

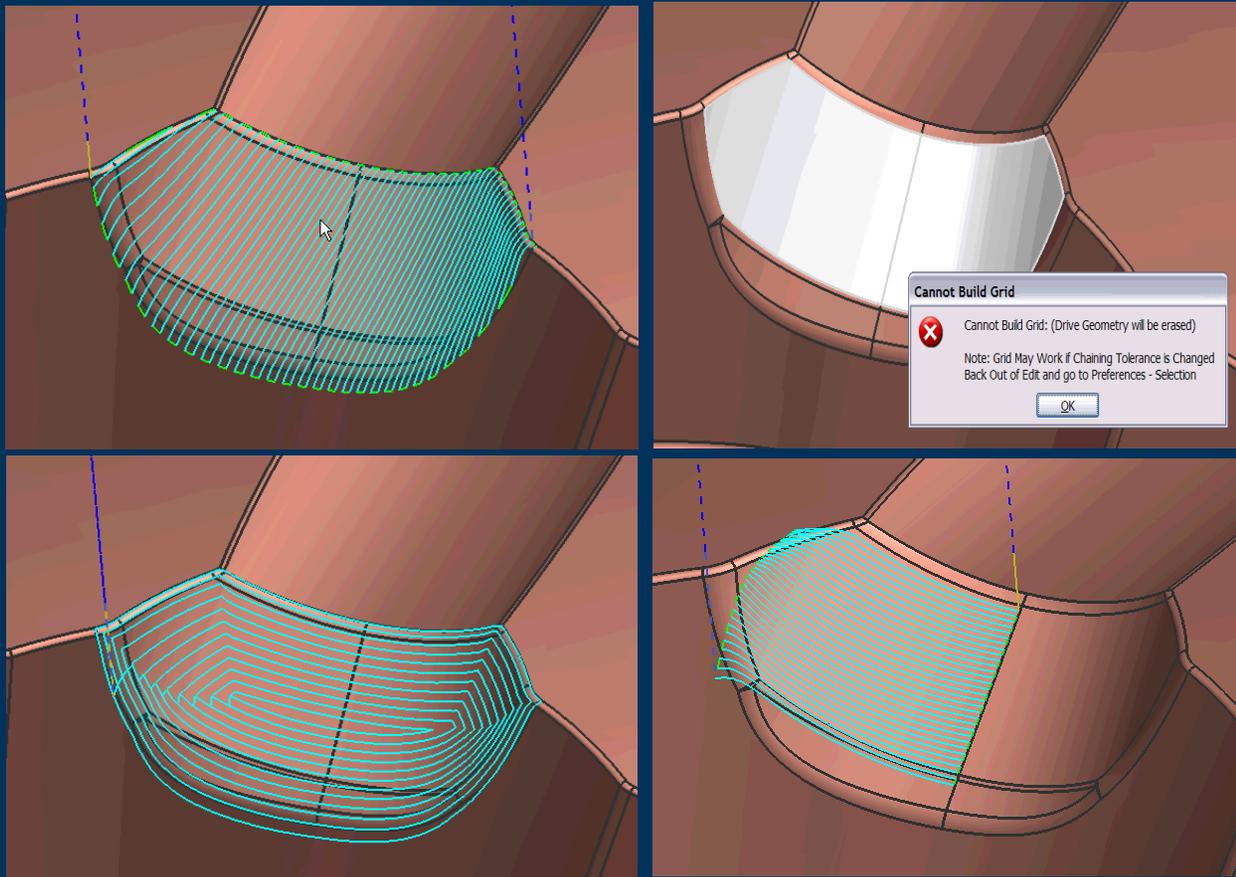


# Milling in NX5

Edwin Gasparraj



# Current Issues

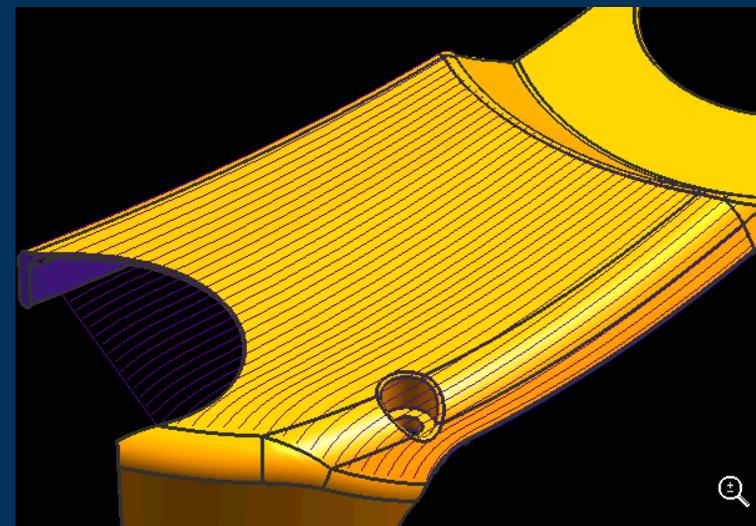
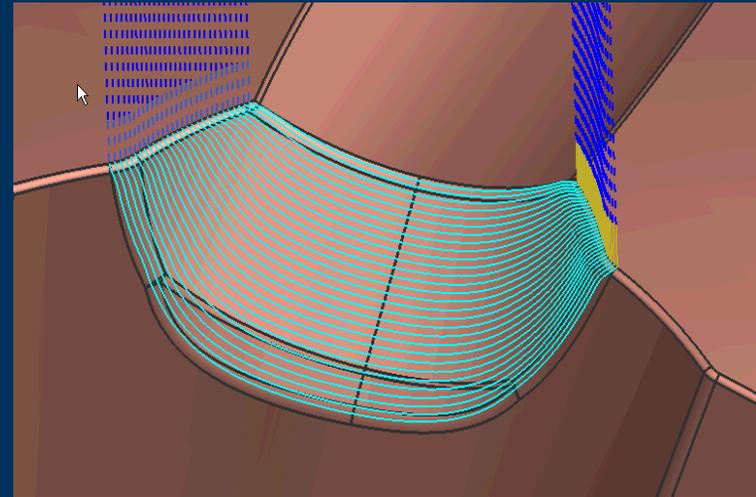


- ▶ Contour Area works well only in clean 4-sided surfaces or surface patches.
- ▶ Area Mill zig patterns do not consider boundary conditions.
- ▶ Area Mill follow-periphery patterns are not well-behaved in steep/shallow surface combinations.



