# Surface Modeling - I

This tutorial will guide you through the creation of a model from a digital image or sketch. The Model we will be creating is of a whimsical cat that also doubles as a bottle opener. We will use lines, curves and basic surfacing techniques to create our model. We will also utilize a capped surface and we'll finish this task off with a Global Bend command.

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1. Step 1: Creating the main surfaces

In this step, we will take the 3D curves to start applying surfaces upon.
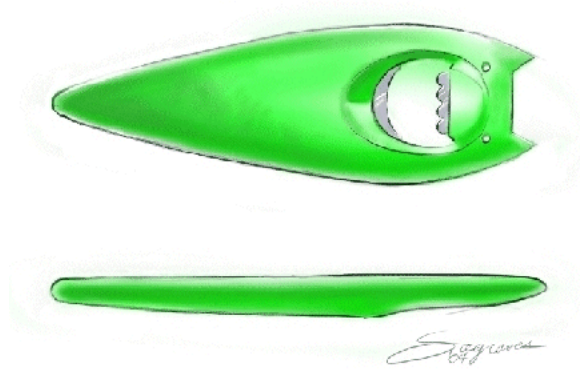
NOTE:

With a double click on the exe file you can run the webtraining session. ThinkDesign will be open with the right model to start.

If request to open a file, you can find it in the C:\MyTraining path.

You'll find a model that contains all entities to follow this session. All curves have been taken to define the better shape of the bottle opener images. The curves, for a better usability, have been moved to different layers.
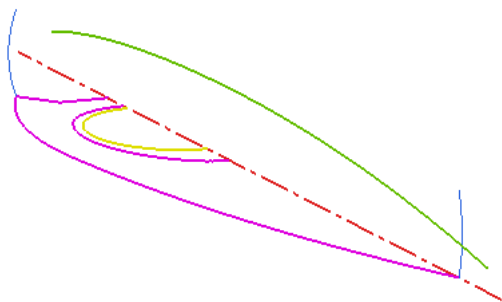
Start the **Format⇨Layers** and set current layer 0 and active also layer 20.

- Go to Global Sweep command in Insert - Surfaces.

- As Drive Curve select the D1 and D2 curves.

- As Curve 1 select the G1.
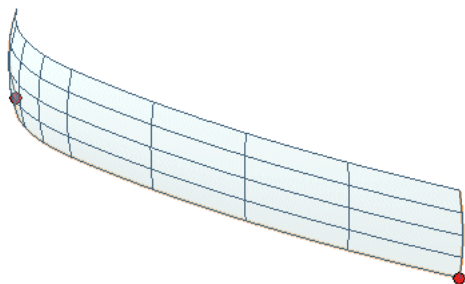
- As Curve 2 select the G2.
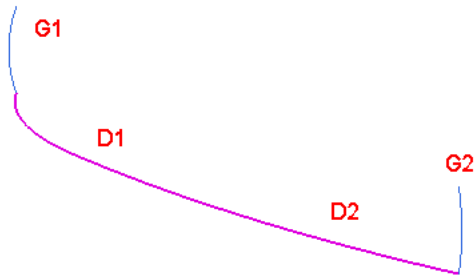
- In the Selection List, under 'Motion Mode', make sure that the type is 'Constant axis' and set as Direction the Z axis.

- Hits Preview to show the result.

- Open 'More Options' if the surface is curled and activate the Invert minidialog to improve the shape.

- Click OK to create the surface and exit the command.

If you don't have Global Sweep Licence!

Use **Union Curve** to join D1 and D2 curves and **Lofted Surface** to make the surface.

Select joined curve (D1 -D2) as Boundary Set A and G1 and G2 as Boundary Set B. This will cause the Lofted command to choose 'Poportional' as the surface type to be created.
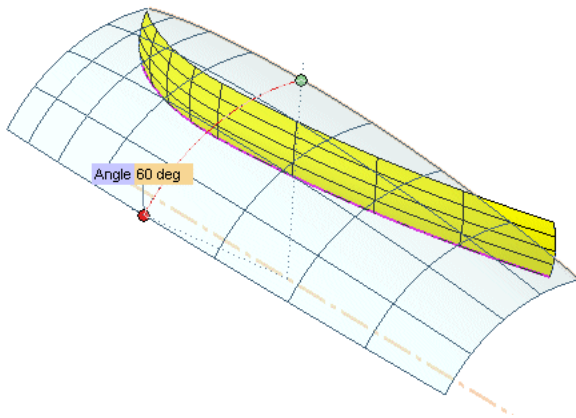

