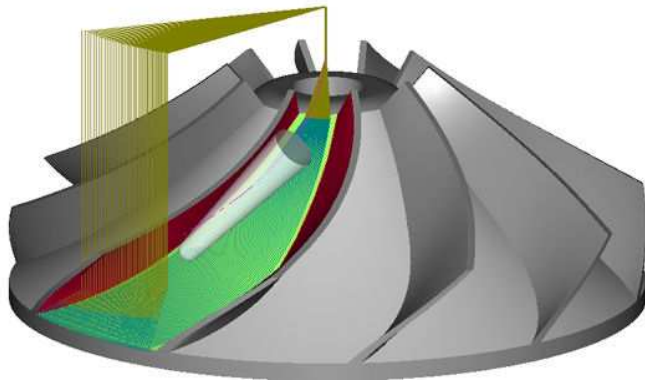


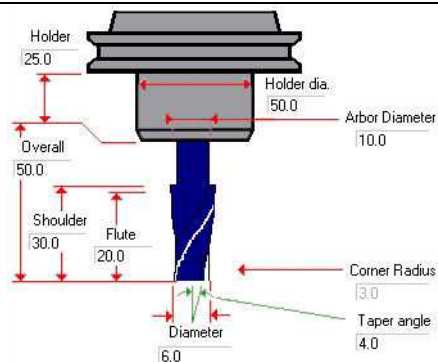
Impeller Floor Finishing

This example looks at machining techniques for finishing machining the floor surface of an impeller blade, a classic 5-Axis simultaneous machining application.



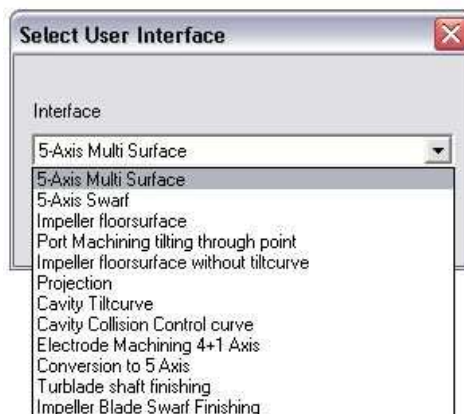
Screenshots and graphical images are taken directly from the extensive ModuleWorks test harness application supplied to all of customers. Depending on implementation the target application may use different user interfaces and graphical display methods.

This example uses a taper ball end mill. Use the tool dialog to specify dimensions. Tool diameter 4 mm, flute length 20mm and length 50mm. The arbour is diameter 8mm, length 30mm and the holder diameter is 20 mm. Select tool taper angles of 4 Degrees and select ball end type as the tool.

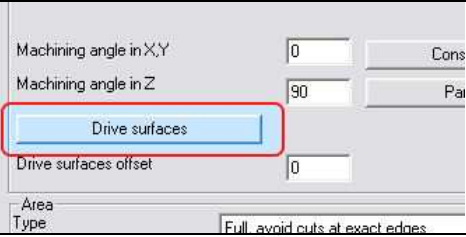


The next stage is to open the native geometry file, in this case "Impeller_floor_surface" and select the 5-Axis Multi Surface interface.

As can be seen in the dropdown options, ModuleWorks has a number of strategies each tuned to specific applications.

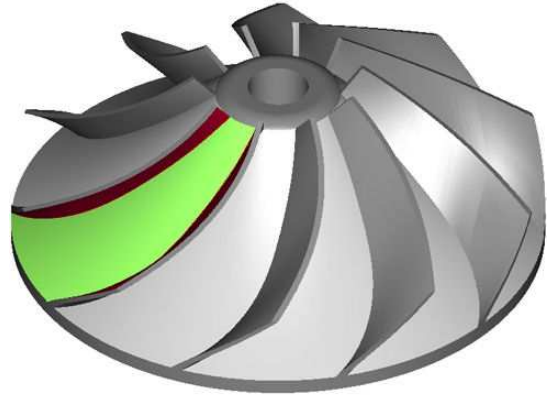


Having selected the user interface, the next step is to select machining strategy. Switch to the 'Surface paths' tab on the dialog and click the *Drive Surfaces* button.



Select the green floor surface as the drive surface. The red surfaces will be used as the drive rails for the toolpath.

Select *Morph between two surfaces* from the pattern strategy drop down menu to generate a tool path on the drive surface by morphing between the two guide surfaces which is very efficient toolpath for impeller components.

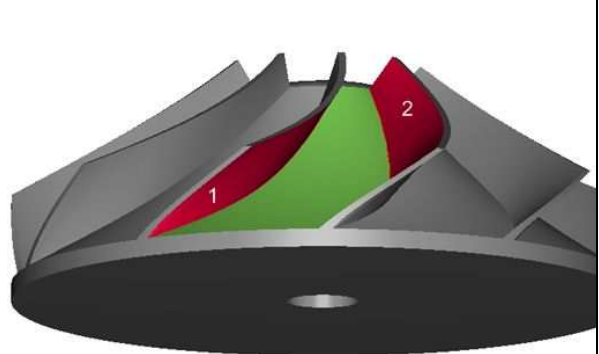


One benefit of this strategy is the option to compensate the tool to the drive surface and check surface in the left and right corners of the work piece. The corners will be defined over margins adjusted on the tool radius allowing the tool to exactly follow the inner edges of the component.

This strategy requires that the tool has a spherical tip and that the drive surface edge touches the check surface edge along the entire length.

