

# Fusion 360

## CAM Fundamental Workflows

Presenter: Kevin Lee

Managing Director

LeeVerge Integration Inc.



@leeverageintegration



**MFG321690**



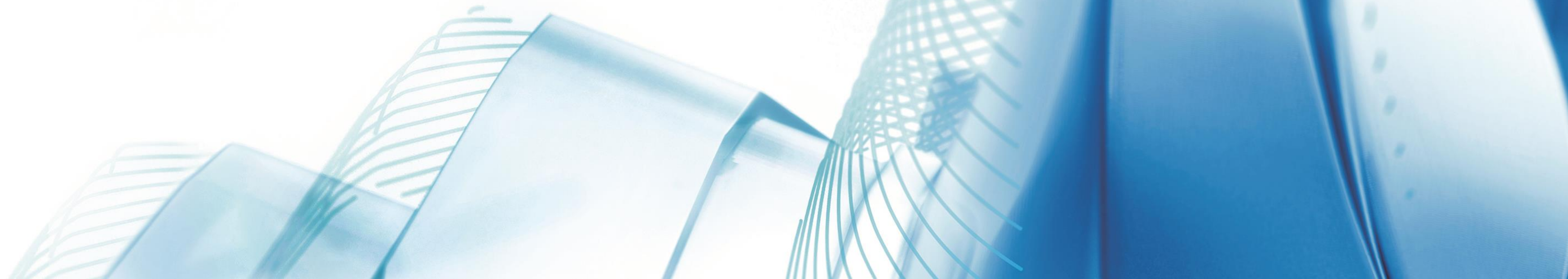
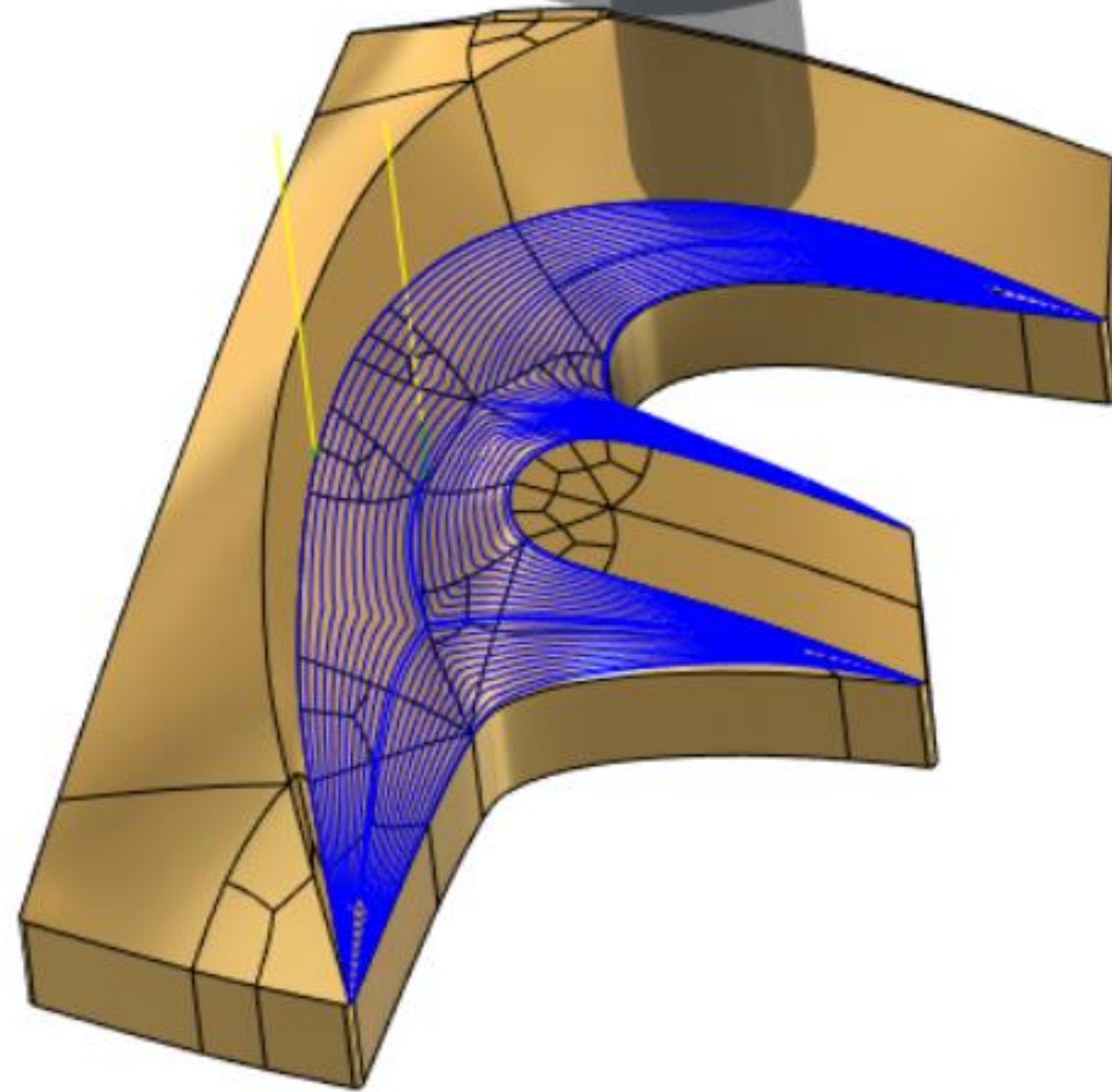
# About the speaker

Kevin Lee – Managing Director  
LeeVerge Integration Inc.