Now. let's continue to create other surfaces to complete the main shape of our object.
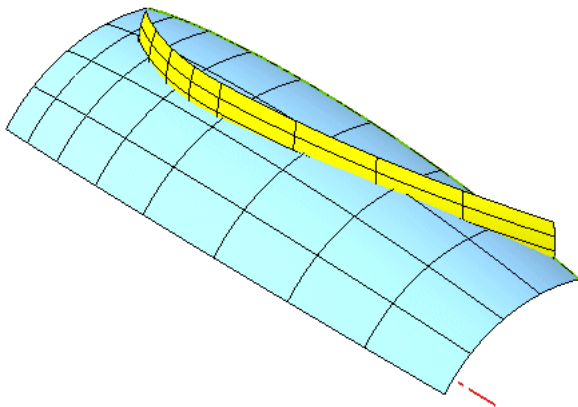
- Activate layer 30

- Go to **Rotational Surface**.

- As Curves select the curve A1.

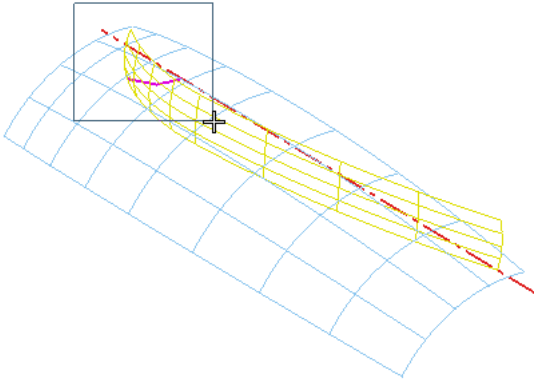- Set 'Line' as Axis and select the curve B1.
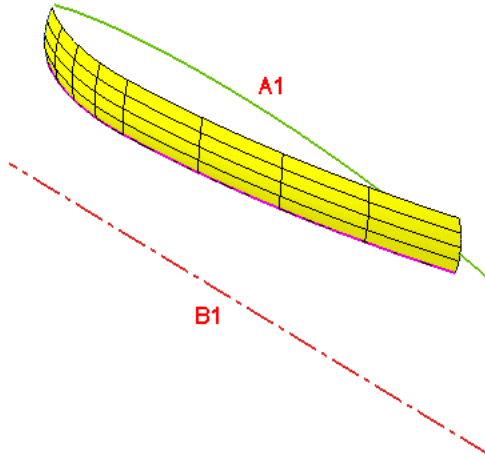
Now, rotate the Handle about 60 degrees; confirm the command.

Now let's use other surface command to complete the rear part and then split all.

- Activate layer 40.

- Zooming to the area indicated below. To do that press z key on the keyboard and Pick two opposite points of the window.

- Go to **Insert**↝**Surface**↝**Linear**.

- Select the magenta curve (b1) in the start model.

- Set the Direction option to Z.

- Drag the Handle located on the Curve to change and move the mouse until p2 point, same to surface's limit, to impose same elevation.

- Click OK to create the surface and exit the command.
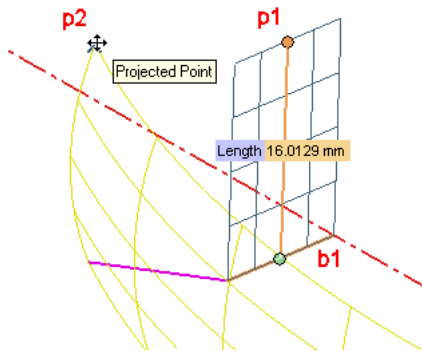
- Treated the curve as line, start the **Lofted Surface** command and then select the left (b1) and the right (b2) curves of the adjacent surfaces.

- A simple ruled surface will be done as you can see in 'More Options' - Type.

- Click OK to create the ruled surface.
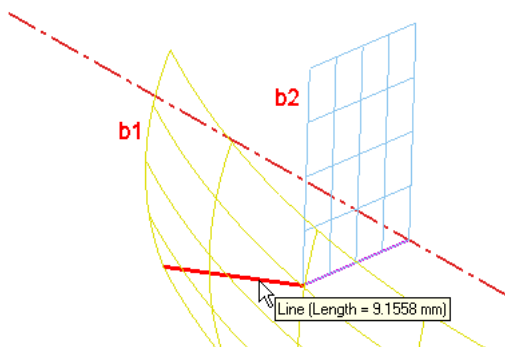

What if the surface is curled?