# Streamline Tool Path

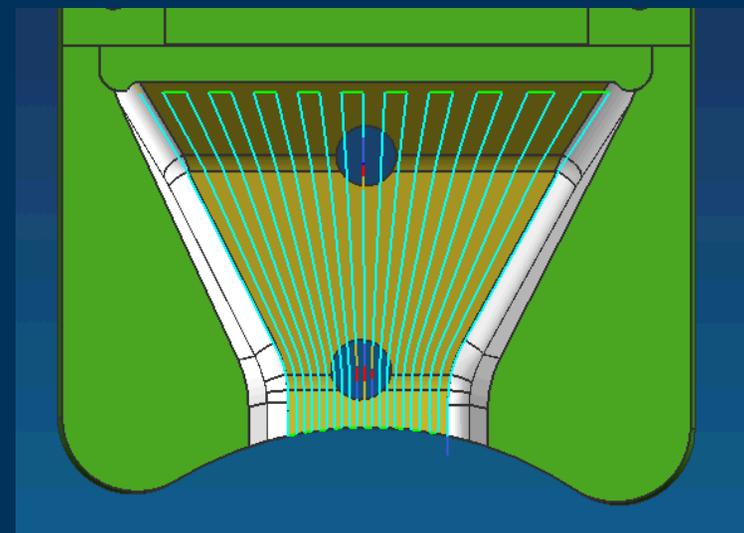
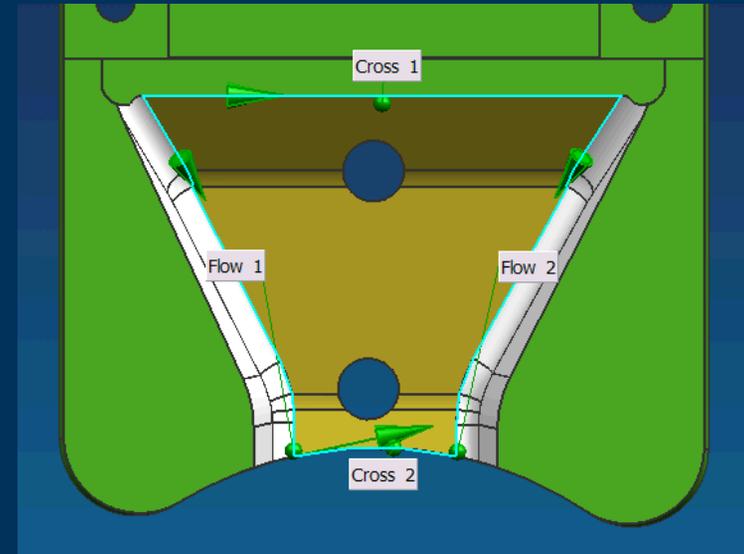
- ▶ Completely flexible tool path pattern generator.
- ▶ Pattern generated from user selected flow/cross curves/edges.
- ▶ Trimmed and untrimmed surfaces could be machined.
- ▶ Need not form a rectangular pattern.





## Streamline Tool Path – Auto option

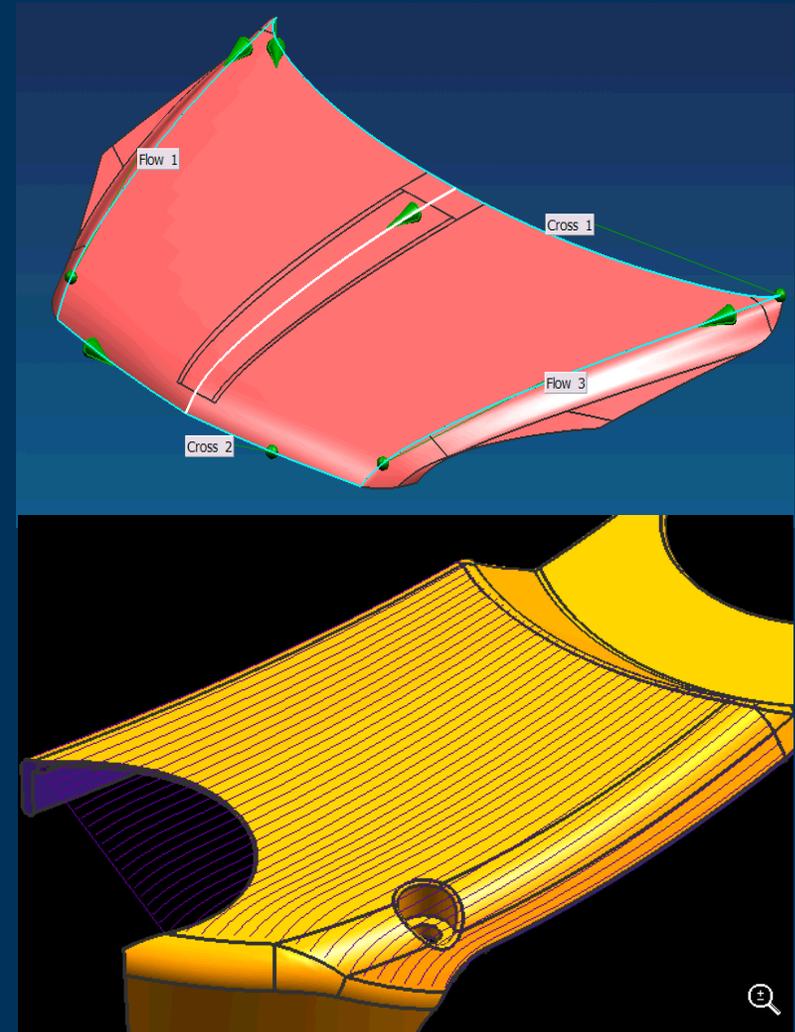
- ▶ Flow/Cross curves could be set to 'Auto'.
- ▶ System identifies edges that form clean flow/cross edge-chains.
- ▶ Holes and small internal trims are automatically eliminated.
- ▶ Small gaps and kinks in the edges are smoothed.





