



This tutorial will take you through the steps required in developing an iLogic vessel in Inventor 2011. Once complete, the files created can be used in production, and modified as required by your company. It is broken into six phases:

- Part Parameter Configuration
- Assembly Parameter Configuration
- Head Component Development
- Shell Component Development
- Skirt Component Development
- Vessel Assembly Development

You will need Inventor 2010 with the iLogic addin installed (available from Autodesk if you're on subscription) or Inventor 2011. It will take about 90 minutes to complete, and requires a basic understanding of Inventor.

Getting Started

Template Setup

Although not necessary, this tutorial will use templates as a basis for the vessel files. This will minimize the amount of parameters we will need to fill out. Creating templates will be a simple matter of copying Inventor's templates and renaming them.

1. Open the Inventor Template Folder, which by default is *%ProgramFiles%\Autodesk\Inventor 2011\Templates*.
2. Create a new folder called **Vessels**
3. Copy **Standard.ipt**, and **Standard.iam** to the new Vessels folder
4. Rename them to **Vessel.ipt**, and **Vessel.iam**

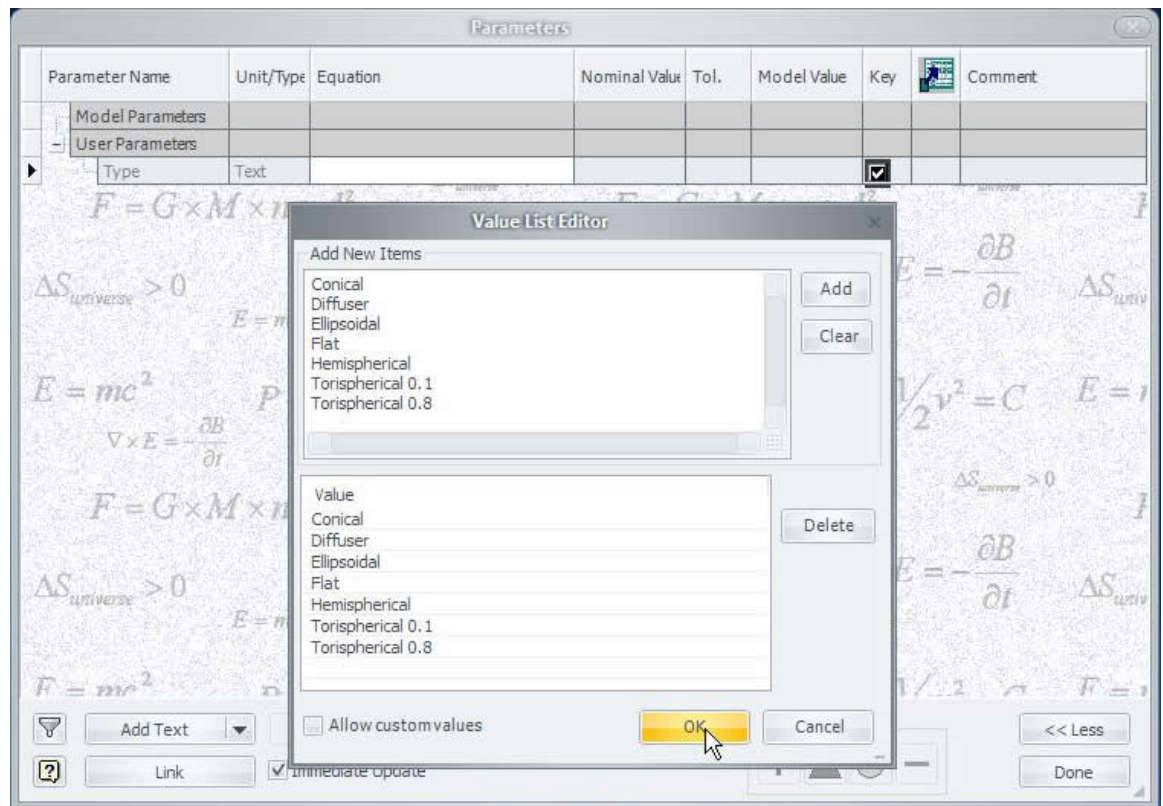
You can download the files [here](#). Extract the contents to your Inventor 2011 Template folder.