- 20 years experience, CNC programmer/CNC machinist
- Disciplined in multiple Cad/Cam software's
- Past part-time College Professor –cnc manufacturing
- Specializing in Autodesk Integrated CAM Training & Consulting
- Integrated CAM Consulting Support
- Fusion 360 Software Solutions

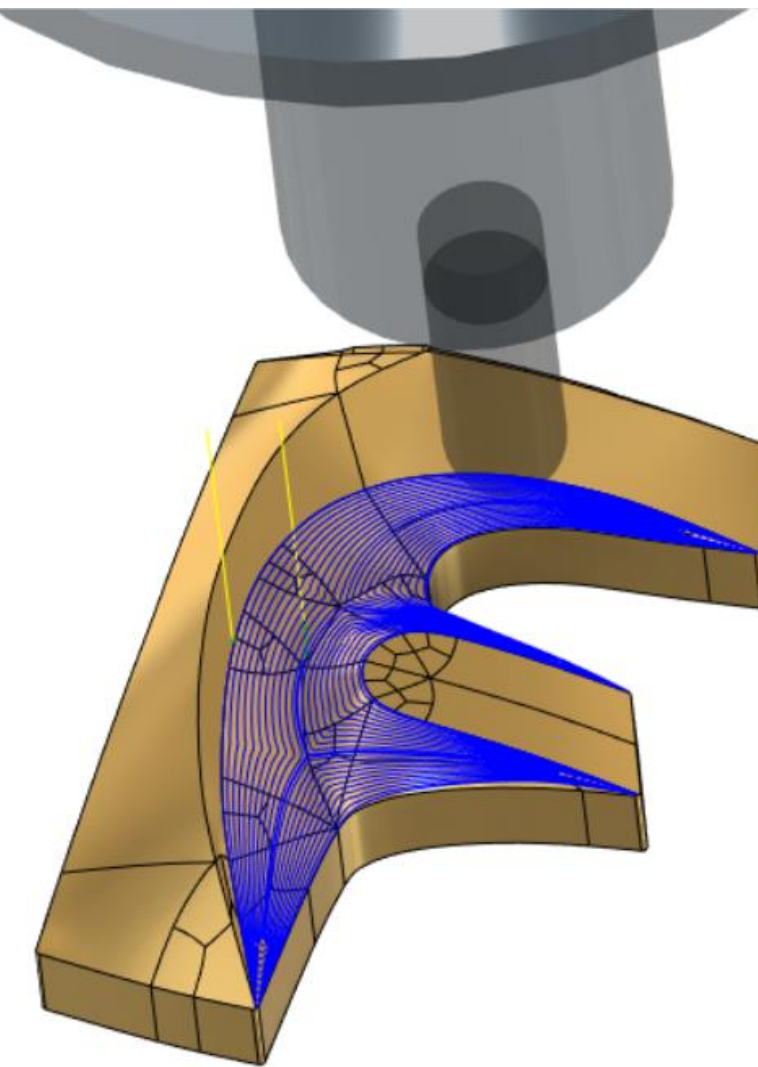






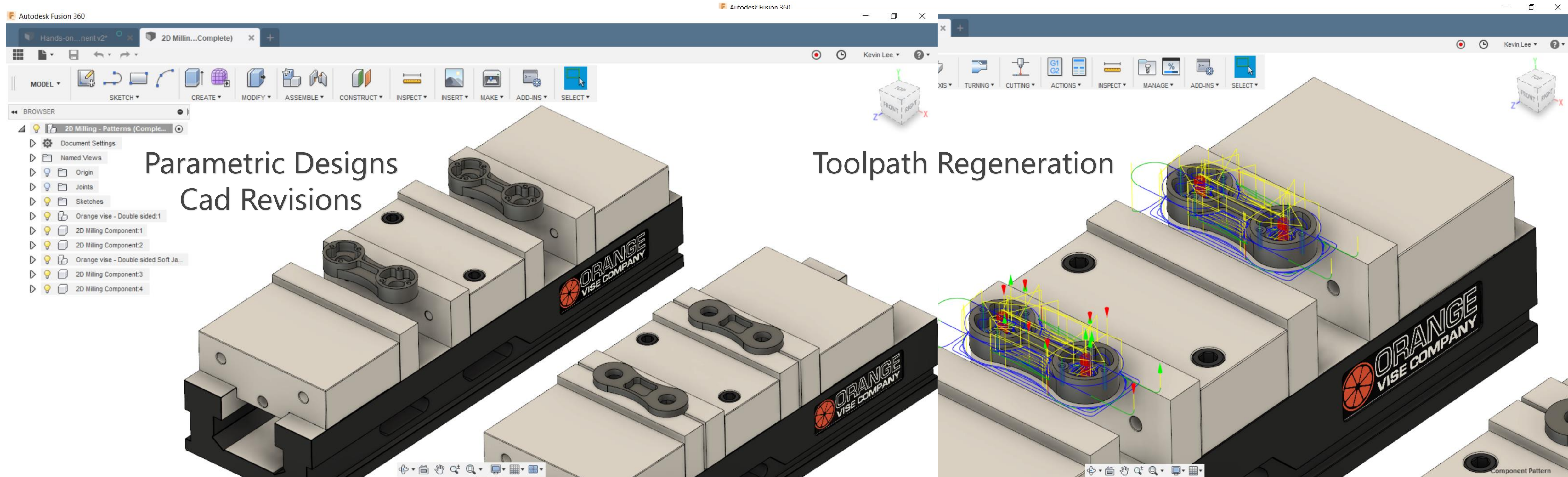
# Learning Objectives

- Discover CAM Milling and Turning Setups with defining Stock and WCS
- Discover the differences between turning and milling operations
- Learn effective workflows with geometry-driven operation templates
- Learn to verify an efficient integrated approach to product development





# Integrated CAM Technology ....What is it?



Model Workspace

Cam Workspace

# Seamless Integration



# Fusion 360

## Importing CAD Data





# Creating a Setup, Defining Stock, Align WCS

The screenshot displays the Autodesk Fusion 360 software interface. The main workspace shows a 3D model of a complex part with a blue stock body defined. The Work Coordinate System (WCS) is aligned with the part. The 'SETUP: SETUP2' dialog box is open, showing the 'Stock' tab. The 'Machine' is set to 'Select...'. The 'Setup' tab shows 'Operation Type' as 'Milling'. The 'Work Coordinate System (WCS)' section shows 'Orientation' as 'Select Z axis/plane & ...'. The 'Z Axis' is set to 'Face'. The 'Flip Z Axis' checkbox is unchecked. The 'X Axis' is set to 'Select...'. The 'Flip X Axis' checkbox is unchecked. The 'Origin' is set to 'Stock box point'. The 'Stock Point' is set to 'Box Point'. The 'Model' section shows 'Model' as 'Body'. The 'Fixture' checkbox is unchecked. The 'OK' and 'Cancel' buttons are at the bottom of the dialog box.

**Mode**  
Specifies the size and shape of the stock.

**Fixed Size Box** - Creates a rectangular stock body of a specific (fixed) size.  
**Relative Size Box** - Creates a rectangular stock body larger than the model by a given set of values. Can be rounded up to the nearest specified increment.