# Streamline Tool Path – Flow/Cross selection

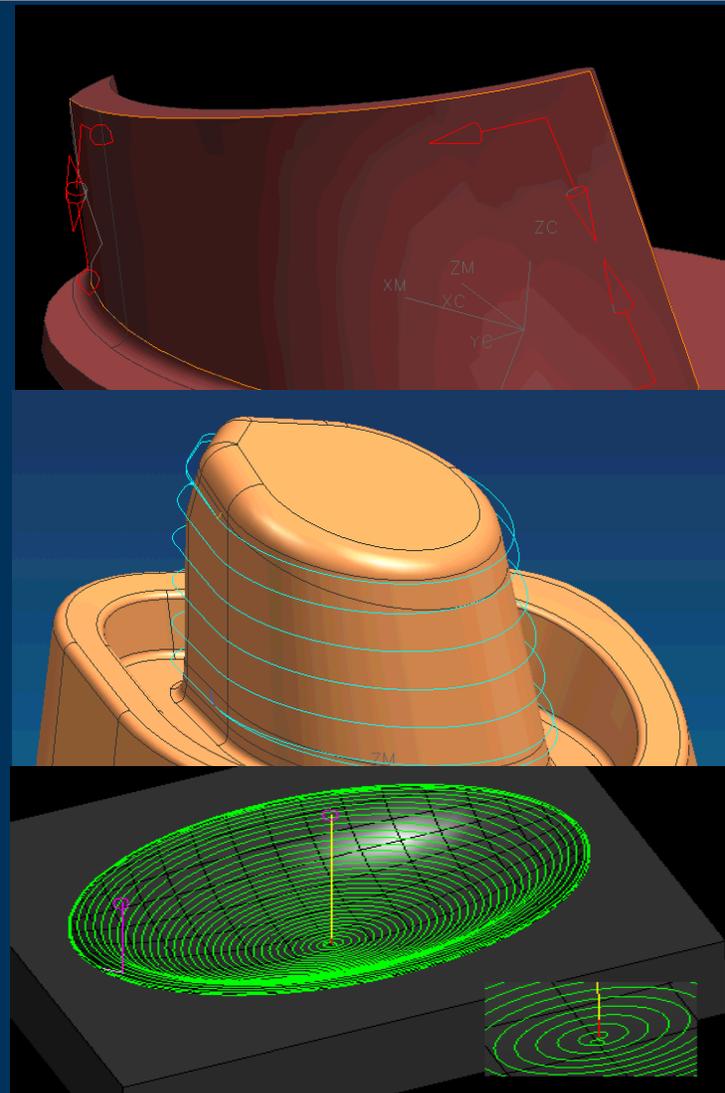
- ▶ Curves, Edges and points could be selected as flow/cross chains
- ▶ Any number of flow, cross chains could be selected.
- ▶ Gaps in chains are automatically bridged.
  
- ▶ Caveat
  - ▶ Selection filter does not keep it's state. Need to reset it for every selection.
  - ▶ Will be fixed in phase 21.





## Streamline Tool Path – Flow/Cross selection

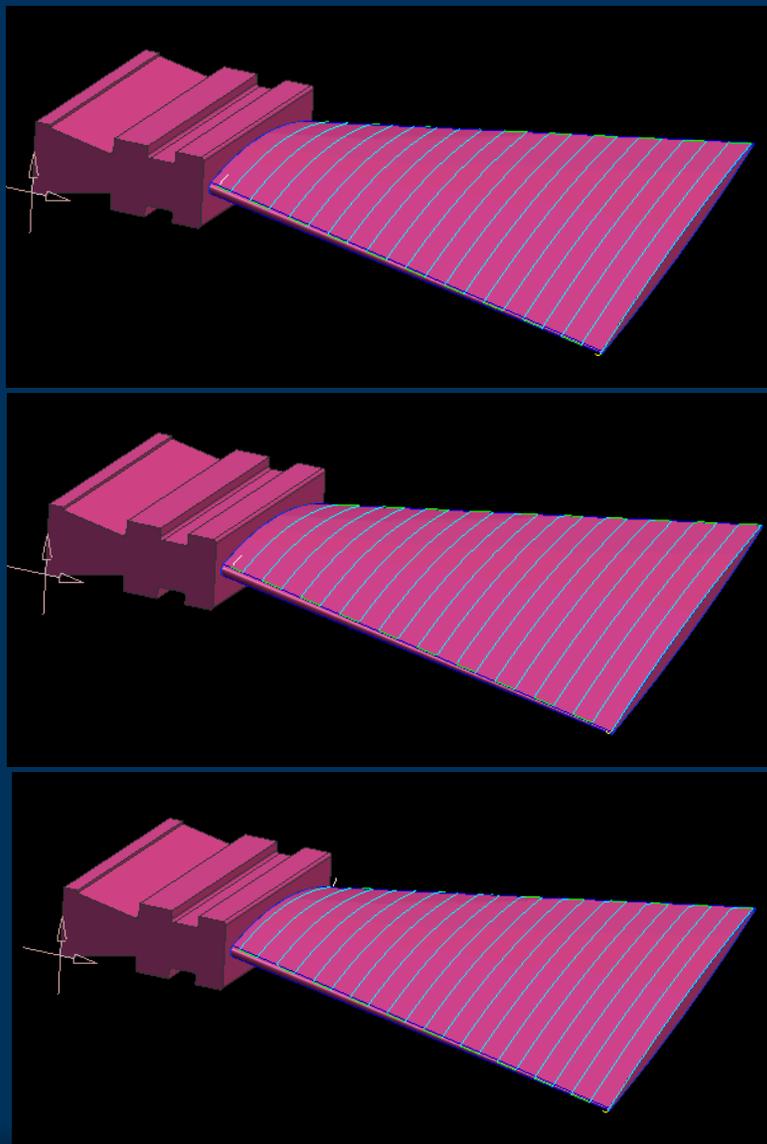
- ▶ Cut Direction could be independently set.
- ▶ Following patterns are supported
  - ▶ Zig,
  - ▶ Zigzag,
  - ▶ Zigzag with lifts
  - ▶ Spiral/Helical