Vessel Part Template

Open the **Vessel.ipt** Template (*%ProgramFiles%\Autodesk\Inventor 2011\Templates\Vessels\Vessel.ipt*). The first step will be the definition of our user parameters.

5. Open the Parameters dialog (*Manage->Parameters*)
 - a. Add the Head Type Parameter
 - i. Click *Add Text*
 - ii. Parameter Name: **Type**
 - iii. Key: **Checked**
 - iv. Export: **Checked**
 - v. Right-Click over the equation field, and select *Make Multi-Value*
 - (1) Enter the following:
 - (a) Conical
 - (b) Diffuser
 - (c) Ellipsoidal
 - (d) Flat
 - (e) Hemispherical
 - (f) Torispherical 0.1
 - (g) Torispherical 0.8
 - (2) Click *Add* to add them to the list
 - (3) Click *OK*
 - vi. Comment: **Vessel Head Type**

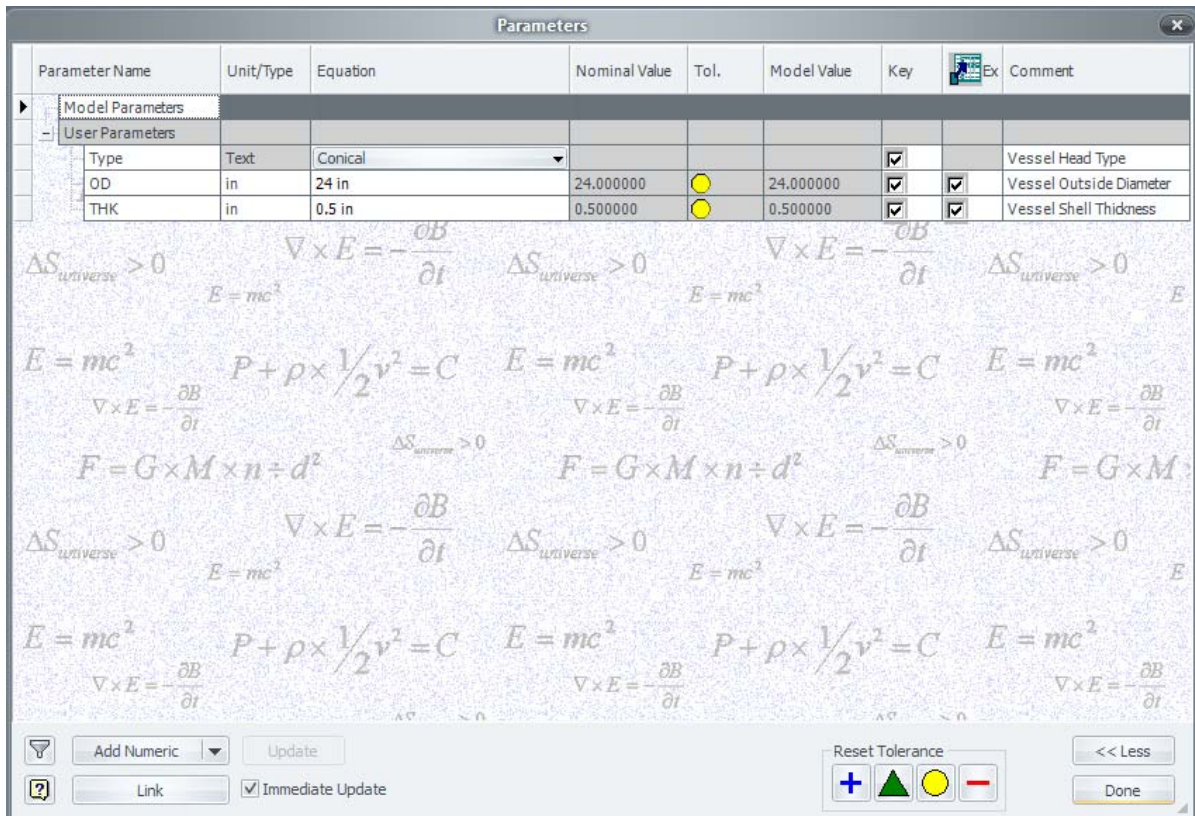
- b. Add the Vessel OD parameter
 - i. Click *Add Numeric*
 - ii. Parameter Name: OD
 - iii. Unit/Type: in
 - iv. Equation: 24
 - v. Key: Checked
 - vi. Export: Checked
 - vii. Comment: Vessel Outside Diameter



