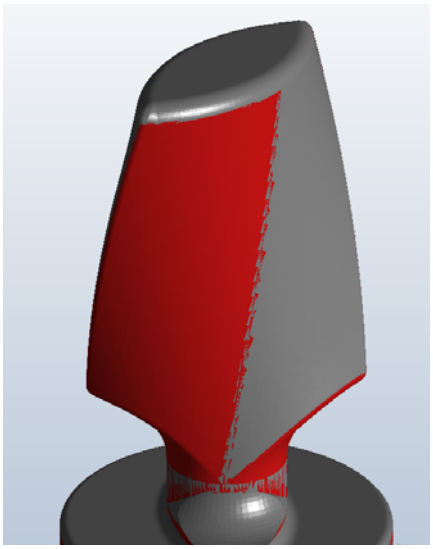
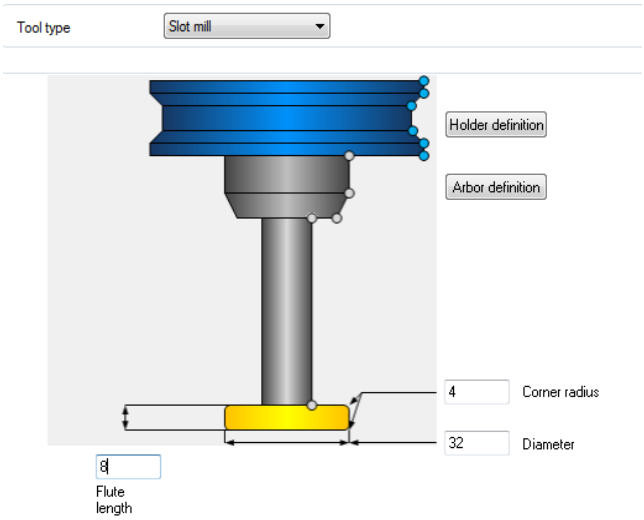
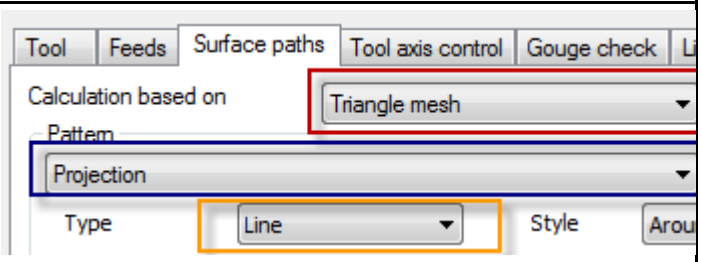
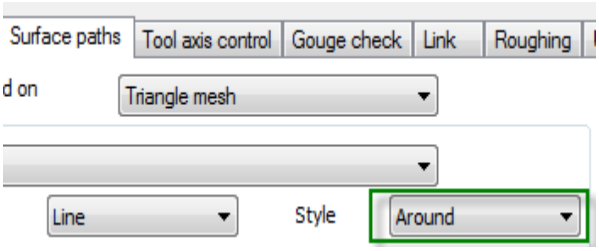
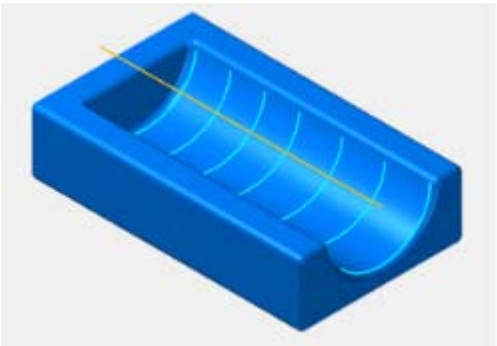
Line projection strategy , features and application.

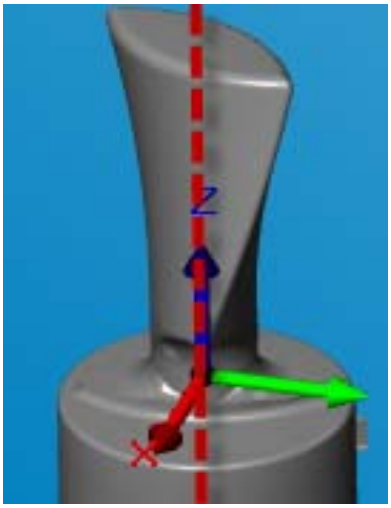
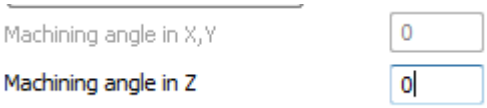
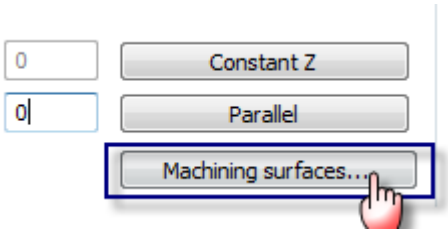
This example demonstrates the features of new Line projection machining strategy and its application. Line projection strategy can be extensively used for machining of bottle molds, but in this example we will demonstrate its application in 3-axis undercut machining and 4-axis & 5-axis machining of a blade.