You have to activate the Invert minidialog. If you are unable to create a clean looking surface even after you invert, you have to analyse the selected curves because they could contain wrong data.
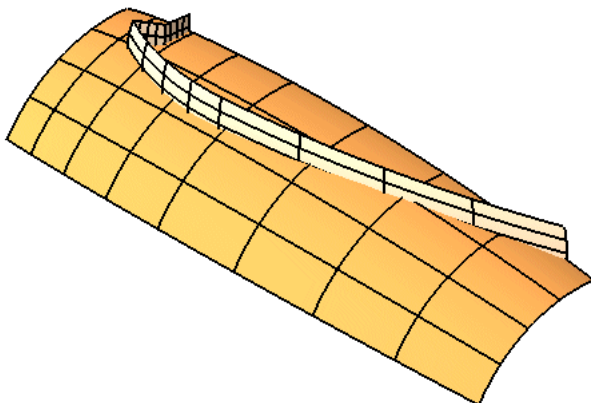
Here the result.
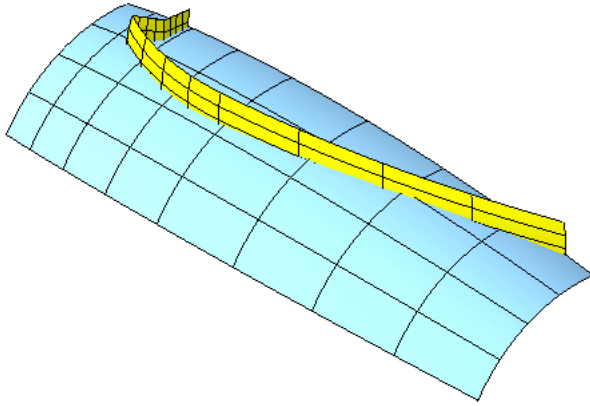
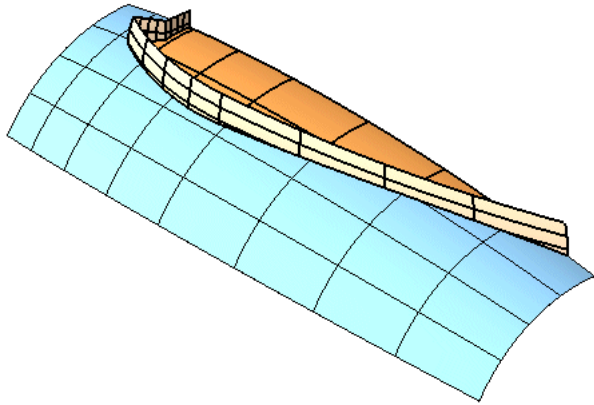Next, we have to trim both surfaces at their intersections.

- Go to **Modify ⇨ Surface ⇨ Trim with Limits**.

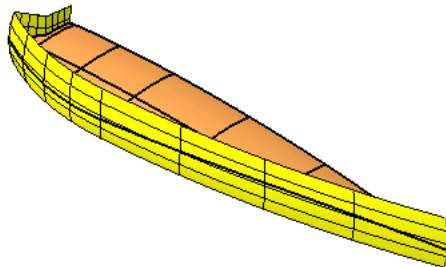- Select yellow surfaces as Limits. Then right-click, Continue.
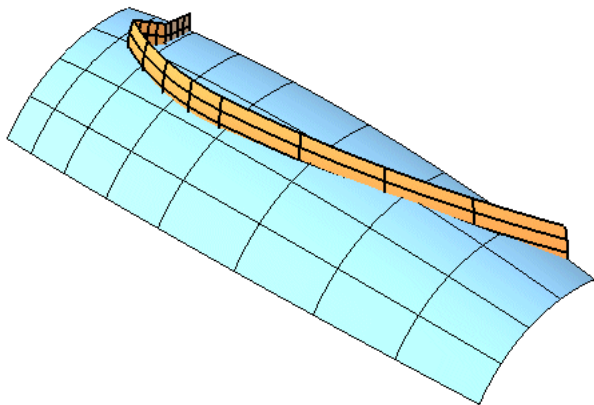
- Select the Rotational surface as the Surfaces to trim. Then right-click, Continue.