**Fixed Size Cylinder** - Creates a cylindrical stock body of a specific (fixed) size.  
**Relative Size Cylinder** - Creates a cylindrical stock body larger than the model by a given set of values. Can be rounded up to the nearest specified increment.

**Fixed Size Tube** - Creates a tube stock body of a specific (fixed) size.  
**Relative Size Tube** - Creates a tube stock body larger than the model by a given set of values. Can be rounded up to the nearest specified increment.

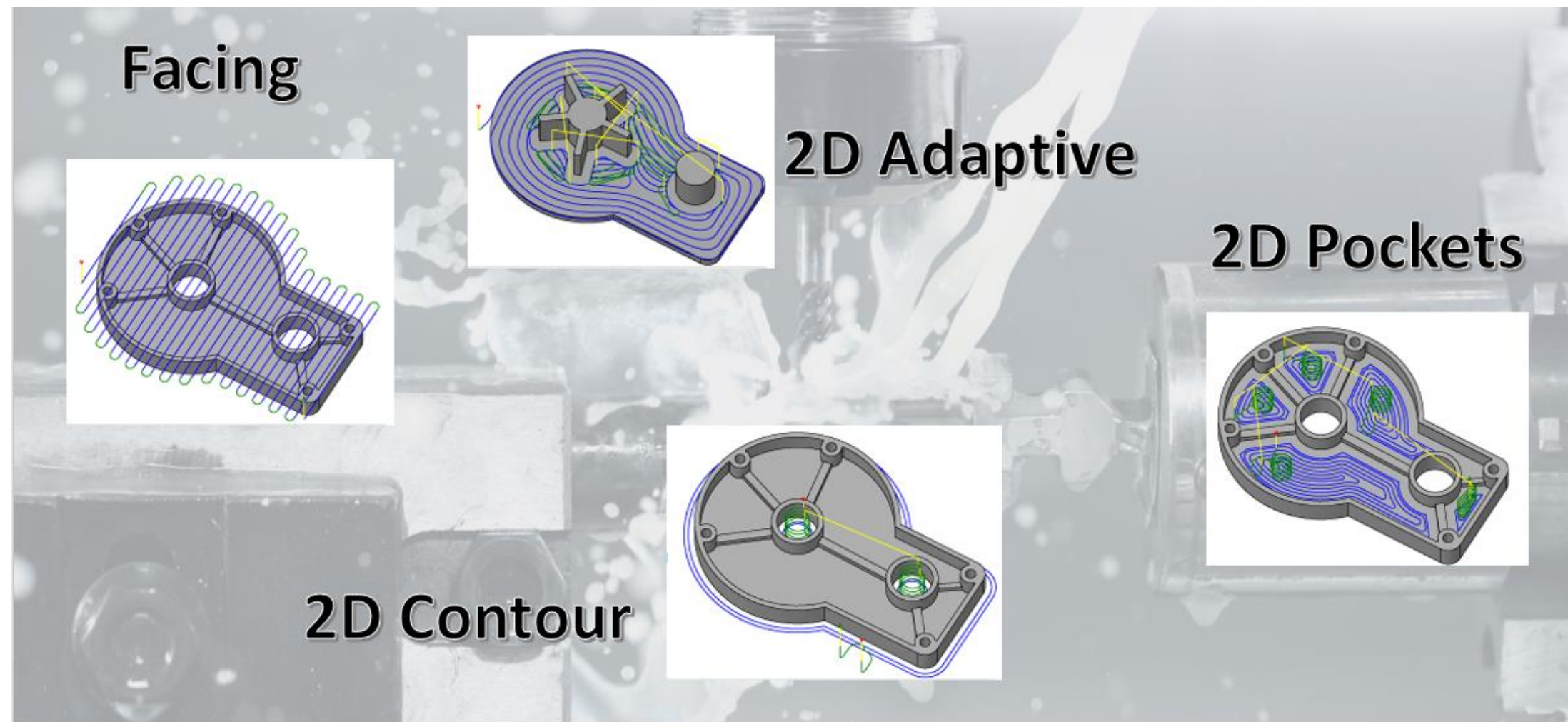
**From Solid** - Creates a stock by selecting a solid body in a multi-body part or from a part file in an assembly.