Screenshots and graphical images are taken directly from the extensive ModuleWorks test harness application supplied to all of customers. Depending on implementation the target application may use different user interfaces and graphical display methods.

Geometry to be machined. Twisted blade model. Input format : STL model Line_projection.stl	
First we demonstrate the use of line projection strategy for 3-axis undercut machining of twisted blade. (Red area highlight's the undercut regions on blade)	

Tool : To machine the model in 3-axis we will use 32 dia slot mill, 8mm flute length and 4mm corner radius.	
On the main dialog move to the '*Surface paths*' tab and select '*Triangle mesh*' from the *'Calculation based on'* drop down. Select '***Projection***' for pattern and **Type** as *'Line'*	

Parameters :	
Style : 'Around' Sets the pattern to be projected normal to line	

Next we specify the machining angles. Machining angles here specify the line orientation. As the part is aligned in Z and the input line we want to use is center or axis of this part we will use following angles. ***Machining angle in X,Y*** : 0 ***Machining angle in Z*** : 0	 
Click on ***Machining surfaces*** and select Line_projection.stl which is the input geometry we want to machine.	
Radius, this parameter specifies the radius at which the pattern to be projected is created , this depends on the geometry to be machine in our case we will set it to 25mm. **Project** Inwards/Outwards. For core type parts as in the example we set the Project parameter to Inwards, this will project the pattern inwards on the STL model.	

Area parameters:

Line start point : This defines the start point of the line in workspace.

X0 Y0 Z0

Start height along line : This parameter defines the start point of the pattern along the line, this can be used to define & control the area to be machined.

Start height along line : 60

End height along line : This defines the point where the pattern will end

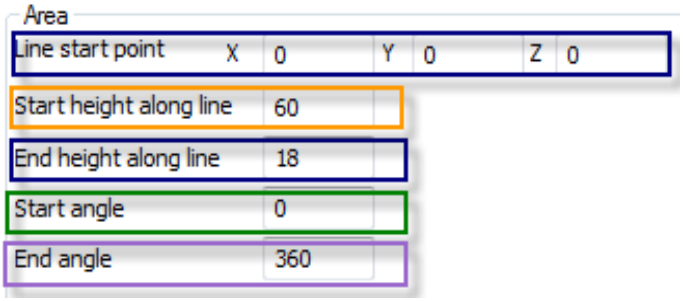
End height along line : 18

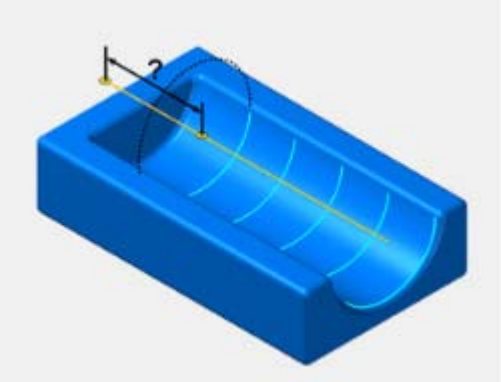
Above parameter also defines the starting point of the toolpath and direction in which the toolpath segments are machined.