- Click inside the domain you want keep for Regions to Keep.

- Click OK to complete and exit the command.

Repeat the same steps to trim the yellow surfaces.

Note:

Trim with Limits : This trim command trims surfaces to boundaries that lie on the surface. It also trims surfaces with boundaries that are projected in the view direction. So when trimming with curves that do not lie on the surface to be trimmed, make sure you set your view for the proper trimming results.
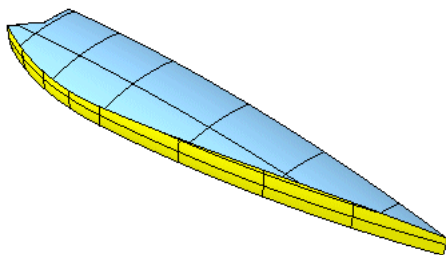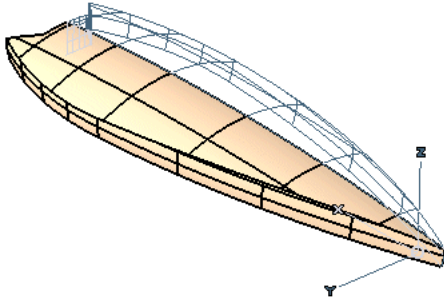

# 2. Step 2: Let's continue to modeling!

Let's continue to define the external shape of our object working with Thinkdesign.

- Go to **Mirror Entities** and select all the surfaces as Entities.

- Change the Symmetry plane option to Perpendicular to axis and through point.

- Set the Y Axis.

- Select the **Work Plane Origin** as through point of the plane.

- Check the Copy checkbox.

- Go to **Plane Surface** and select all bottom surfaces's edges.
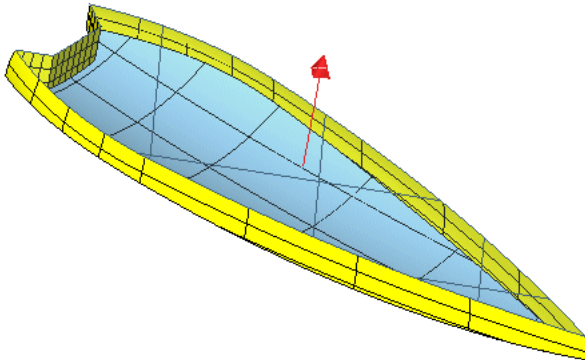
Note: Cannot make plane surface!

If you have problem to select them, create the boundary curves and hide all surfaces.

Make sure that the outer boundary curve makes a chain. Create the necessary curves using **Boundary Curve** and you can chain them by right clicking on one of the perimeter curves and selecting Select >> Chain.
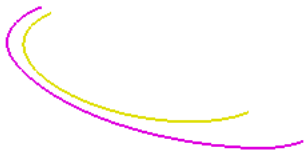
If the boundary curves do not chain, then use **Trim/Extend Curves** command to clean up the ends of these curves.

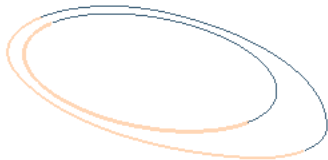The image below shows the plane surface.
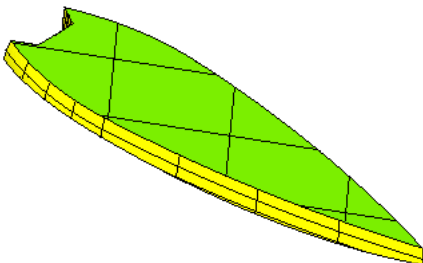
We will move the boundary curves in the space to make other surfaces to use to split the internal slot.

- Set current layer 10 and only itself visible.

Go to **Mirror Entities**. Select all curves as Entities and hit Retrieve button to resume last symmetry operation..