c. Add the Vessel Thickness Parameter

- i. Click *Add Numeric*
- ii. Parameter Name: THK
- iii. Unit/Type: in
- iv. Equation: 0.5
- v. Key: Checked
- vi. Export: Checked
- vii. Comment: Vessel Thickness

We have successfully configured the Vessel Part Template. We will now configure the Vessel Assembly Template.

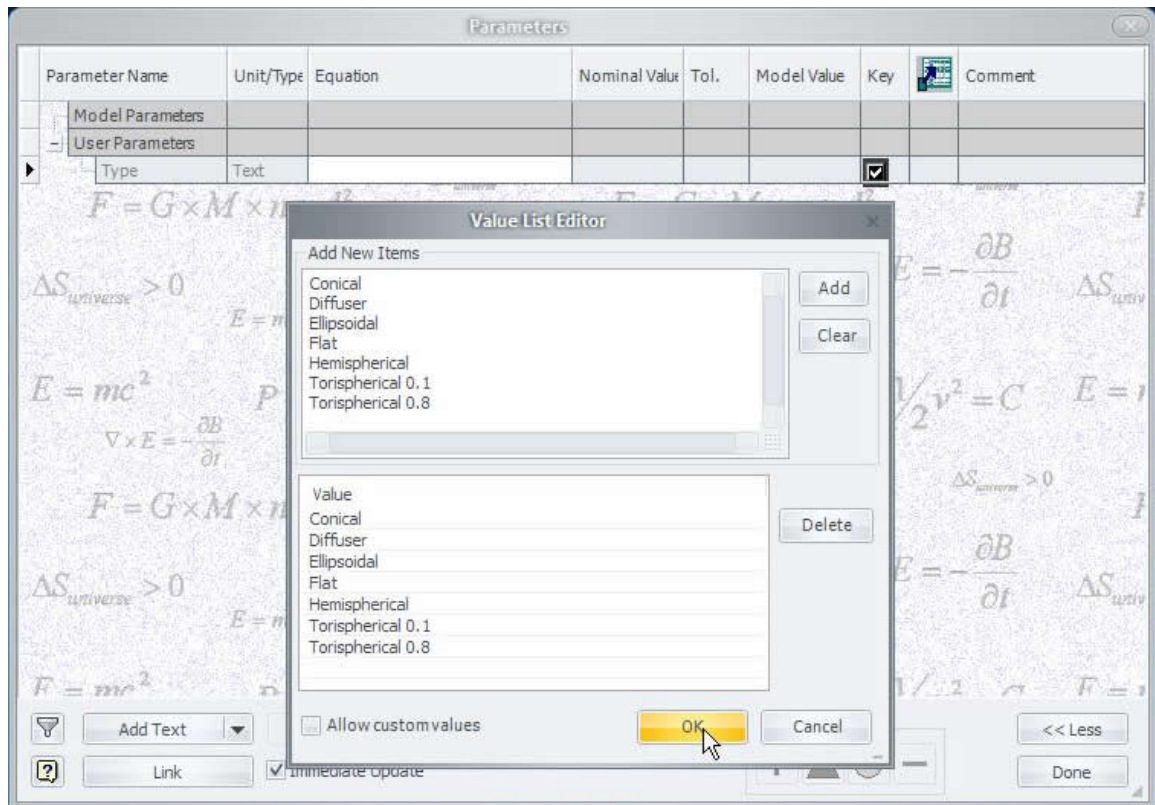


Vessel Assembly Template

Open the *Vessel.iam* Template (*%ProgramFiles%\Autodesk\Inventor 2011\Templates\Vessels\Vessel.iam*), and we will configure our assembly user parameters, using the same steps as for the part template, with some additions.

