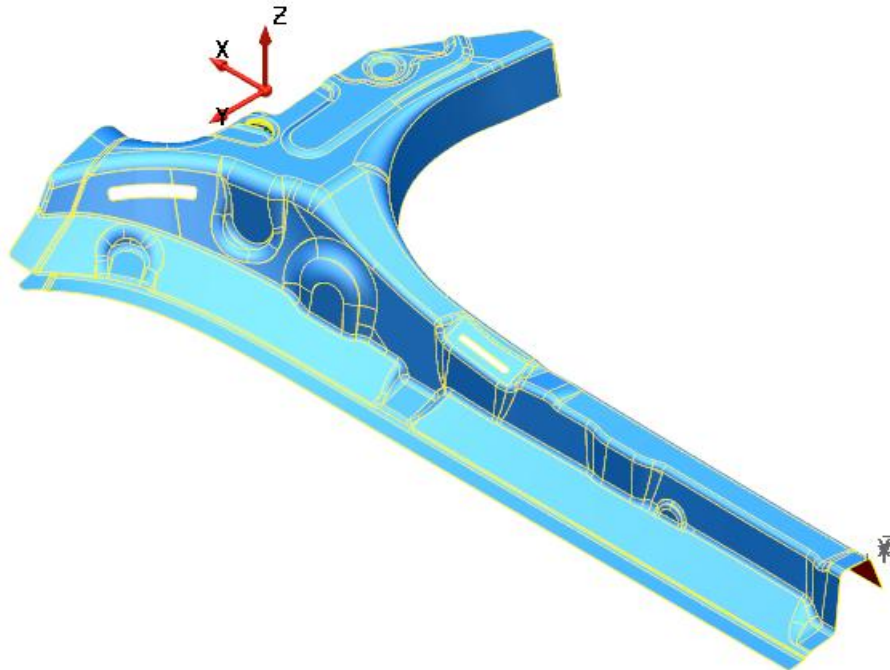There should be a tick in the box now.

5 Click **OK**.

6 Click **Select** [icon].

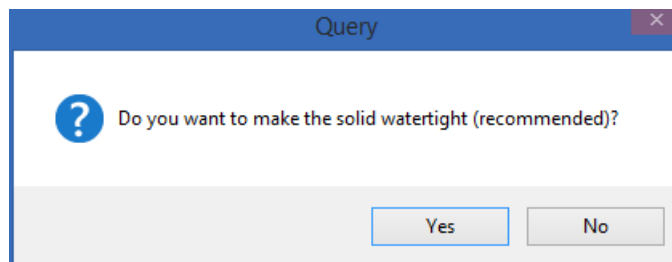**7** Click **Quick select all surfaces** [icon].

The surfaces are selected, shown in the image below:
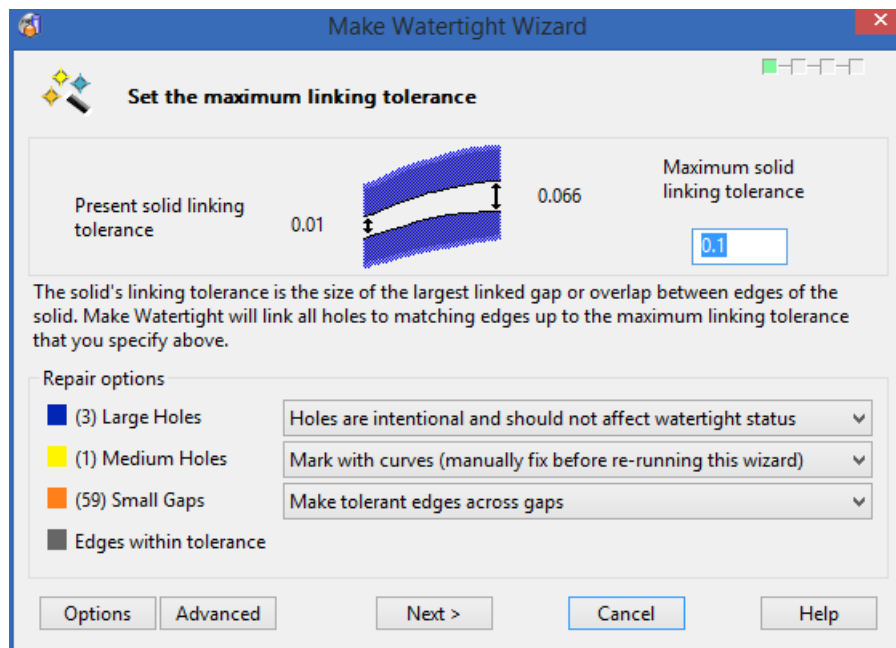
8 Click **Solid from selected surfaces** .