Use **Move Copy Entities** command to move the inner conic curve in Z direction by 3 mm. Check the copies as 2. This will move these curves into the interior of the part. You have to use the moved curves.
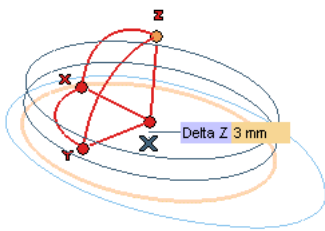

Now let's create a projection of bottom conic curve in the top surfaces using **Project Curve**. You need to activate and show all surfaces by **Wireframe View**.
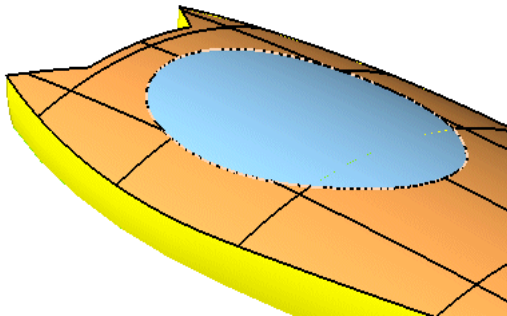
• Start the **Project Curve** command

• As Curves select curve c1.

• Under 'Method' select Pierce direction and indicates Z as Direction.

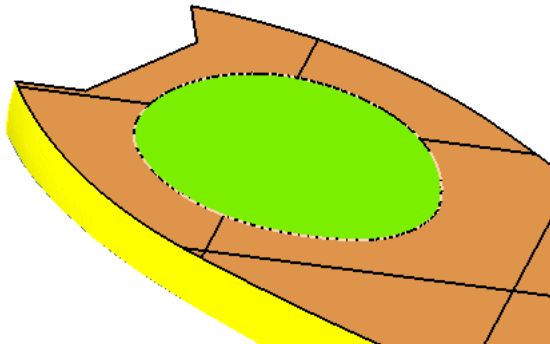• As 'On' choose 'Surface' and select the all top surfaces.
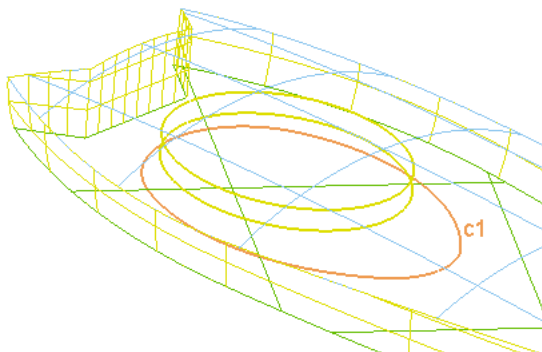
The projected curves now lie on top surfaces.
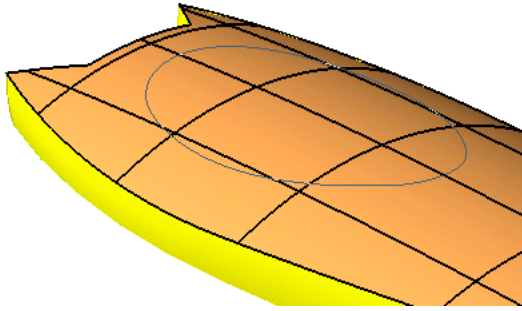
Use **Trim with Limits** to split top surfaces using the projected curves as limits.
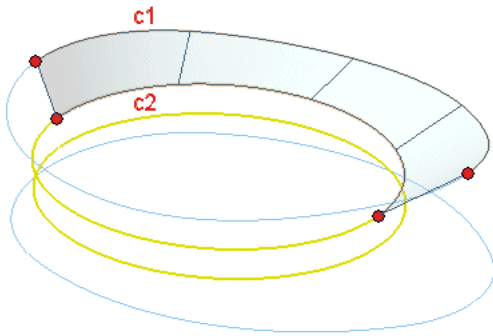

Repeat the same command in the bottom using the original curves..

Now, hide all surfaces to clear the model but keep the curves to define the internal slot.

- Start the **Blending Shapes** command

- As First Curves select the C1.

- As Second Curves select the C2.

- Check Same continuity and impose 'Continuity' as Position.
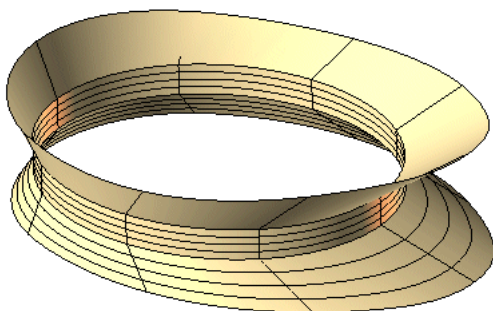
- Hits Preview to show the result.

You don't have Blending Shapes Licence??