Start angle: This parameter defines the angular region to machine as we want to machine the whole part

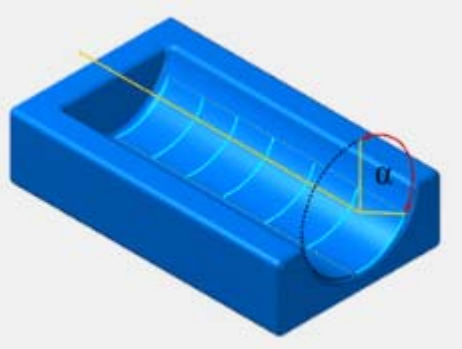
Start angle: 0

End angle: 360





Start/End Height

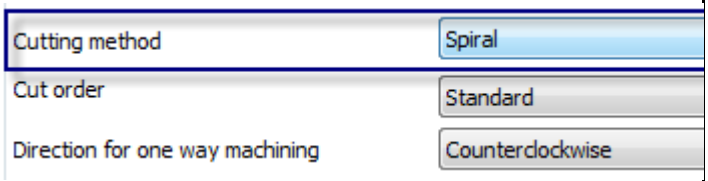


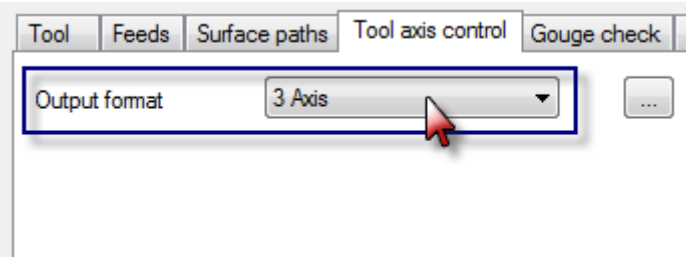
Start/End angle

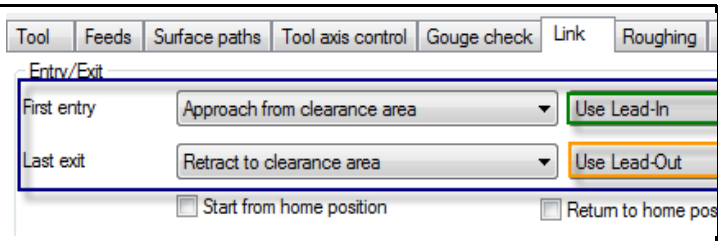
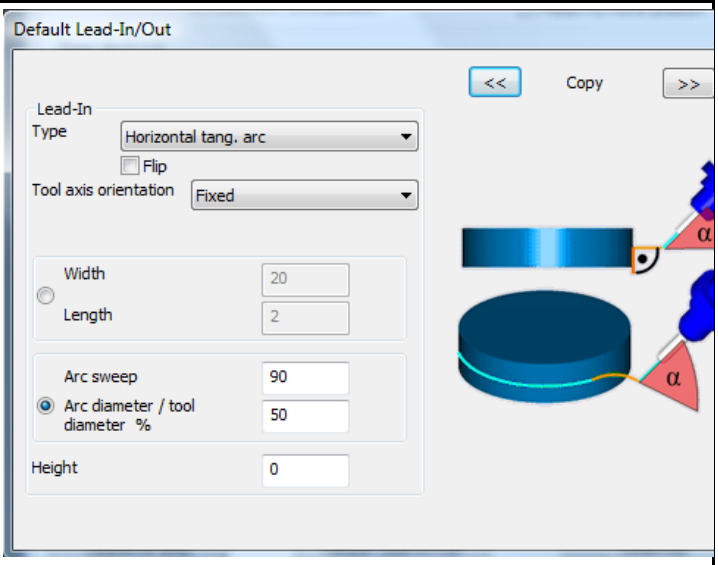
Sorting parameter