## Streamline Tool Path

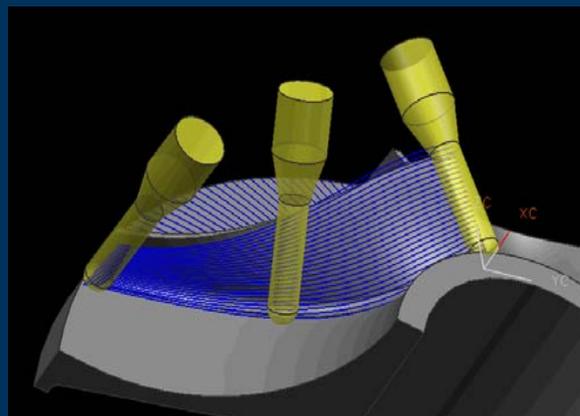
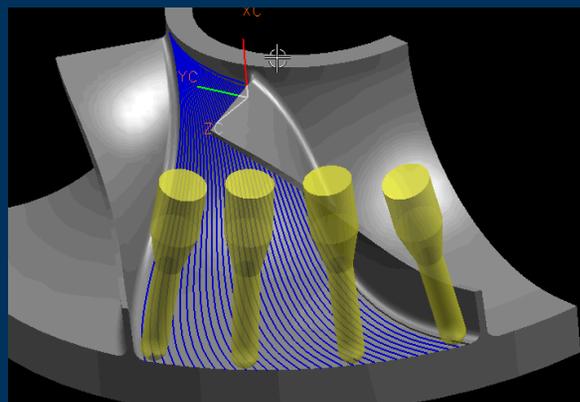
- ▶ Tool Tip and Contact Options
- ▶ Trim and Extend Options.
- ▶ All existing projection options supported.
- ▶ All existing tool axis options supported.





## Streamline in Variable Axis

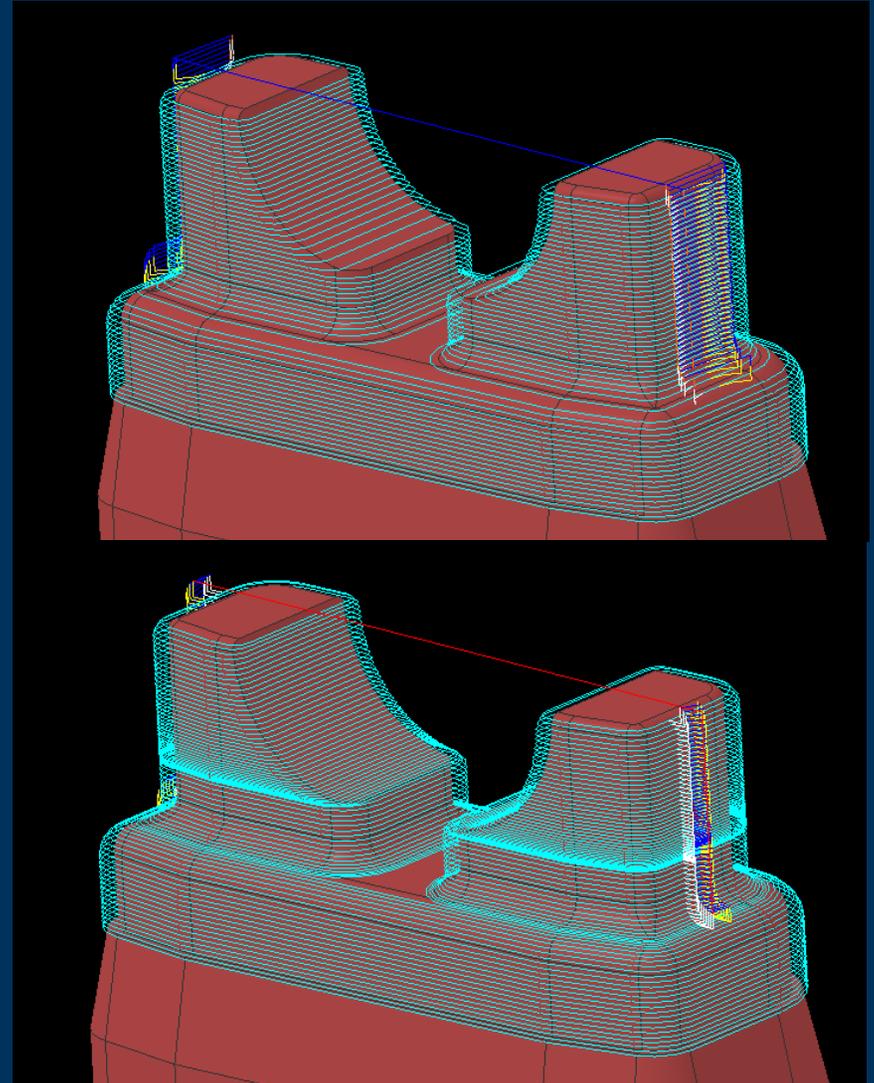
- ▶ All existing projection options are supported.
- ▶ All existing tool axis options are supported.
- ▶ Cut Area supported.
- ▶ No (dual) contact option yet.