Use **Join Curves** to join curves and **Lofted Surface** (ruled) to make the surface.

Continue to insert ruled surfaces.
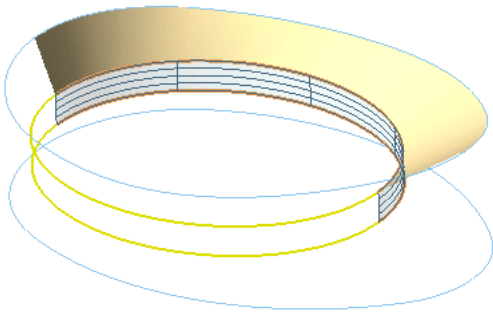
Rotate the part over and repeat the same steps we just did in the mirrored curves.


3. Step 3: Let's create hybrid geometries!

Let's create the complete model using hybrid modeling to quicken the modeling time.

Hide all extra entities to take a look at the clean; keep the surfaces.

Let's define one solid and then remove all tangency discontinuity.

- Go to **Make Solid** command and **Select All**.

- Click OK to complete and exit the command. Your model will be similar to the image below.
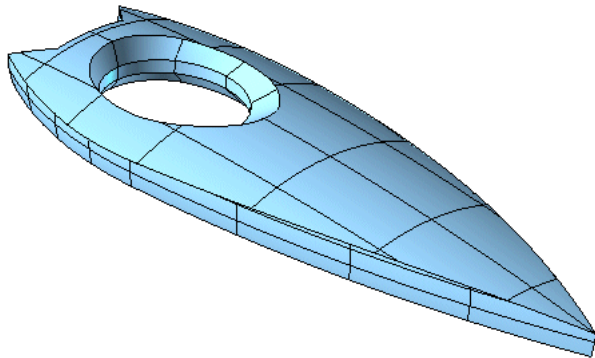

Let's insert some solid fillets to give a better look.

- Start the **Fillet Edges** command and select the front edge.

- Set the Radius to 5mm.

- Set as Constant Radius mode.

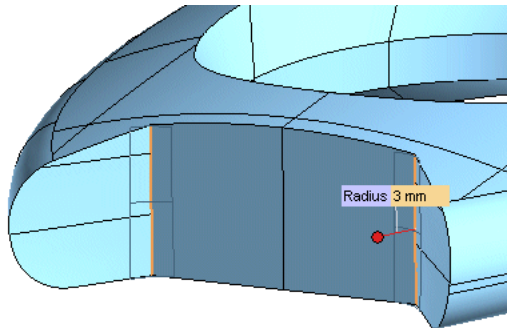- Click Apply to create the fillet and stay in the fillet command
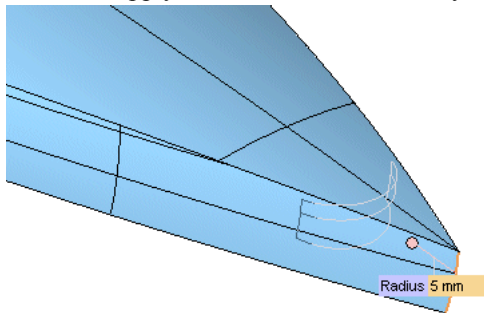
Next, let's add some more fillets to soften the look of our model. Rotate the model on the bottom side.

- The **Fillet Edges** is yet active.

- Select the top and bottom edges.

- Set the Radius to 4mm. .

- Set Constant Arc Length.

- Click Apply to create the fillet and stay in the fillet command
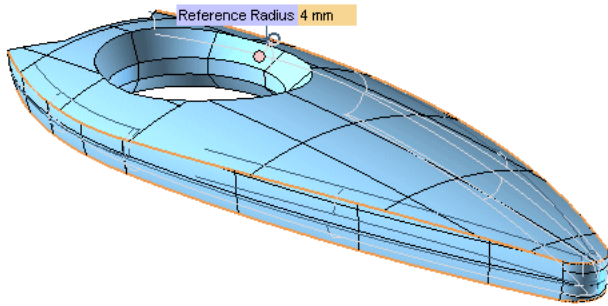
- Next select the two inside edges of the cat's ears.

- Set radius size to 3mm. Set as Constant Radius mode.

- Click Apply to create the fillet and stay in the fillet command

- Next, we'll run a fillet around little cat's hear.