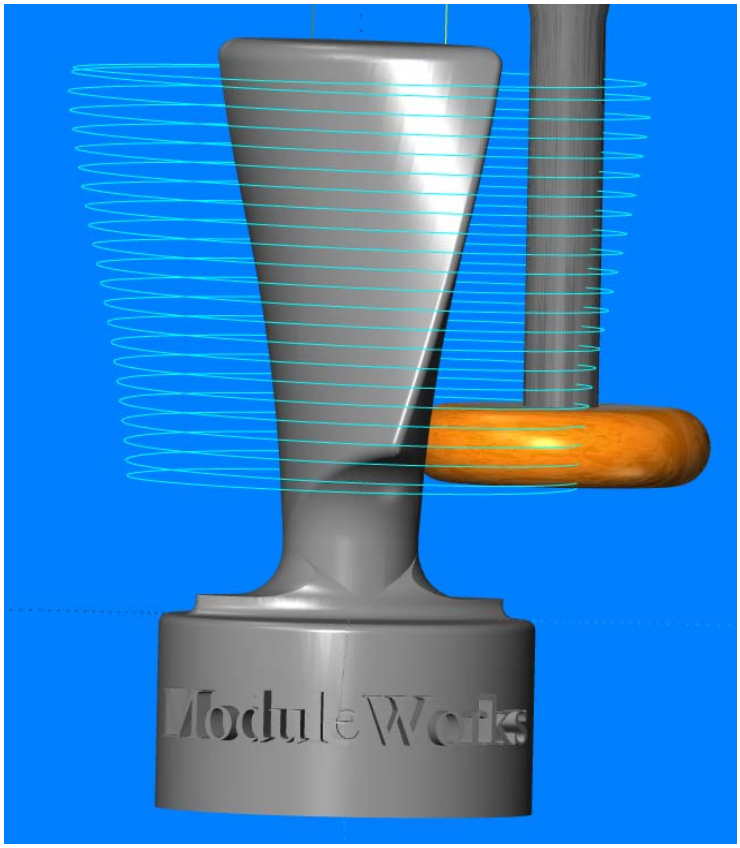
Cutting method: Spiral

This will generate a spiral toolpath with one lead in and lead-out

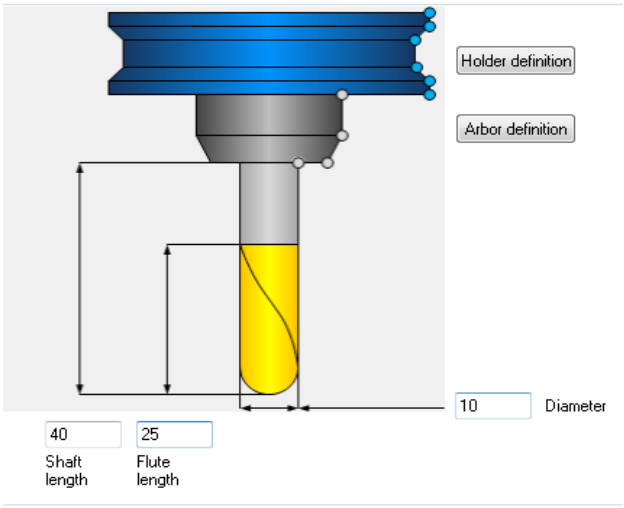


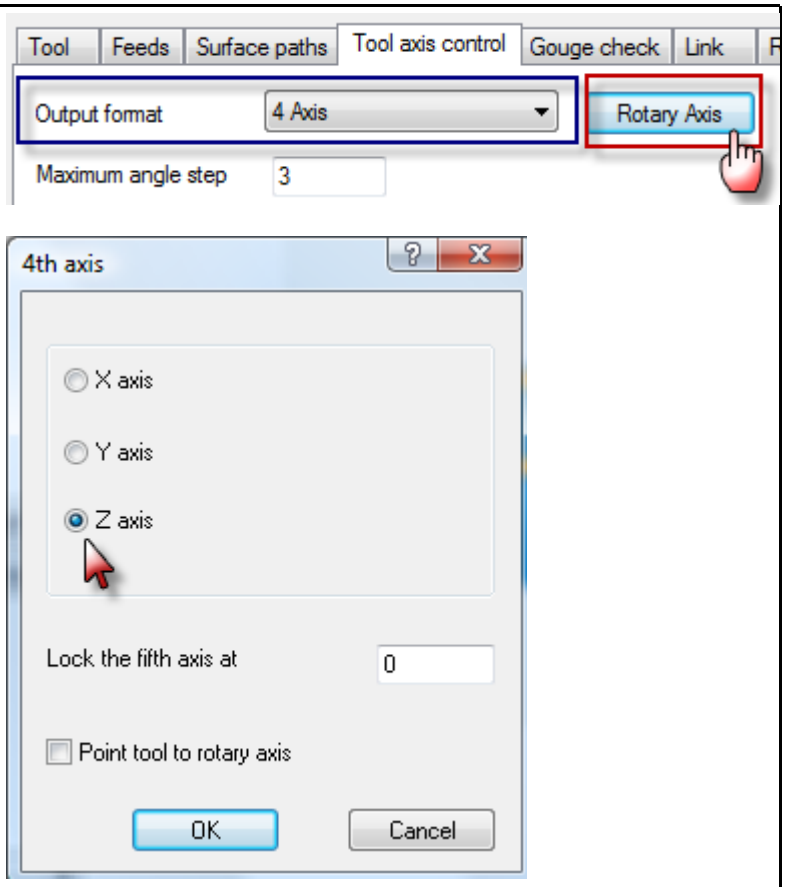
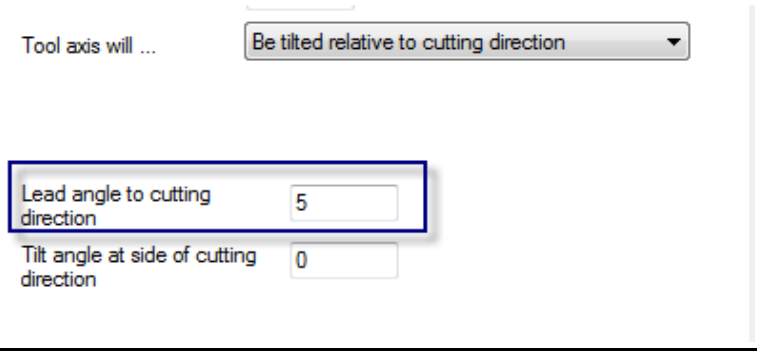
Tool axis: Go to tool axis control page. Set the ***Output format*** to 3-axis	