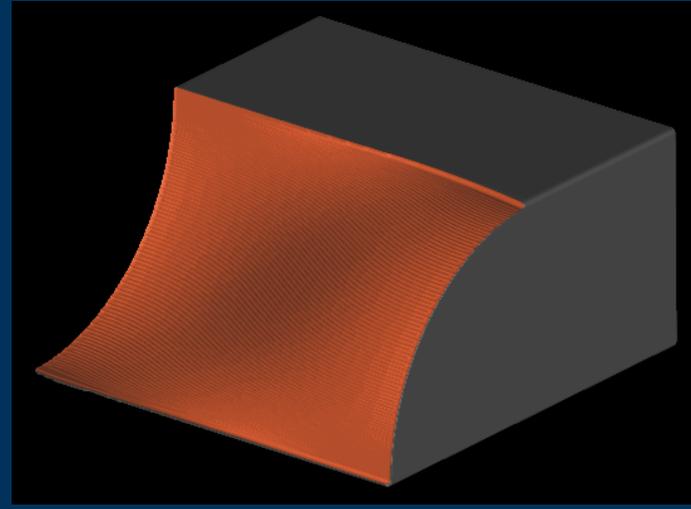
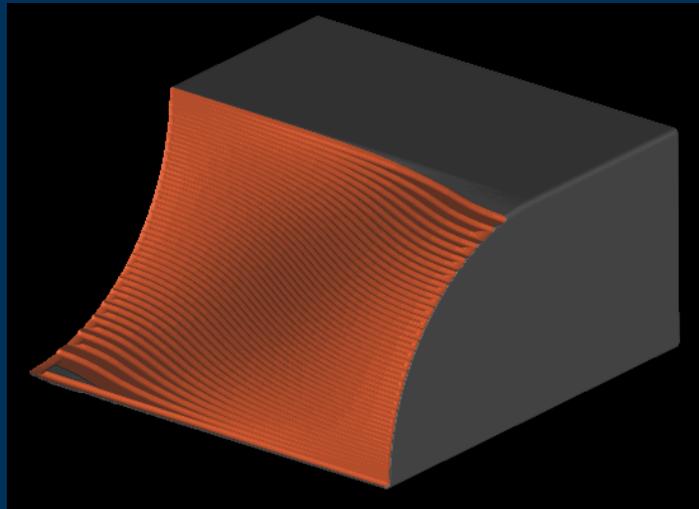
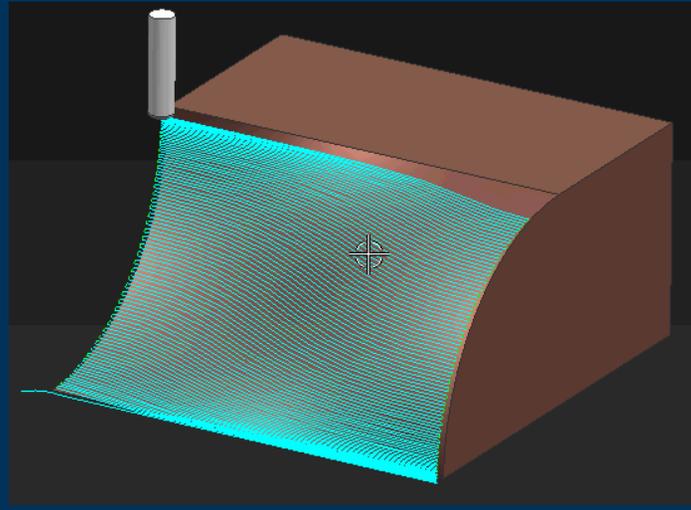
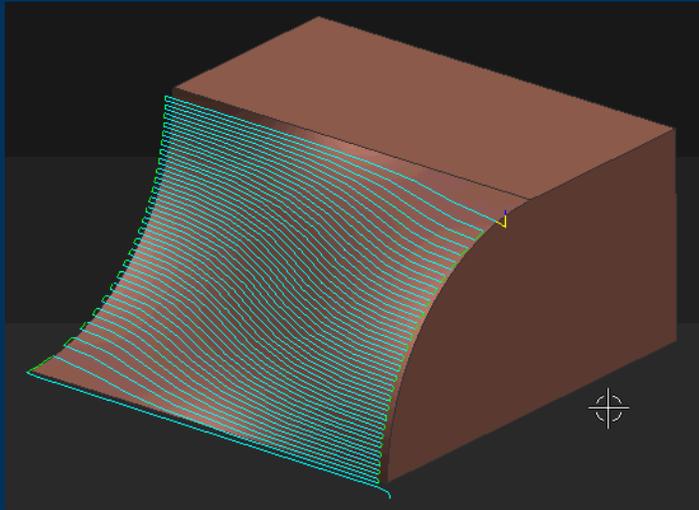
## Optimized ZL

- ▶ Cut Levels influenced by surface slope produces denser tool path in shallow areas and creates uniform surface finish.
- ▶ Z-level finishing is an important technique for HSM. It is the most used tool path in hard milling.
- ▶ Currently, users have to manipulate cut ranges and cut levels to get better finish in shallow areas.
- ▶ This feature automates this process and gives excellent finish through out the part.