- Set the radius size to 2mm. Set the radius type to Constant Radius,

- Click Apply to create the fillet and stay in the fillet command
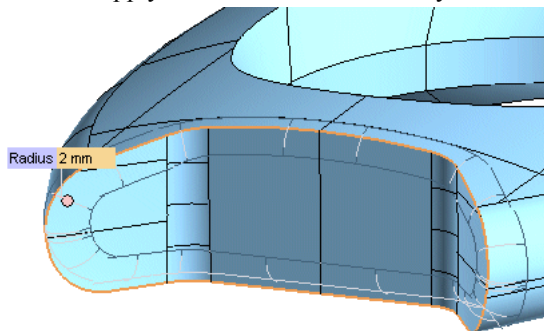
- Next, we'll run a fillet around the top and bottom slot edges of the part. Select the edges shown below for fil-leting.

- Set the radius size to 4mm. Set the radius type to Constant Arc Length.

- Click OK to complete and exit the command.
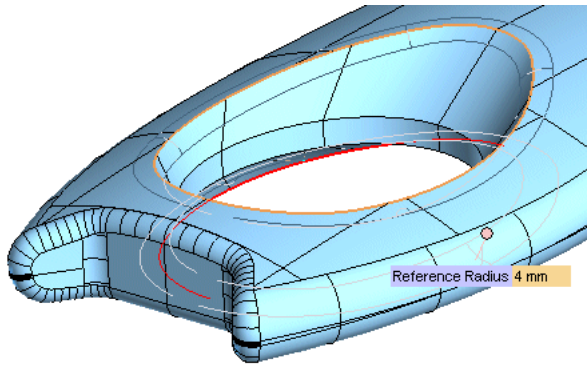
OK, that's great.
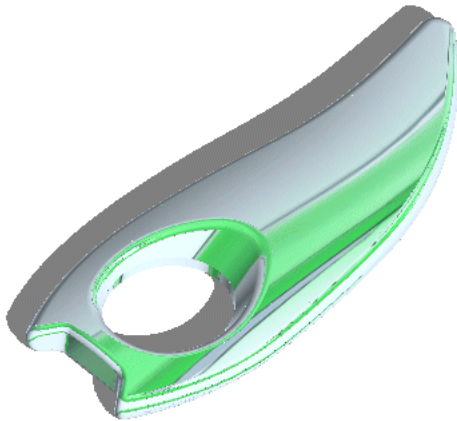
We are basically done with this part so let's save it.

- **Save** with the name 'Cat Bottle Opener.e3'.

Let's have some fun and create a variation of this design. By utilizing thinkdesign's Global modeling technology, we can quickly come up with a variation of this design.

- Activate layer 50

- Go to **Global Bend** command. Set the entities to solid and pick the solid model.

- Set the Bend line option to 'Line'. Choose the line of the level 50.
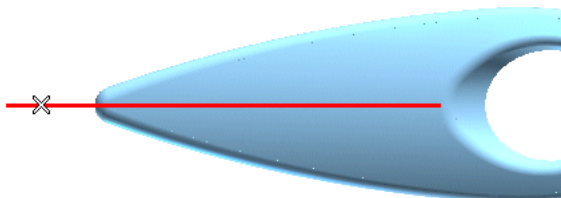
- Change the Length and Angle handles to change the way the bend happens. Since this is a solid, don't forget to check the 'Copy' option.
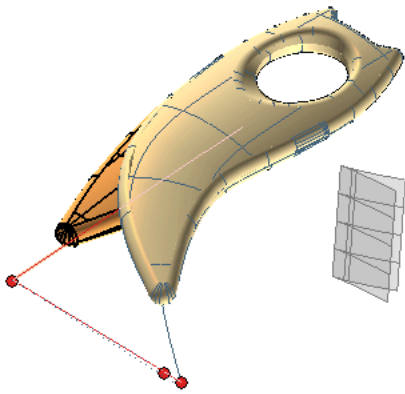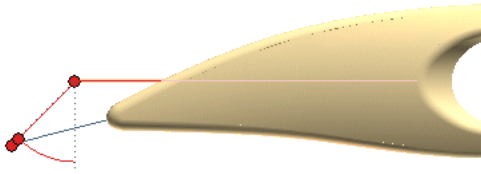
Alert message: Warning

Changing the Bend data, system alerts you each time the geometry bend it-self.

- Once the bend operation is successful, you may hide the original solid you used for bending.

Great job!! The final model should look similar to this one.