**COMMENTS**

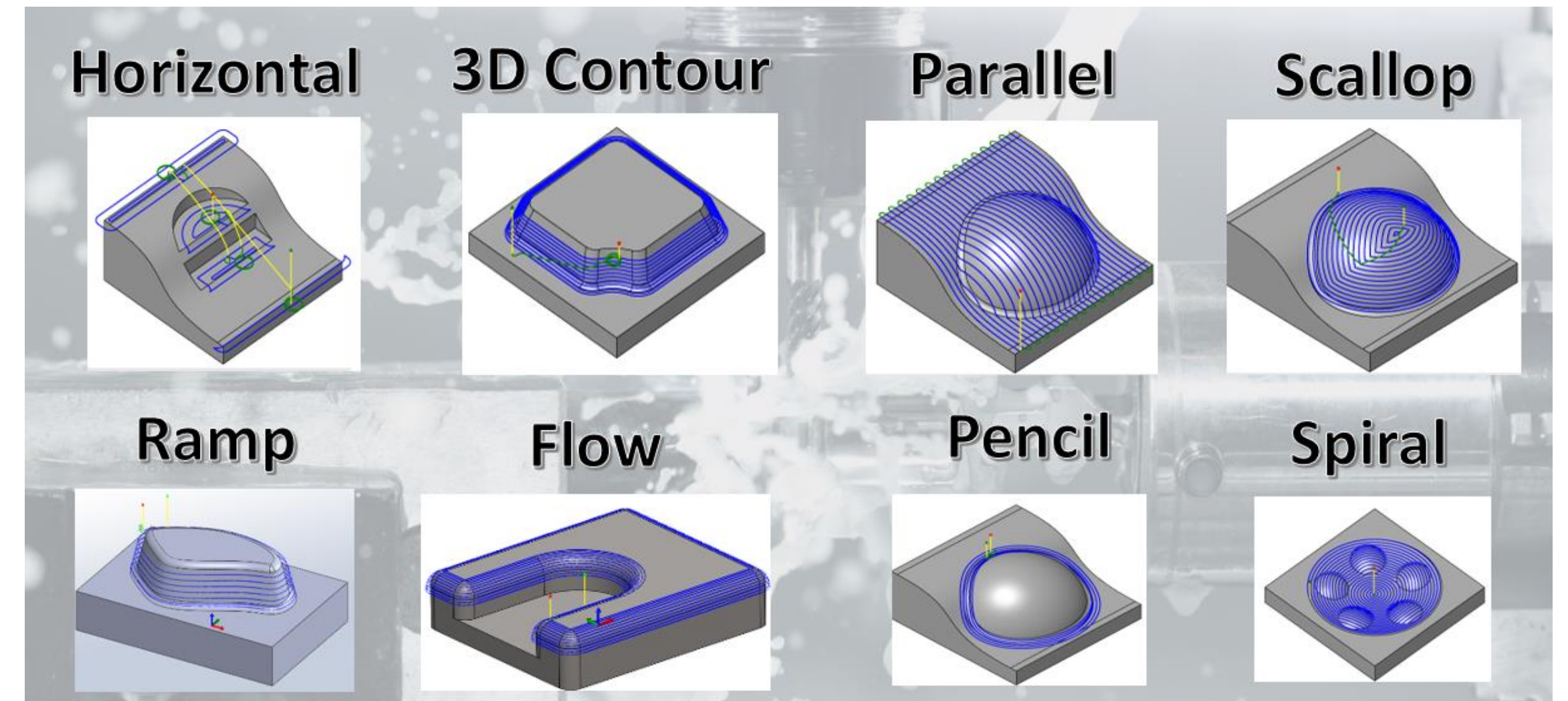
**1 Face | Area : 5728.737 mm^2**



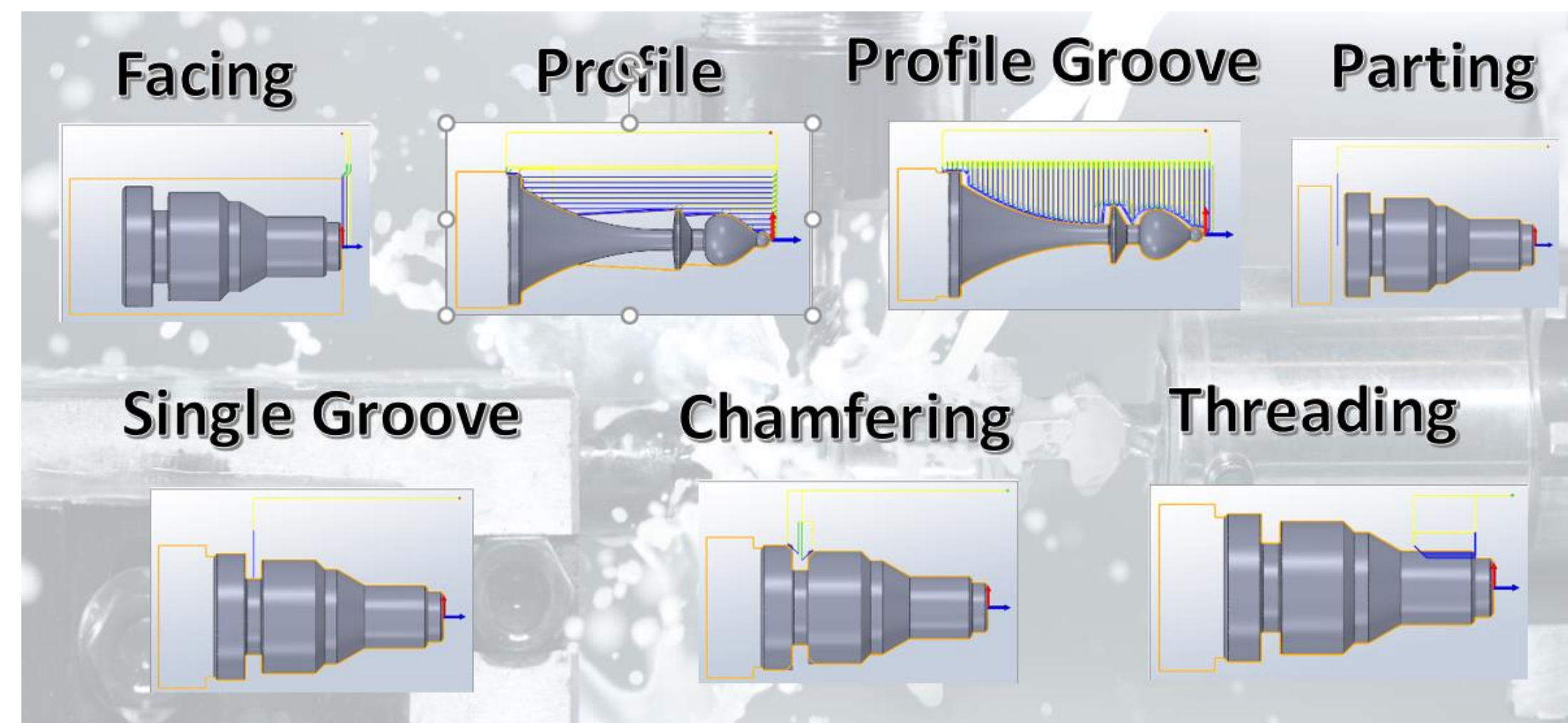
# Creating a Setup, Defining Stock, Align WCS