1. Open the Parameters dialog (*Manage->Parameters*)
 - a. Add the Head Type Parameter
 - i. Click *Add Text*
 - ii. Parameter Name: **Type**
 - iii. Key: **Checked**
 - iv. Export: **Checked**
 - v. Right-Click over the equation field, and select *Make Multi-Value*
 - (1) Enter the following:
 - (a) Conical
 - (b) Diffuser
 - (c) Ellipsoidal
 - (d) Flat
 - (e) Hemispherical
 - (f) Torispherical 0.1
 - (g) Torispherical 0.8
 - (2) Click *Add* to add them to the list
 - (3) Click *OK*
 - vi. Comment: **Vessel Head Type**

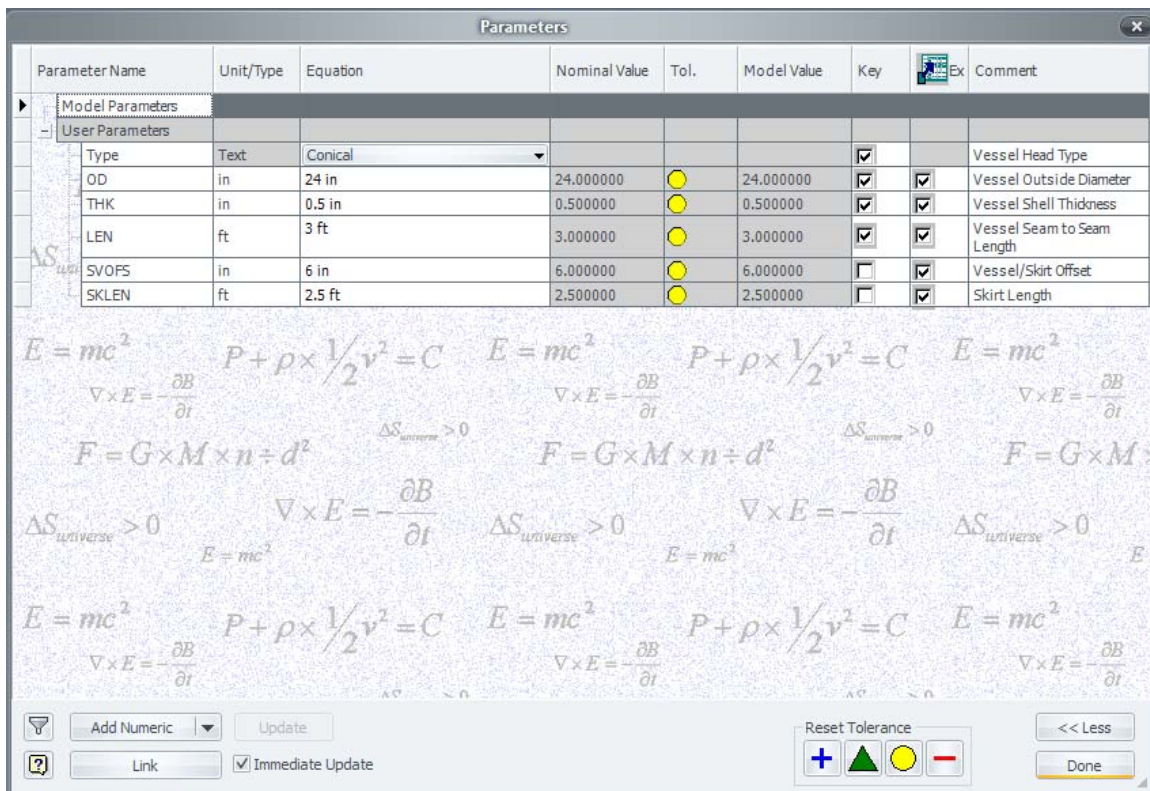
- b. Add the Vessel OD parameter
 - i. Click *Add Numeric*
 - ii. Parameter Name: OD
 - iii. Unit/Type: in
 - iv. Equation: 24
 - v. Key: Checked
 - vi. Export: Checked
 - vii. Comment: Vessel Outside Diameter