Links settings: Go to link page. Activate the lead in and lead out for the first entry and last exit.	
The leads are parametric entry and exit movements to and from the machining surfaces. By default all link types use the 'Default Lead-In/Out' which can be set by pushing the 'Default Lead-In/Out' button on the link page. For ***Lead-In*** use Horizontal tang-arc Arc sweep : 90 Arc diameter / tool diameter% : 50 Copy the parameters to Lead out.	

We are now ready to generate the final toolpath. Select OK on the main dialog page and the toolpath is calculated	

4-axis Rotary toolpath using line projection strategy.

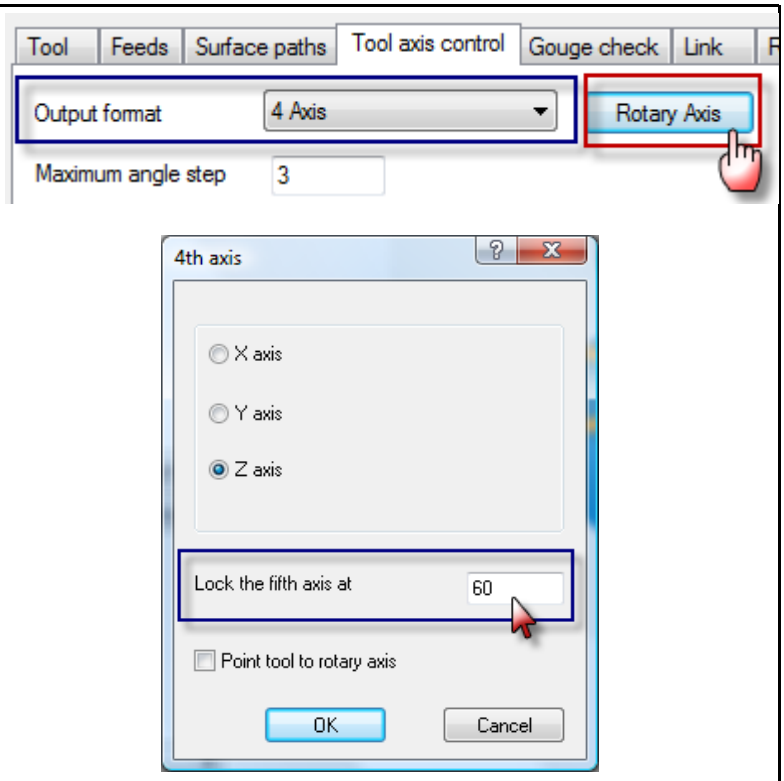
Tool : To machine the model in 4-axis we will use 10 dia Sphere mill, with default parameters	
Use same parameters as above 3-axis example on Surface tab	

Tool axis: Go to tool axis control page. Set the ***Output format*** to 4-axis Click on Rotary Axis button Select Z-axis as 4th Axis.	
Enter a lead angle of 5 deg , this avoids any tip cutting with ball mill and gives a good surface finish.	

Select OK on the main dialog page and the toolpath is calculated .	

4+1 axis rotary toolpath using line projection strategy.

On 5-axis machine you can lock one of the axis to fixed and use the C-axis rotary motion to finish the above part.

Change the following settings in above example. ***Tool axis:*** Go to tool axis control page. Set the ***Output format*** to 4-axis Click on Rotary Axis button Select Z-axis as 4th Axis. Lock the fifth axis at 60 deg	
Select OK on the main dialog page and the toolpath is calculated