2D Milling Operations



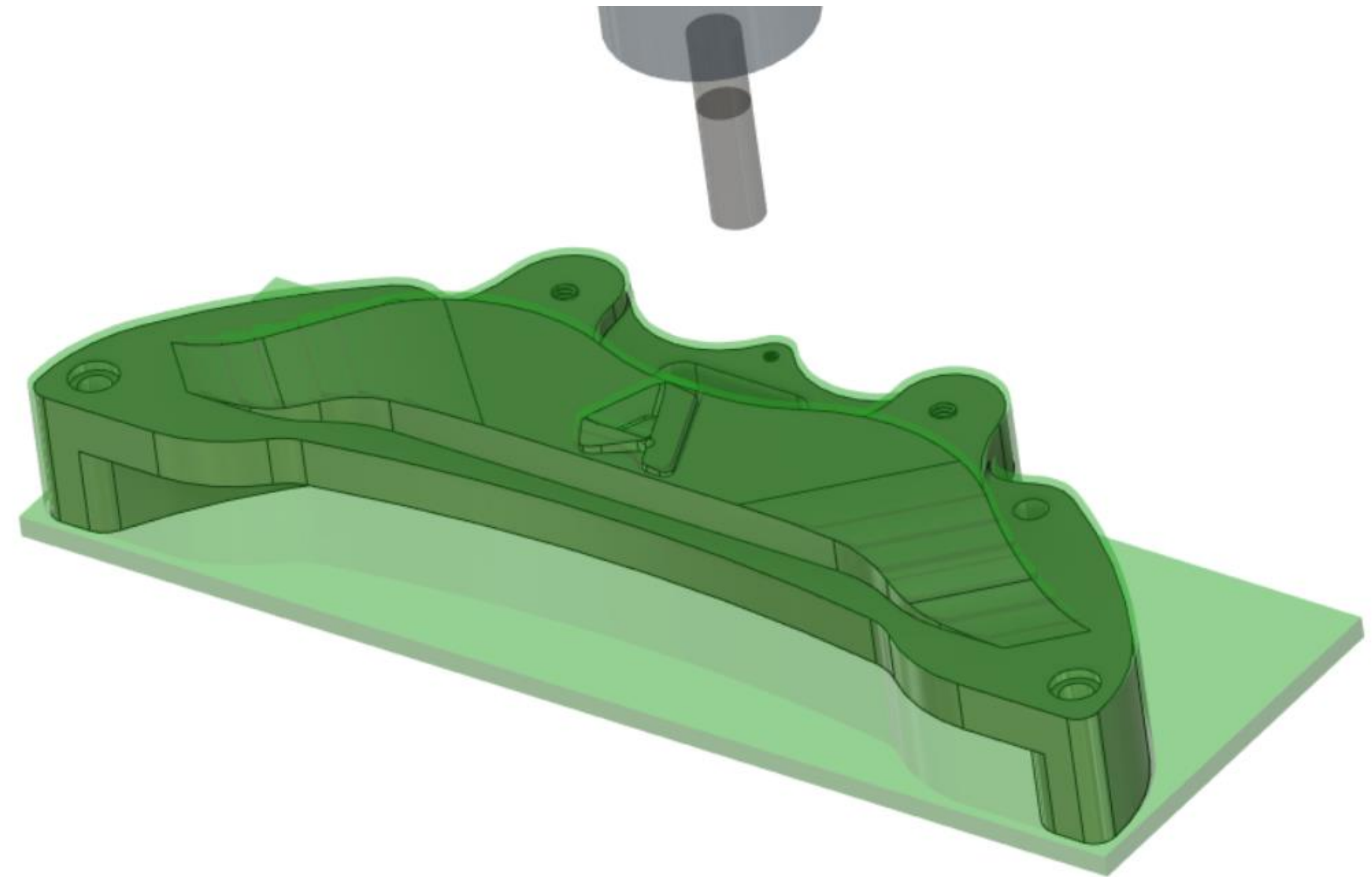
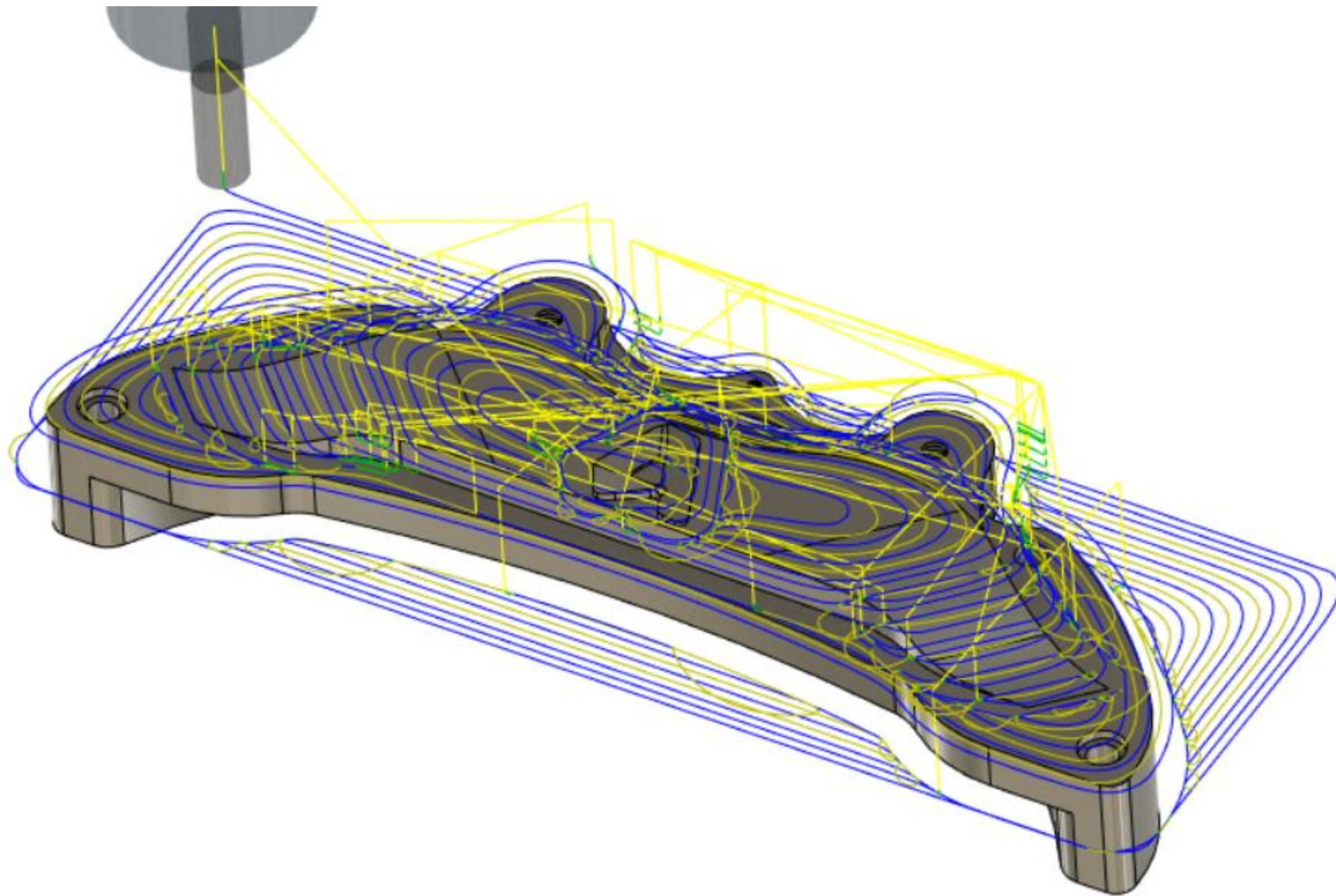
3D Milling Operations