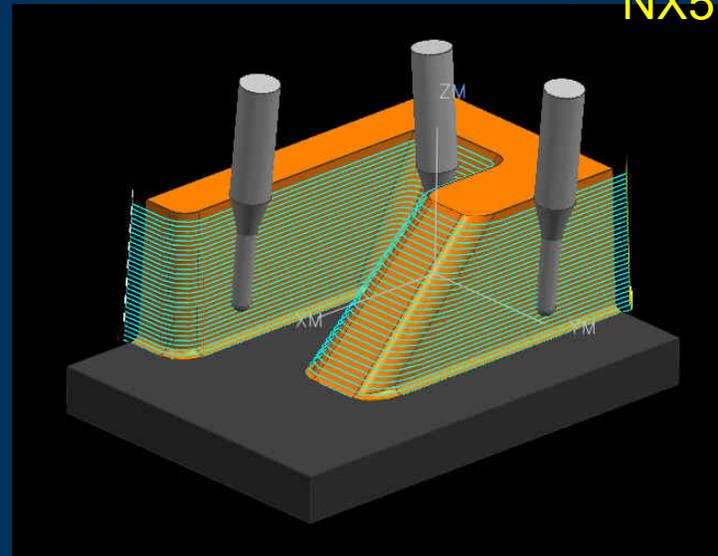
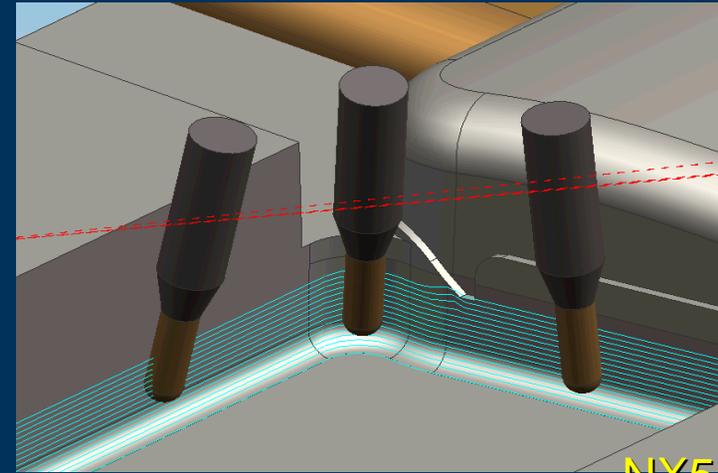
# Optimized ZL





## Variable Axis Z Level – NX5

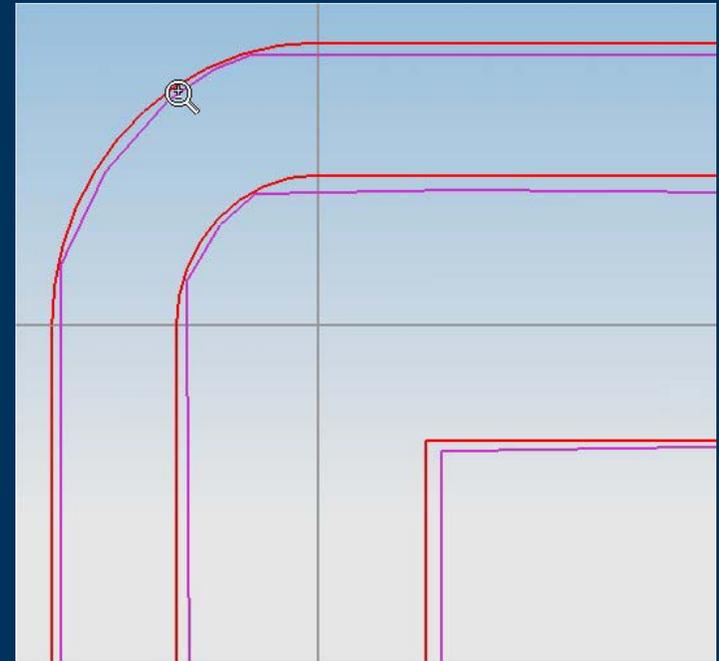
- ▶ Similar to existing fixed axis Z Level with user specified Tilt Angle
- ▶ Tool tilting options.
  - ▶ Away from Part
  - ▶ Towards/Away from Point
  - ▶ Towards/Away from Curve
- ▶ Allows shorter tools to cut deep vertical walls improving machining productivity.
- ▶ 20% Increase in tool length increases deflection by about 50%.
- ▶ 20% reduction in tool length allows 36% faster machining.
- ▶ Only for ball-end mills.