9 Click **Yes**. in the **Query** dialog.

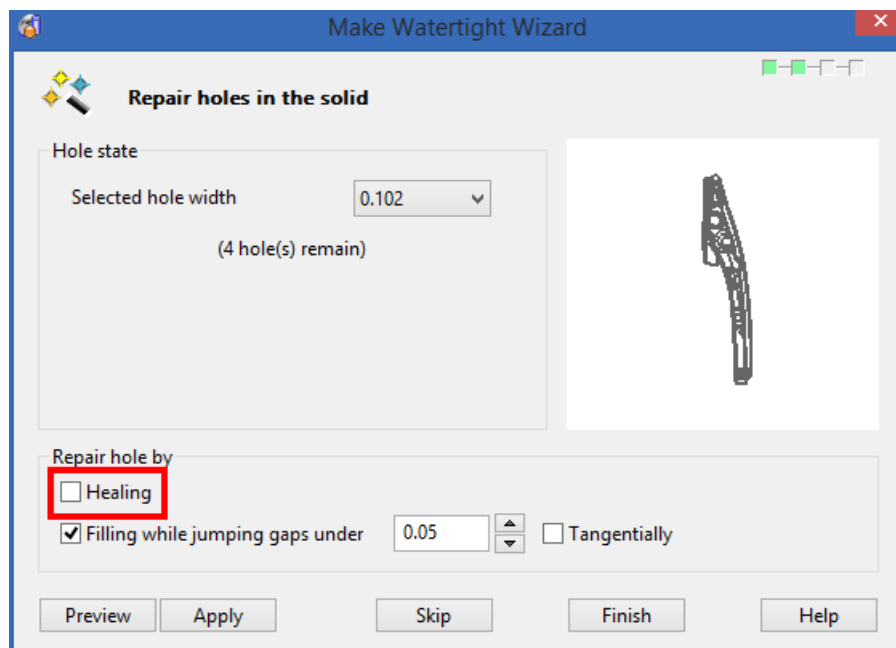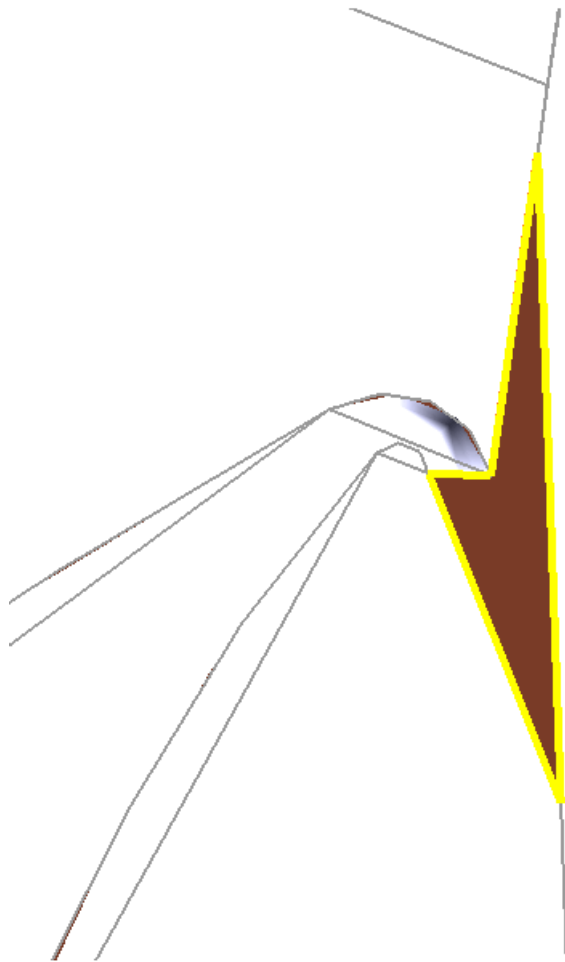Do you want to make the solid watertight (recommended)?