Turning Operations



# Toolpath Simulation ~> Full Stock Verification





# Generating Setup Sheets

## Setup Sheet for Program 001

PROGRAM COMMENT: Test Fusion

JOB DESCRIPTION: Setup2

DOCUMENT PATH: Bearing Mounting Plate CAM v26

### Setup

WCS: #0

Stock:

DX: 7in

DY: 6in

DZ: 2.25in

PART:

DX: 7in

DY: 5in

DZ: 2in

Stock Lower in WCS #0:

X: 0in

Y: -6in

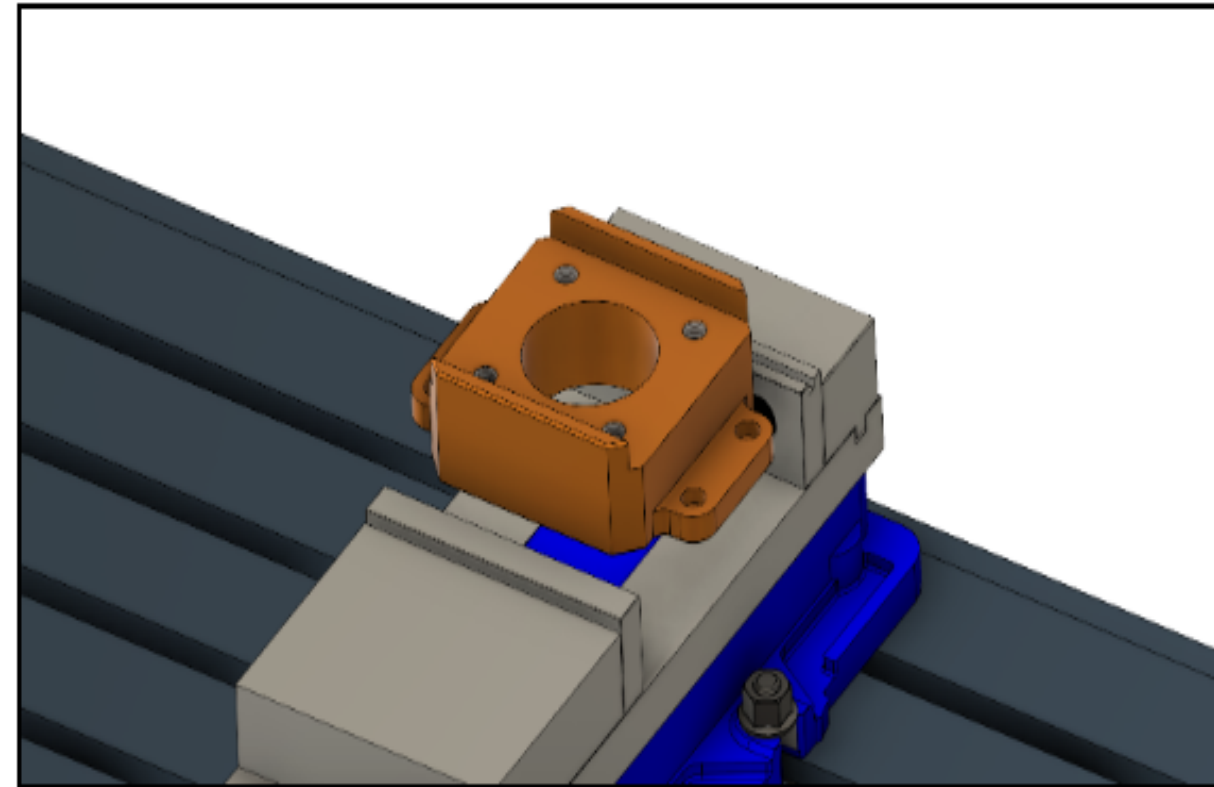
Z: -2.25in

Stock Upper in WCS #0:

X: 7in

Y: 0in

Z: 0in



### Total

NUMBER OF OPERATIONS: 21

NUMBER OF TOOLS: 8

TOOLS: T1 T2 T3 T4 T7 T9 T10 T19

MAXIMUM Z: 0.969in

MINIMUM Z: -2.105in

MAXIMUM FEEDRATE: 65in/min

MAXIMUM SPINDLE SPEED: 6500rpm

CUTTING DISTANCE: 3563.745in

RAPID DISTANCE: 807.967in

ESTIMATED CYCLE TIME: 2h:10m:53s

### Tools

#### T1 D1 L1

TYPE: face mill

DIAMETER: 2in

LENGTH: 1.563in

FLUTES: 5

DESCRIPTION: 2" Face Mill

VENDOR: Maritool

PRODUCT: MSAP16-D050A05R-25.4

MINIMUM Z: -0.03in

MAXIMUM FEED: 65in/min

MAXIMUM SPINDLE SPEED: 6500rpm

CUTTING DISTANCE: 74.696in

RAPID DISTANCE: 1.66in

ESTIMATED CYCLE TIME: 1m:9s (0.9%)

HOLDER: Maritool CAT40-FMA1.0-1.5M

VENDOR: Maritool

PRODUCT: CAT40-FMA1.0-1.5M



#### T2 D2 L2

TYPE: spot drill

DIAMETER: 0.375in

TIP ANGLE: 118°

LENGTH: 1.181in

FLUTES: 3

MINIMUM Z: -0.605in

MAXIMUM FEED: 19.685in/min

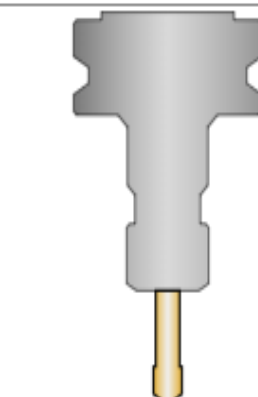
MAXIMUM SPINDLE SPEED: 6500rpm

CUTTING DISTANCE: 2.2in

RAPID DISTANCE: 30.311in

ESTIMATED CYCLE TIME: 7s (0.1%)