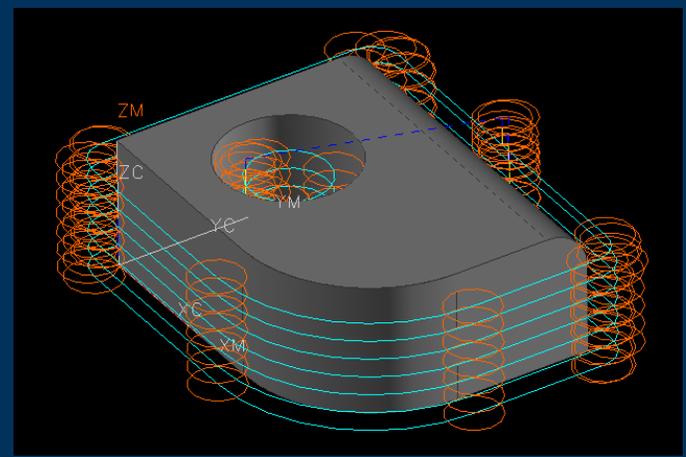
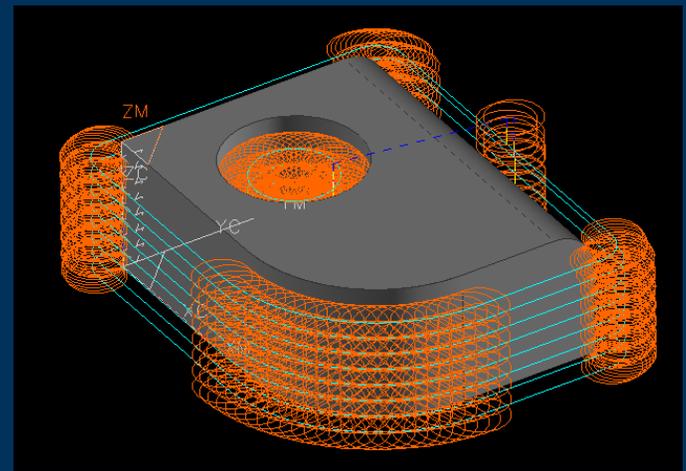
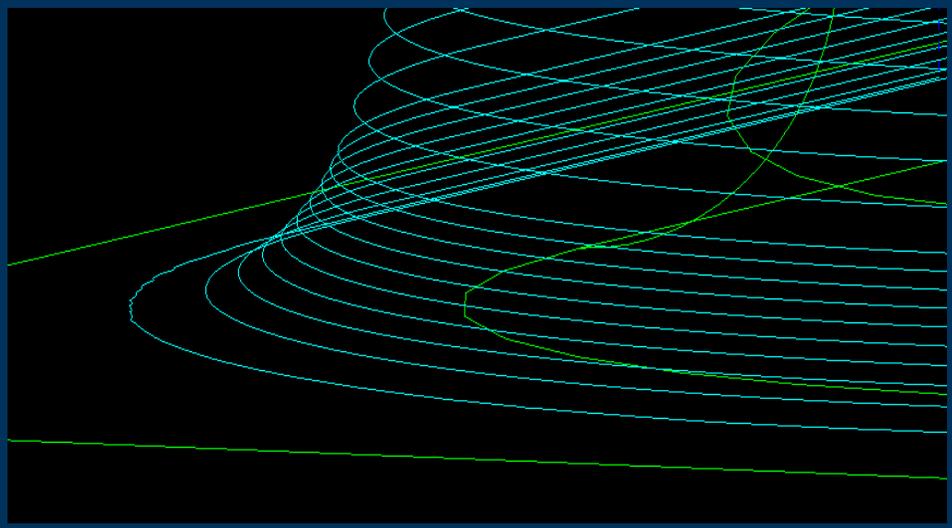
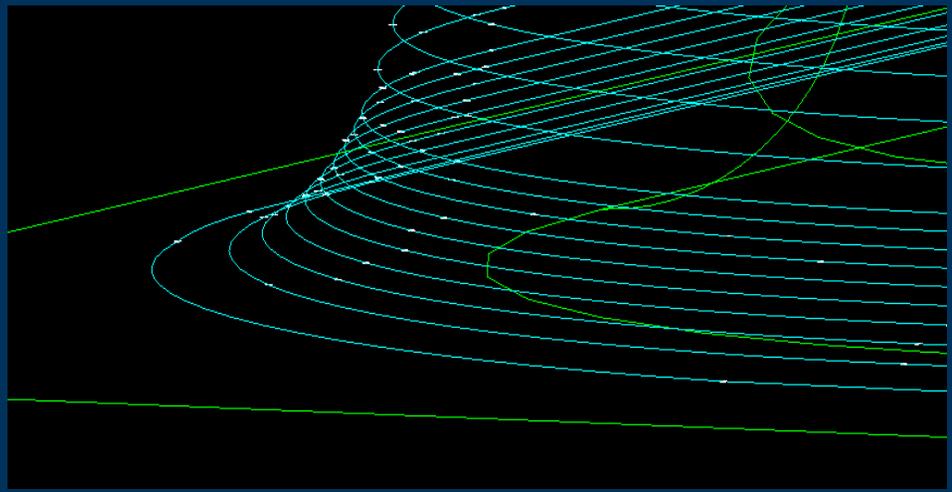
# Cavity Milling Exact Output – NX4/5

- ▶ Analytic output for pure analytic parts (NX4)
- ▶ Cavity Milling and Zlevel recognize cylinders, cones, and planes, and output much smoother and cleaner paths
- ▶ Reduced “noise” in near horizontal
- ▶ Consistent point distribution
- ▶ Improved arc fitting
- ▶ Reduced memory usage for large paths
- ▶ Analytic output for all parts. (NX5)
- ▶ Exact result output for analytic faces only.





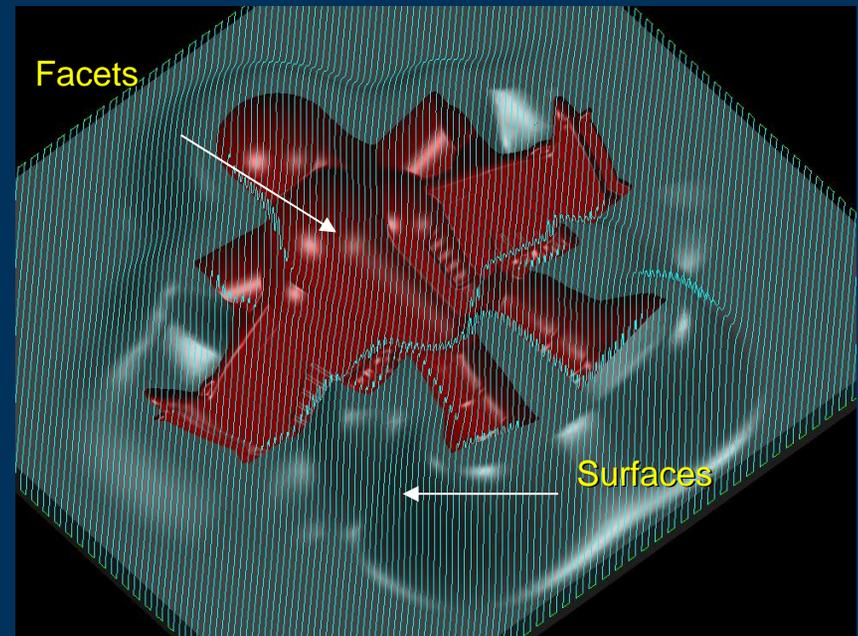
# Cavity Milling Quality – NX4





# Facet/Surface Machining

- ▶ Starting with NX4.0.3, NX supports selection of surfaces and facets for machining in a single setup/operation.