Yes   No

The model is checked. The holes in the model are found automatically and the results displayed in the dialog shown below:
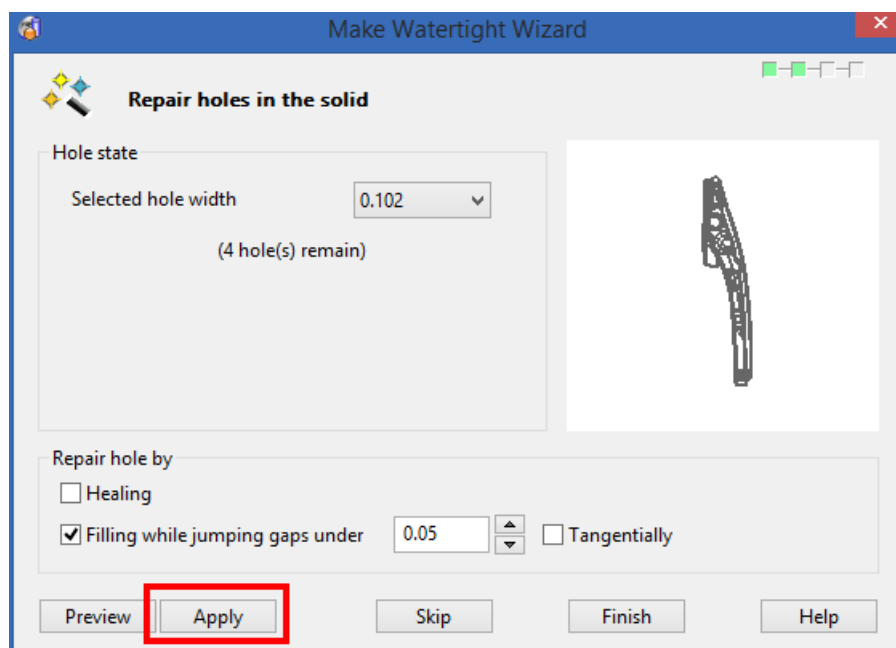