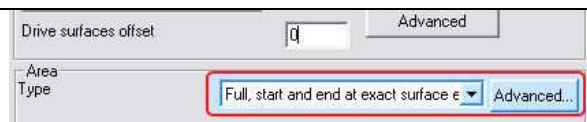


Now select the first and the second check surface by clicking the *First* and *Second* buttons and selecting the surfaces as shown.



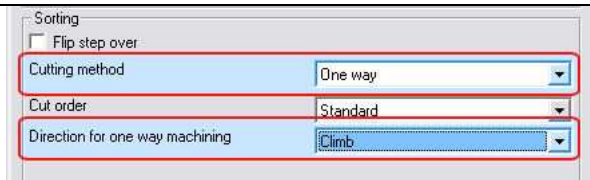
Set the area type to *Full, start and end at exact surface edge* to position the first and last cuts exactly on the surface edge.

Click the *Advanced...* button and specify margin (or offset) values for each check surface. Both values should be the same as the tool radius, in this case 3mm.



Select *Cutting method* of *One-way* and specify *Climb* milling as the direction of machining.

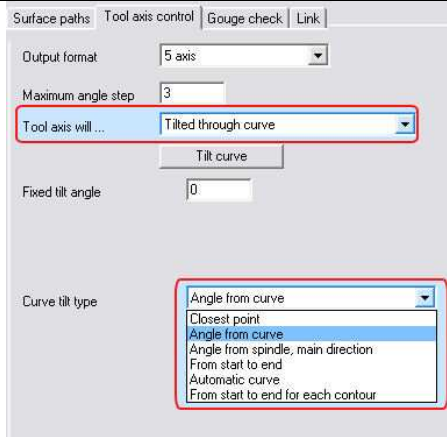
All other strategy settings remain at their defaults.



In this example we are going to use tool axis control to avoid any collision with the check surfaces.

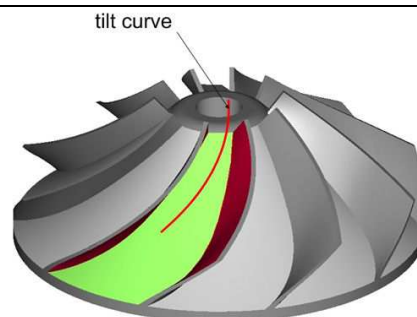
Select *Tool axis will....* to *Tilted through curve* and a *Curve tilt type* of *From start to end for each contour*. This will take each toolpath contour and use the tilt curve to tilt the tool as follows:

At the start the tool axis is tilting to the start of tilt curve. At the mid-point the tool axis is tilted to the midpoint and at the end the tool axis will be tilted to the end of the tilt curve.



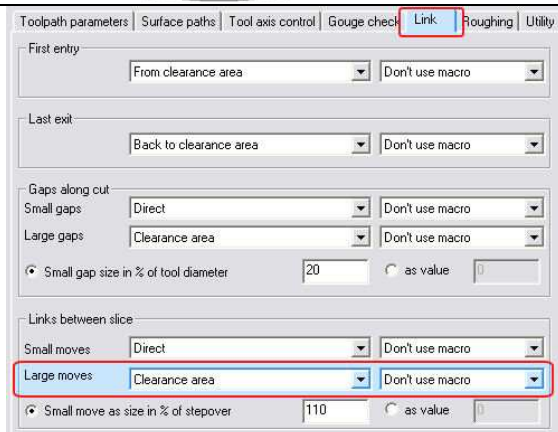
Select tilt curve by clicking the *Tilt curve* button and selecting the curve above the drive surface.

The curve is created by taking the surface edge and transforming it to the centre of the drive surface.

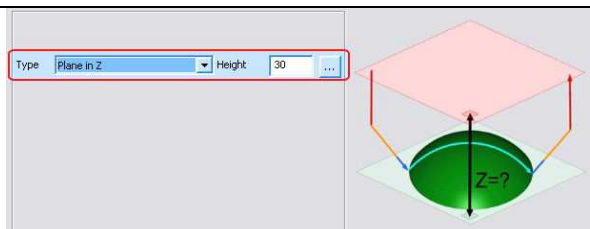


Select the *Link* tab to control the toolpath as it moves between slices. This example is using one way machining so the toolpath begins from one side and returns to start. In the *Link between slice* set *Large moves* to *Clearance area* to ensure the tool retracts to clearance between each pass.

ModuleWorks allows different link strategies for small and large moves to give maximum control over toolpath. The definition of a small move is controlled by the *Small move as size in % of stepover*.

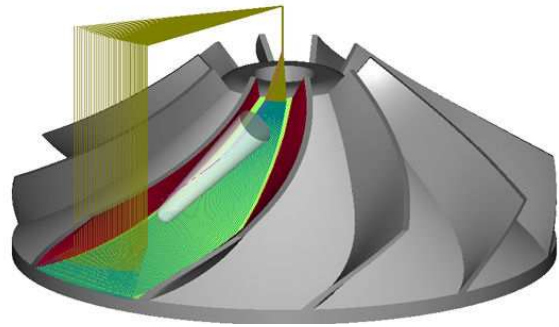


Click the *Clearance* button to specify safe clearance height. This can be specified as a *Plane in Z*, *Cylinder* or *Sphere* and in this case a 30mm plane is used.



We are now ready to generate the final toolpath by selecting the *Regenerate operation* option.

The toolpath is moving from the bottom to the top of the component and is morphed between the two guide surfaces to give evenly spaced cuts. The toolpath retracts to clearance of 30mm between each pass.



The margin or offset value ensures the tool fits exactly between the drive and check surfaces. For this ensure that a ball ended cutter is used and the toolpath is calculated based on tool centre.