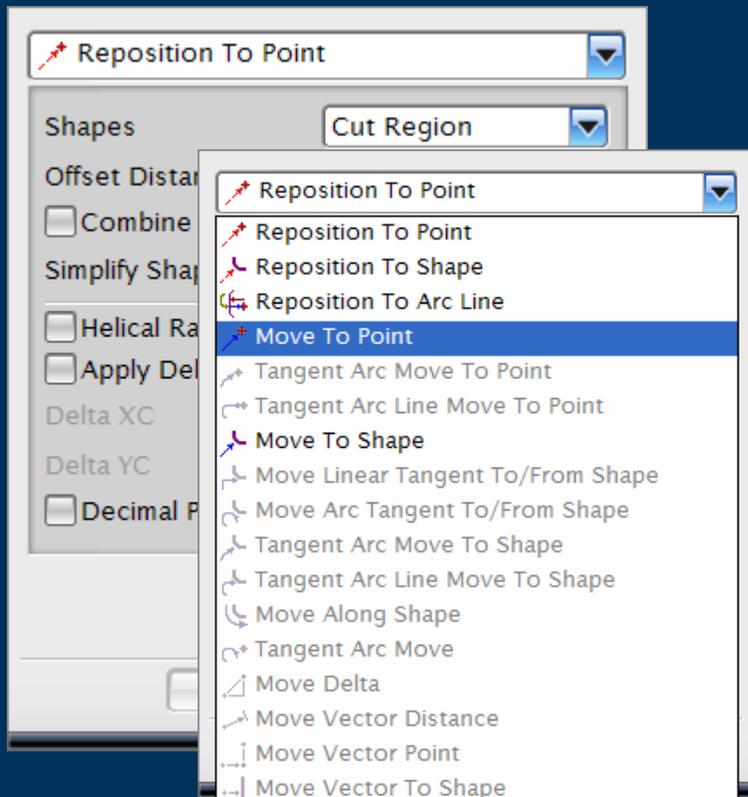




# Face Milling Manual Cut Pattern

## New Move Types

### ▶ More move types



### ▶ Enhanced positioning

### ▶ Safe Engages

### ▶ Rounded Corners

### ▶ New Moves

#### ▶ Reposition to Arc Line

#### ▶ Tangent arc move to point

#### ▶ Tangent arc line move to point

#### ▶ Tangent arc move to shape

#### ▶ Tangent arc line move to shape

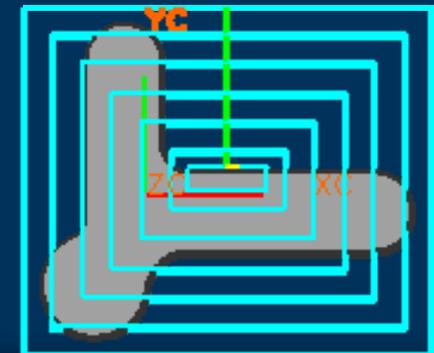
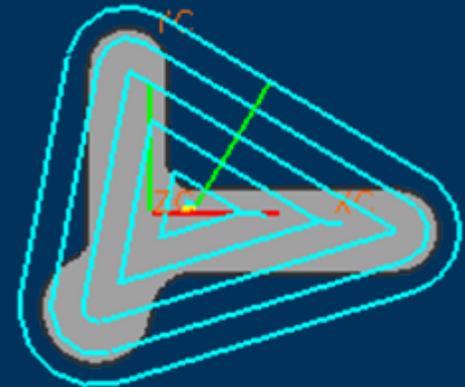
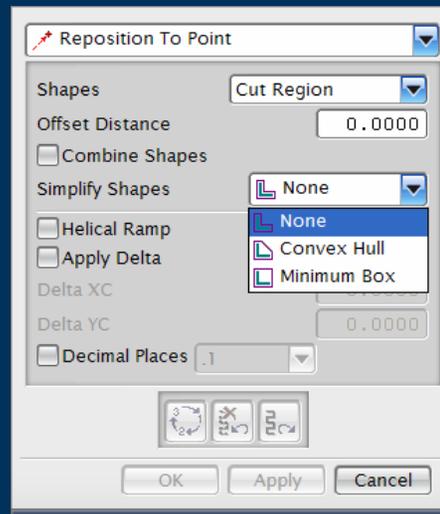
#### ▶ Tangent arc move

#### ▶ Move vector to shape



# Simplify Cut Area Shape

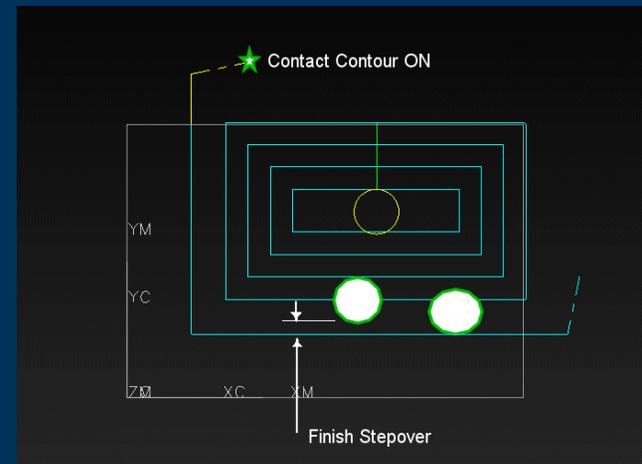
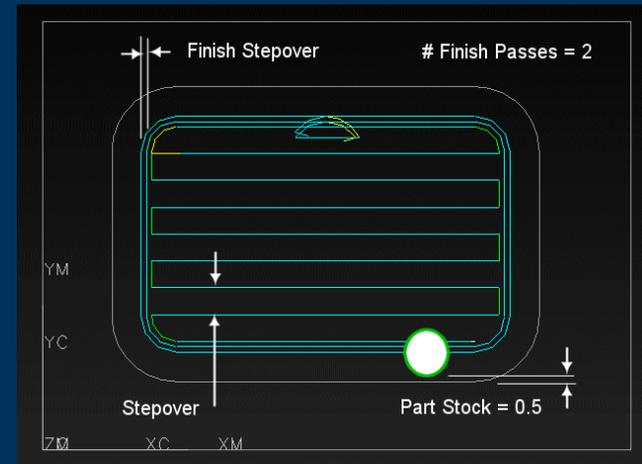
- ▶ Simplify Shape
  - ▶ None
  - ▶ Convex Hull
  - ▶ Minimum Box
- ▶ Make simpler paths for complex shapes





# Finish Passes and CutCom

- ▶ All roughing operations now support an option to specify finish passes.
- ▶ Contact Contour
  - ▶ In Planar and Face milling operations, the finish pass on the boundary could be directly output as tool path for full radius compensation.





# CM, ZL Performance/Memory Improvements

- ▶ Check against IPW toggle