10 Click **Advanced**.

11 The next page of the wizard is displayed.
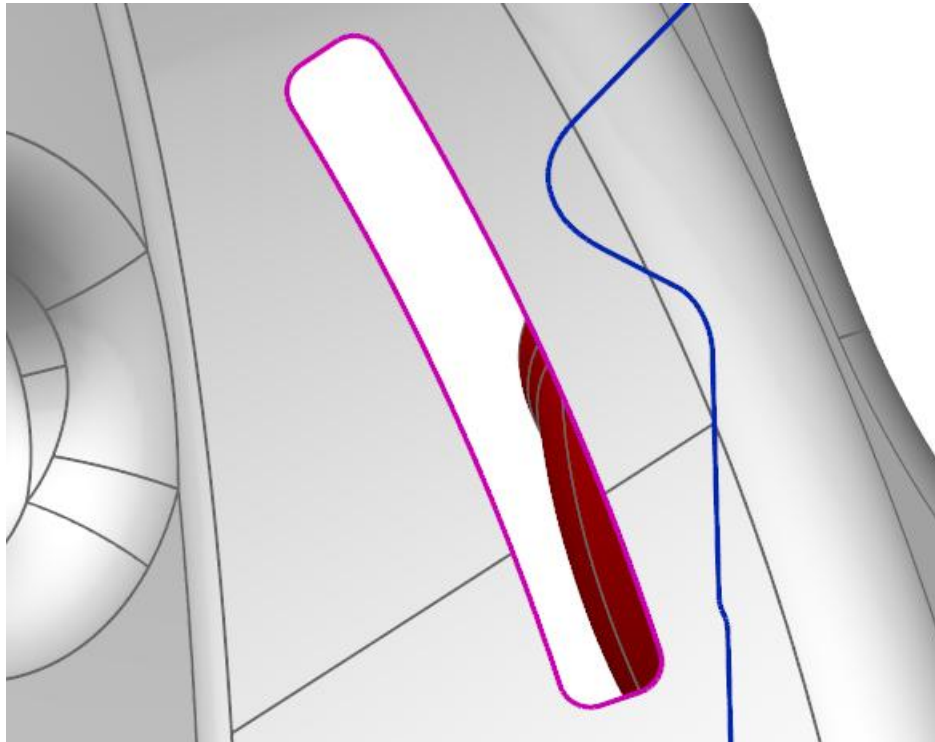
12 Click **Healing** to deselect the option.
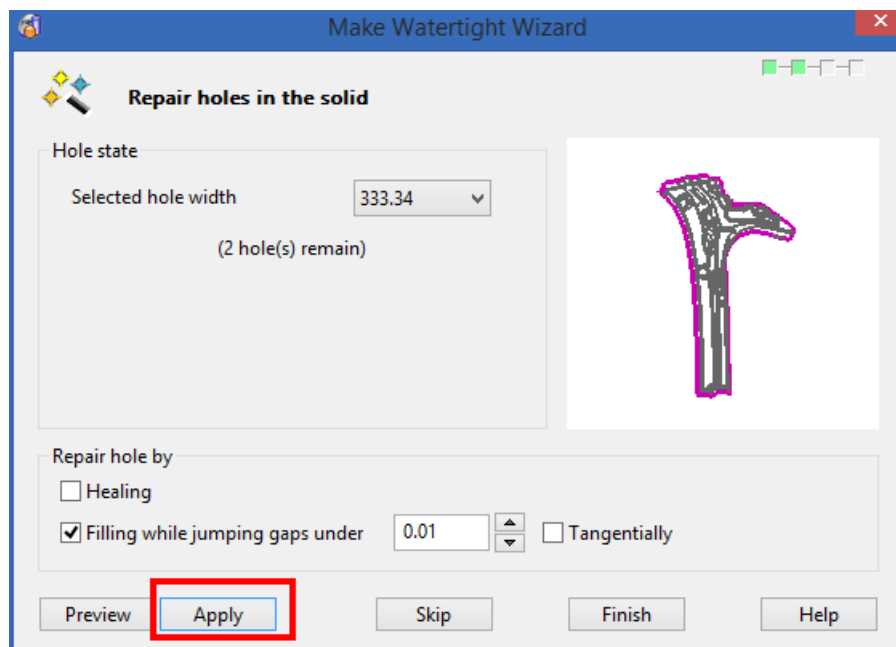
13 Select the hole, shown in the image below:

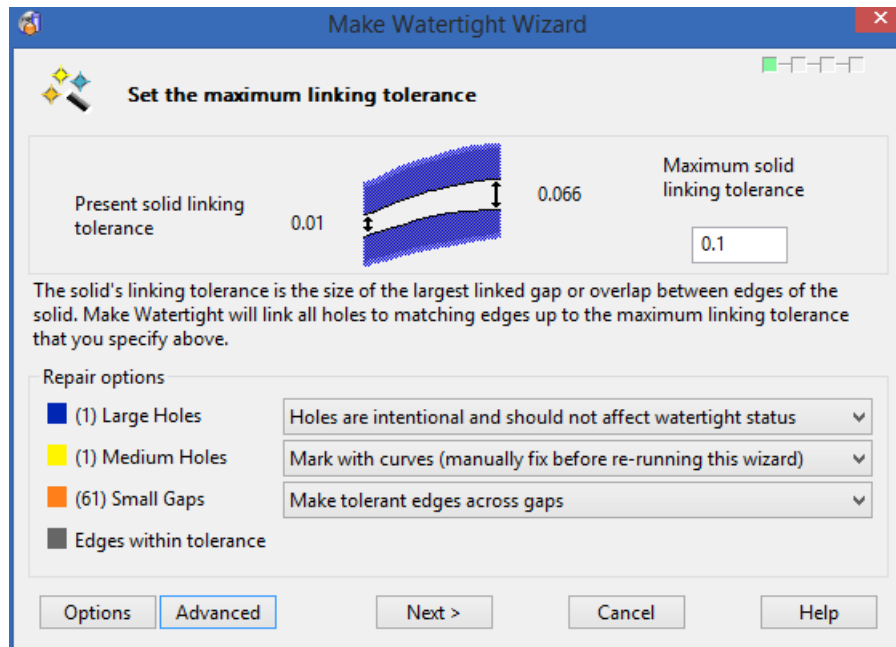**14** Click **Apply** on the dialog.

