Understanding CAM in Fusion 360

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About Me

Paul Clauss

- Fusion 360 and Embedded CAM Product Support and Knowledge Domain Expert
- Portland, OR
- Mountain biking and the outdoors
- Making things!
AGENDA

Concepts
• Strategies in Fusion 360
• Toolpath Containment
• Selections
• Smoothing/Tolerance

Troubleshooting
• Identify
• Isolate
• Experiment
• Resolve
Concepts
CAM Strategies in Fusion 360 - Milling

2D Milling
- Only sees geometry selections
  - Fill/Follow Style
- Straightforward or Prismatic Geometry (2.5 axis parts)

3D Milling
- Sees 3D model
  - Projection style
- Control and Automation
Strategy Choice

GEOMETRY

Check out the “CAM Deep Dive” videos and sample parts!
Containment
Model Selection in CAM Setup
Containment

Along Z-axis - HEIGHTS
Containment

On XY Plane – Machining boundaries, Stock Contours
Containment

3D Bonuses!

Slope
Model Override
Avoid/Touch Surfaces
Automatic
Problem: Boundary conditions are not the same on all sides of boundary
Goals: Side Entry & No Air Cutting (cylindrical stock)
Selections - Editor

Contour Editor Example

Don’t forget to click the + to confirm the contour!
Toolpath Tolerance

Controls accuracy of “mesh” model driving toolpath generation
Toolpath Smoothing

Applies arc moves to reduce excessive linear segments
Toolpath Tolerance & Smoothing

LARGE TOLERANCE
(6.3 KB)

SMALL TOLERANCE
(37.4 KB)

SMALL TOLERANCE WITH SMOOTHING (1:1 RATIO)
(13.6 KB)

Total Tolerance = (Toolpath Tol. + Smoothing Tol.)
Toolpath Tolerance

SCALLOP EXAMPLE
Troubleshooting
Troubleshooting

IDENTIFY

WHAT IS THE PROBLEM?

Tools:
• Warnings & Errors
• SEARCH! AKN, Learning Materials, Google

ISOLATE

WHAT IS THE CAUSE?

• Tools
  o Compare & Edit

EXPERIMENT

WHAT ALTERNATIVES EXIST?

• Tools:
  o Derived Operations
  o Different Parameters & Selections
  o Integrated CAD

RESOLVE

CHOOSE AN ALTERNATIVE

• Which alternative approaches give an acceptable outcome?
Warnings

Note any *automatic changes* made to the toolpath during generation.
IDENTIFY: ERRORS

Errors

Explain why the toolpath cannot be generated
Warnings & Errors Example
ISOLATE: Compare & Edit
ISOLATE: Compare & Edit

- Why is toolpath twice as large?
- Why is generation time notably slower?
EXPERIMENT – Derived Operations

- What alternative strategies may work?
- How can alternatives be generated quickly?
EXPERIMENT – Different Strategies

• More than one strategy may give acceptable motion
• What will be easiest to set up?
EXPERIMENT – Different Strategies

Scallop

Flow
EXPERIMENT – Integrated CAD
EXPERIMENT: Imported Data

• How can we get around graphics faceting when creating toolpaths?
EXPERIMENT: Surface Quality

How can we remove toolpath chatter in UV toolpaths?
• Posts are .CPS – JavaScript text files
• Program not posting?
  o Check .failed NC output for error messaging!
  o Search CPS file for message to see logic
• Quick Example: Program #
Review

- **Basics/Stepping Stones**
  - Strategies in Fusion 360
    - 2D vs. 3D
  - Toolpath Containment
    - XY Plane, Z
  - Contour Selection
  - Smoothing/Tolerance
    - Effect on toolpaths
    - Effect on NC output

- **Troubleshooting**
  - Identify
    - Warnings & Errors
  - Isolate
    - Compare & Edit
  - Experiment
    - Parameter choices
    - Derived Operations
    - Integrated CAD
  - Resolve!
Questions?