HOLDER: BT40 - B4C4-0016



#### T3 D3 L3

TYPE: flat end mill

DIAMETER: 0.5in

LENGTH: 2.25in

FLUTES: 3

MINIMUM Z: -2.03in

MAXIMUM FEED: 30in/min

MAXIMUM SPINDLE SPEED: 6500rpm

CUTTING DISTANCE: 3424.295in

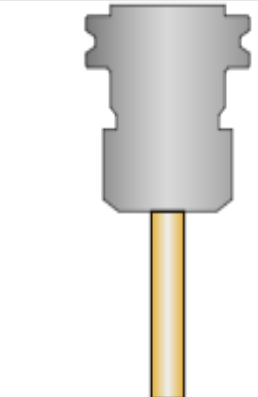
RAPID DISTANCE: 555.083in

ESTIMATED CYCLE TIME: 2h:3m:54s (94.7%)

HOLDER: Maritool CAT40-ER32-2.35

VENDOR: Maritool

PRODUCT: CAT40-ER32-2.35



#### T4 D4 L4

TYPE: flat end mill

DIAMETER: 0.25in

LENGTH: 2in

FLUTES: 3

MINIMUM Z: -1.78in

MAXIMUM FEED: 40in/min

MAXIMUM SPINDLE SPEED: 6500rpm

CUTTING DISTANCE: 5.458in

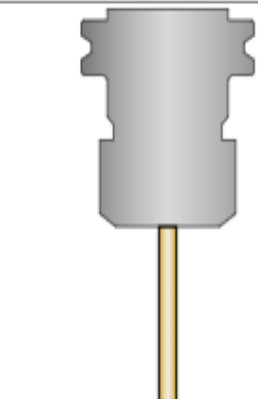
RAPID DISTANCE: 50.333in

ESTIMATED CYCLE TIME: 13s (0.2%)

HOLDER: Maritool CAT40-ER32-2.35

VENDOR: Maritool

PRODUCT: CAT40-ER32-2.35



#### T7 D7 L7

TYPE: drill

DIAMETER: 0.422in

TIP ANGLE: 118°

LENGTH: 4.319in

FLUTES: 1

DESCRIPTION: 27/64

MINIMUM Z: -1.657in

MAXIMUM FEED: 29in/min

MAXIMUM SPINDLE SPEED: 6500rpm

CUTTING DISTANCE: 10.811in

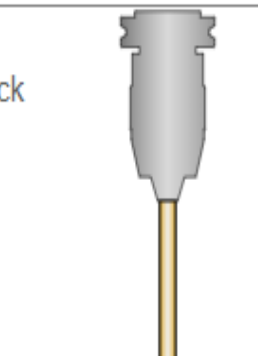
RAPID DISTANCE: 100.935in

ESTIMATED CYCLE TIME: 24s (0.3%)