- c. Add the Vessel Thickness Parameter
 - i. Click *Add Numeric*
 - ii. Parameter Name: THK
 - iii. Unit/Type: in
 - iv. Equation: 0.5
 - v. Key: Checked
 - vi. Export: Checked
 - vii. Comment: Vessel Thickness
- d. Add the Vessel Seam to Seam Length Parameter
 - i. Click *Add Numeric*
 - ii. Parameter Name: LEN
 - iii. Unit/Type: ft
 - iv. Equation: 3
 - v. Key: Unchecked
 - vi. Export: Checked
 - vii. Comment: Vessel Seam to Seam Length
- e. Add the Vessel/Skirt Offset Parameter
 - i. Click *Add Numeric*
 - ii. Parameter Name: SVOFS
 - iii. Unit/Type: in
 - iv. Equation: 6
 - v. Key: Unchecked
 - vi. Export: Checked
 - vii. Comment: Vessel/Skirt Offset

- f. Add the Skirt Length Parameter
 - i. Click *Add Numeric*
 - ii. Parameter Name: SKLEN
 - iii. Unit/Type: ft
 - iv. Equation: 2.5
 - v. Key: Unchecked
 - vi. Export: Checked
 - vii. Comment: Vessel/Skirt Offset

This completes the configuration of the Vessel Assembly Template. Save the file, and then save it as *%ProgramFiles%\Autodesk\Inventor 2011\Templates\Vessels\Skirt.iam*, and we will configure the skirt assembly.



Skirt Assembly Template

Our final template is the *Skirt Assembly Template*. If necessary, open *%ProgramFiles%\Autodesk\Inventor 2011\Templates\Vessels\Skirt.iam*.

1. Open the **Parameters** dialog box
 - a. Right click the **Type** parameter and delete it. It is not required for the skirt.
 - b. Make **SVOFS**, and **SKLEN** keys.
 - c. Add the **Skirt Flange Width** parameter
 - i. Click *Add Numeric*
 - ii. Parameter Name: **SKFWDT**
 - iii. Unit/Type: **in**
 - iv. Equation: **1**
 - v. Key: **Checked**
 - vi. Export: **Checked**
 - vii. Comment: **Skirt Flange Width**
 - d. Add the **Skirt Flange Thickness** parameter
 - i. Click *Add Numeric*
 - ii. Parameter Name: **SKFTHK**
 - iii. Unit/Type: **in**
 - iv. Equation: **0.5**
 - v. Key: **Checked**
 - vi. Export: **Checked**
 - vii. Comment: **Skirt Flange Thickness**

Skirt Assembly Template

We have completed configuring all our templates, and are ready to continue with the Vessel Component Design.

The Parameters dialog box displays the following table of parameters:

Parameter Name	Unit/Type	Equation	Nominal Value	Tol.	Model Value	Key	Ex	Comment
Model Parameters								
User Parameters								
OD	in	24 in	24.000000	●	24.000000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Vessel Outside Diameter
THK	in	0.5 in	0.500000	●	0.500000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Vessel Shell Thickness
LEN	ft	3 ft	3.000000	●	3.000000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Vessel Seam to Seam Length
SVOFS	in	6 in	6.000000	●	6.000000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Vessel/Skirt Offset
SKLEN	ft	2.5 ft	2.500000	●	2.500000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Skirt Length
SKFWDT	in	3 in	3.000000	●	3.000000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Skirt Flange Width
SKFTHK	in	0.5 in	0.500000	●	0.500000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Skirt Flange Thickness

The background of the dialog box is filled with mathematical equations such as $E = mc^2$, $P + \rho \times \frac{1}{2} v^2 = C$, $\nabla \times E = -\frac{\partial B}{\partial t}$, $F = G \times M \times n \div d^2$, and $\Delta S_{universe} > 0$.

At the bottom of the dialog, there are controls for adding numeric values, linking parameters, and resetting tolerances. The "Reset Tolerance" section includes a yellow circle icon, which is currently selected.