15 Click **Apply**.
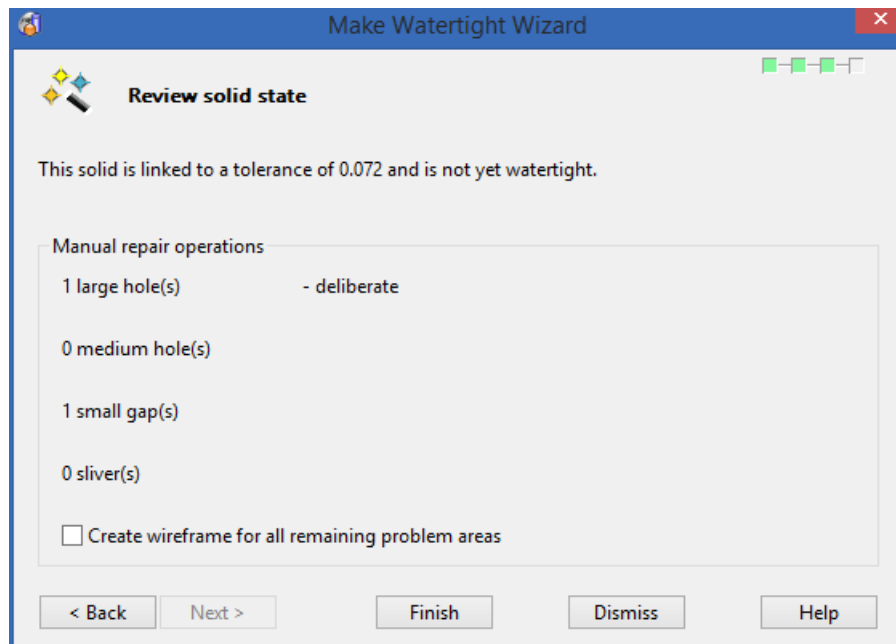

16 Click **Apply**.

17 Click **Finish** as the last large hole is the outside of the model.

18 Click **Next**.

19 Click **Finish**.
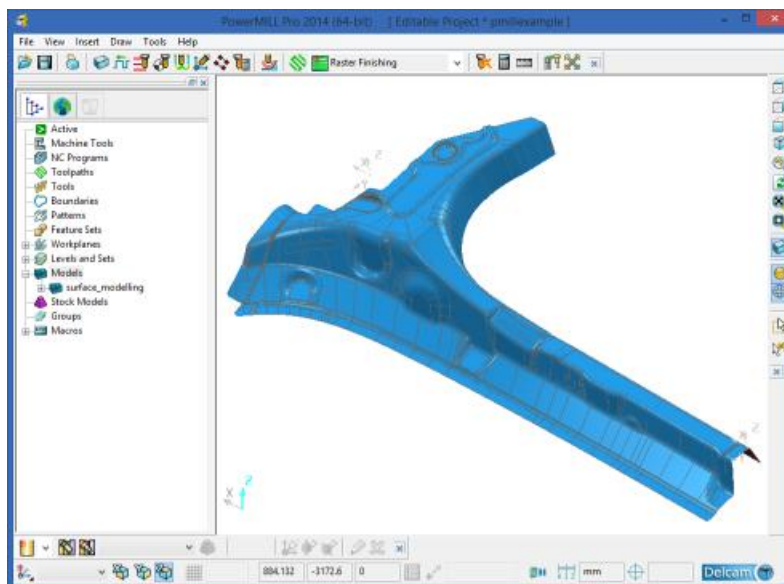
20 The results as shown in the model shown below:

16. Exit Surface modelling

1 Click ✓ on the main toolbar to return to **PowerMILL**.

2 Click **Plain shade** 🟡.

3 Click **Save** 💾.

Summary

You have modified surfaces using PowerMILL Modelling

You have done the following:

- Saved a project file in PowerMILL
- Started surface modelling
- Fixed undercut areas of your model
- Recreated surfaces to change the draft angle
- Removed holes using trimming tools and Make Watertight Wizard
- Returned the fixed model to PowerMILL