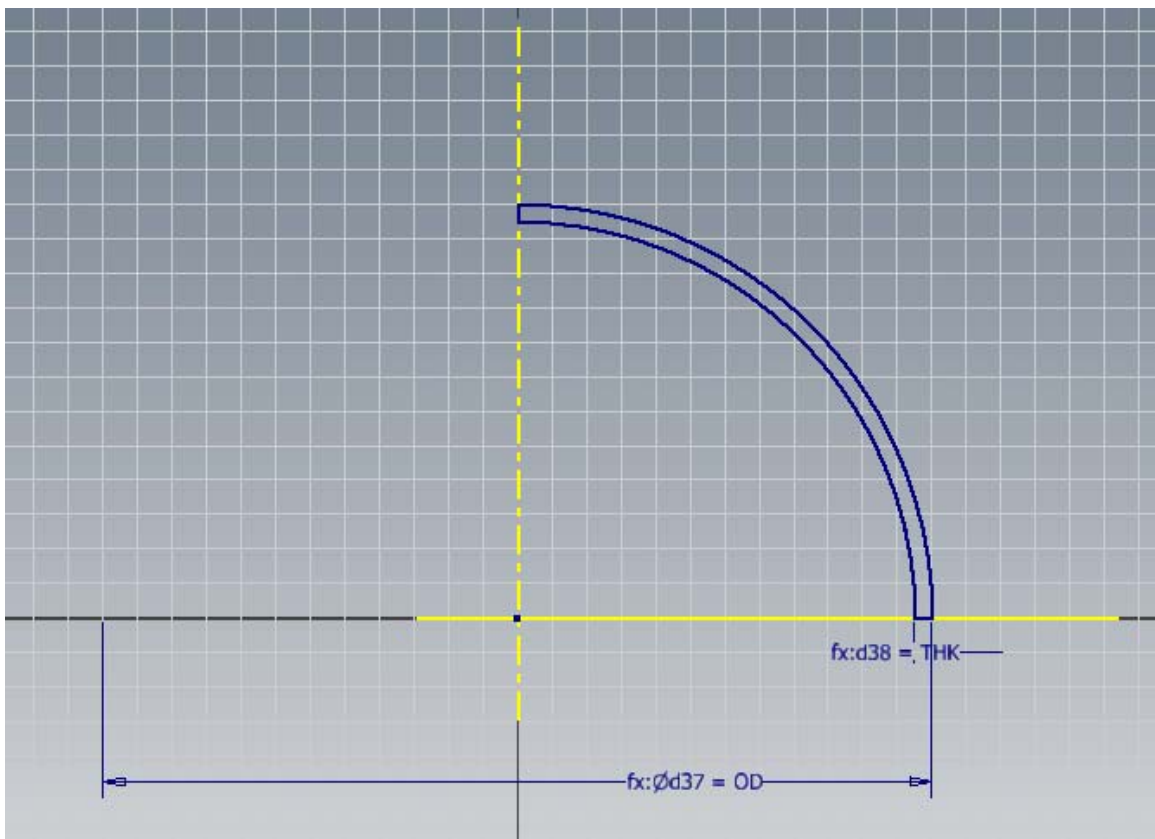
Tutorial Project

Create a new project called *iLogicVessel*, and make it active. It can either be a single user, or a vault project. If you need help with setting up a project, consult your Inventor help Files.

Hemispherical



1. Create a new sketch on the XY Plane
2. Rename the sketch to *skHemispherical*
3. Create the following sketch
4. Finish the sketch, and revolve the profile around the Y-Axis
5. Rename the Revolved feature to *Hemispherical*
6. Place two **Opposed Insert** iMates on the weld face of the head
7. Rename them both *Vessel*
8. Suppress the *Hemispherical* feature

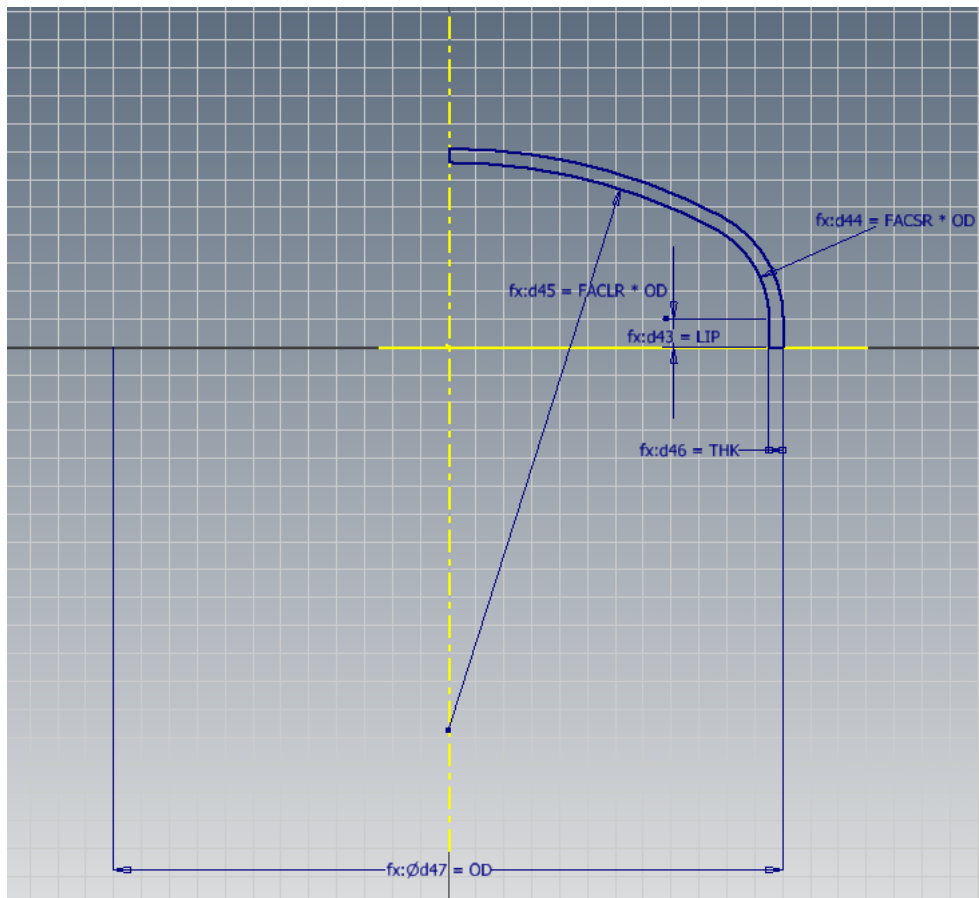


Torispherical



the Y-Axis

1. Create a new sketch on the XY Plane
2. Rename the sketch to *skTorispherical*
3. Create the following sketch
4. Finish the sketch, and revolve the profile around
5. Rename the Revolved feature to *Torispherical*
6. Place two **Opposed Insert** iMates on the weld face of the head
7. Rename them both *Vessel*
8. Suppress the *Torispherical* feature



iLogic Code

We are now ready to write the iLogic code for the head.

1. Add a new rule (Manage->Add Rule)
 - a. Rule Name: Heads
 - i. Ensure that all Features are suppressed.

```
' Suppress all features
Feature.IsActive("Conical") = False
Feature.IsActive("Diffuser") = False
Feature.IsActive("Ellipsoidal") = False
Feature.IsActive("Flat") = False
Feature.IsActive("Hemispherical") = False
Feature.IsActive("Torispherical") = False
```

This can easily be done by clicking the feature in the model tree and selecting *Capture Current State*. Keep only the **Feature.IsActive(<FeatureName>) = False** lines.

- ii. Unsuppress Selected Head Type

```
' Unsuppress and set parameters for selected head type
If Type = "Conical" Then
    Feature.IsActive("Conical") = True
    KRFAC = 0.154 ul

ElseIf Type="Diffuser" Then
    Feature.IsActive("Diffuser") = True
    DRFAC = 0.85 ul 'Dish Radius Factor
    KRFAC = 0.154 ul

ElseIf Type="Ellipsoidal" Then
    Feature.IsActive("Ellipsoidal") = True

ElseIf Type="Flat" Then
    Feature.IsActive("Flat") = True

ElseIf Type="Hemispherical" Then
    Feature.IsActive("Hemispherical") = True

ElseIf Type="Torispherical 0.1" Then
    Feature.IsActive("Torispherical") = True
    DRFAC = 1 ul
    KRFAC = 0.1 ul

ElseIf Type="Torispherical 0.8" Then
    Feature.IsActive("Torispherical") = True
    DRFAC = 0.85 ul
    KRFAC = 0.154 ul

End If
```