HOLDER: Maritool CAT40-APU13 Drill Chuck

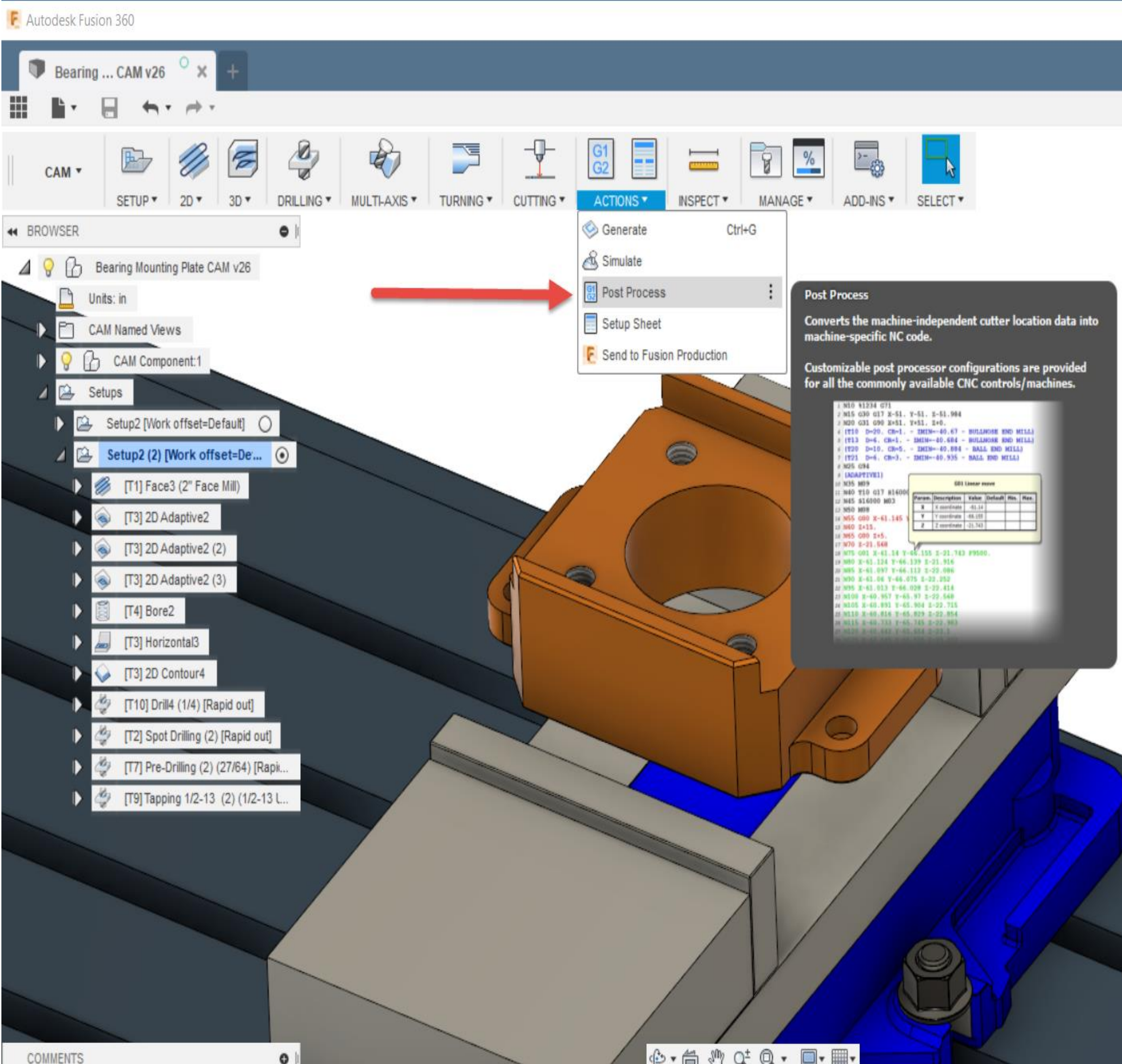
VENDOR: Maritool

PRODUCT: CAT40-APU13





# Post Processing G Code for Machines



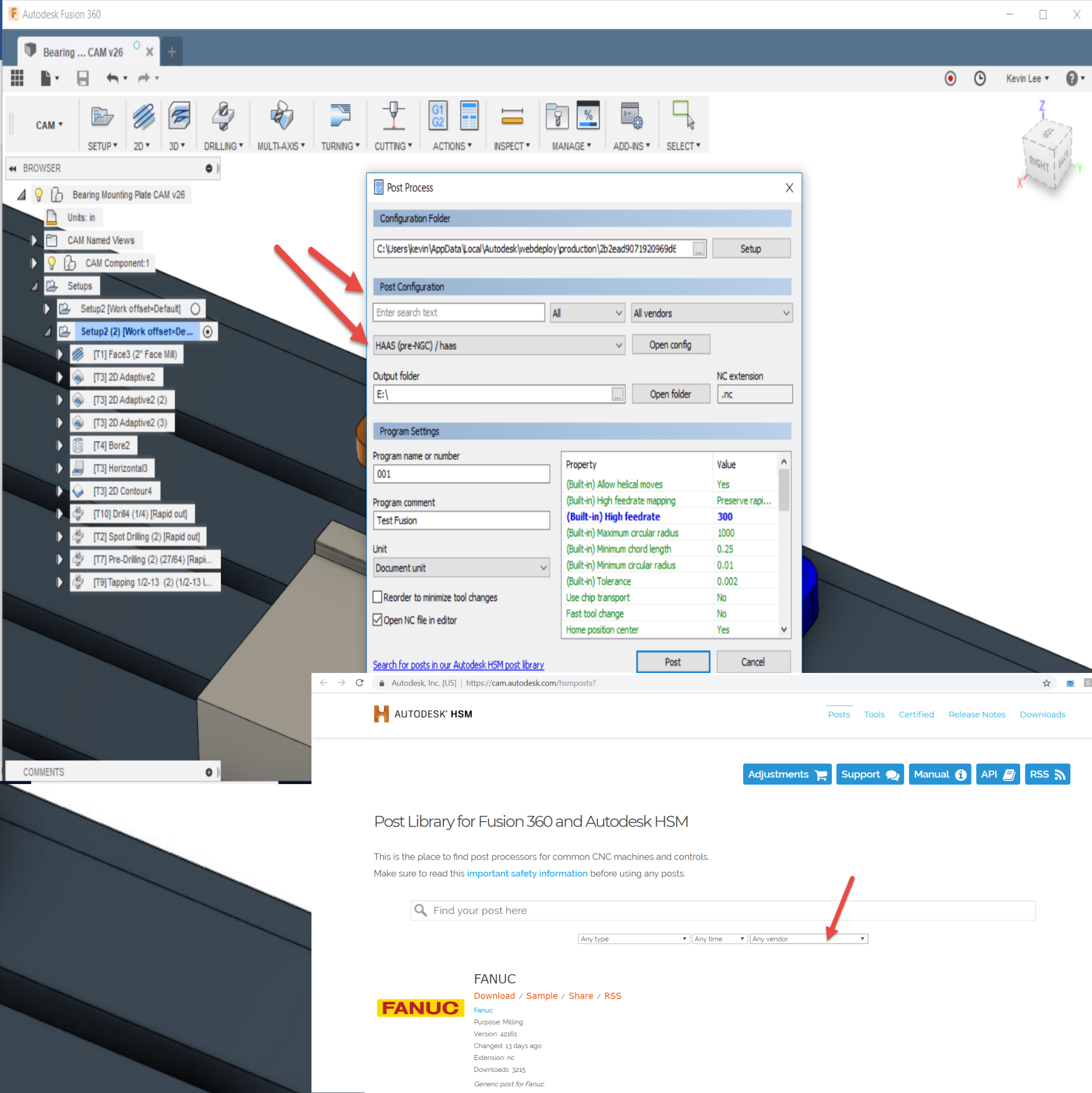
**Post Process**

Converts the machine-independent cutter location data into machine-specific NC code.

Customizable post processor configurations are provided for all the commonly available CNC controls/machines.

```

1 N10 G17 G21
2 M15 G30 G17 X-51. Y-51. Z-51.004
3 M20 G31 G99 Z=51. Y=51. Z=0.
4 (T10 D=20, CR=1, - ZMIN=-40.47 - RIGIDHORN END M15)
5 (T13 D=6, CR=1, - ZMIN=-40.484 - RIGIDHORN END M15)
6 (T20 D=10, CR=5, - ZMIN=-40.484 - BALL END M15)
7 (T23 D=6, CR=3, - ZMIN=-40.935 - BALL END M15)
8 M25 G94
9 (ADAPTIVE)
10 N35 M09
11 M40 G10 G17 R14000
12 M45 R14000 M03
13 M50 M09
14 M55 G00 X-63.145 Y
15 M60 Z=13.
16 M65 G00 Z=5.
17 M70 Z-21.548
18 M75 G01 X-63.14 Y-65.155 Z-21.743 F9000.
19 M80 X-63.124 Y-66.139 Z-21.916
20 M85 X-63.097 Y-66.113 Z-22.086
21 M90 X-63.08 Y-66.075 Z-22.252
22 M95 X-63.013 Y-66.008 Z-22.418
23 M100 X-60.953 Y-65.97 Z-22.548
24 M105 X-60.893 Y-65.904 Z-22.715
25 M110 X-60.816 Y-65.829 Z-22.854
26 M115 X-60.733 Y-65.745 Z-22.983
27 M120 X-60.585 Y-65.508 Z-23.1
  
```



**Post Process**

Configuration Folder: C:\Users\kevin\AppData\Local\Autodesk\webdeploy\production\2b2ead9071920969dc

Post Configuration: HAAS (pre-NGC) / haas

Output folder: E:\

NC extension: .nc

Program Settings:

Property	Value
(Built-in) Allow helical moves	Yes
(Built-in) High feedrate mapping	Preserve rapi...
(Built-in) High feedrate	300
(Built-in) Maximum circular radius	1000
(Built-in) Minimum chord length	0.25
(Built-in) Minimum circular radius	0.01
(Built-in) Tolerance	0.002
Use chip transport	No
Fast tool change	No
Home position center	Yes

Program name or number: 001

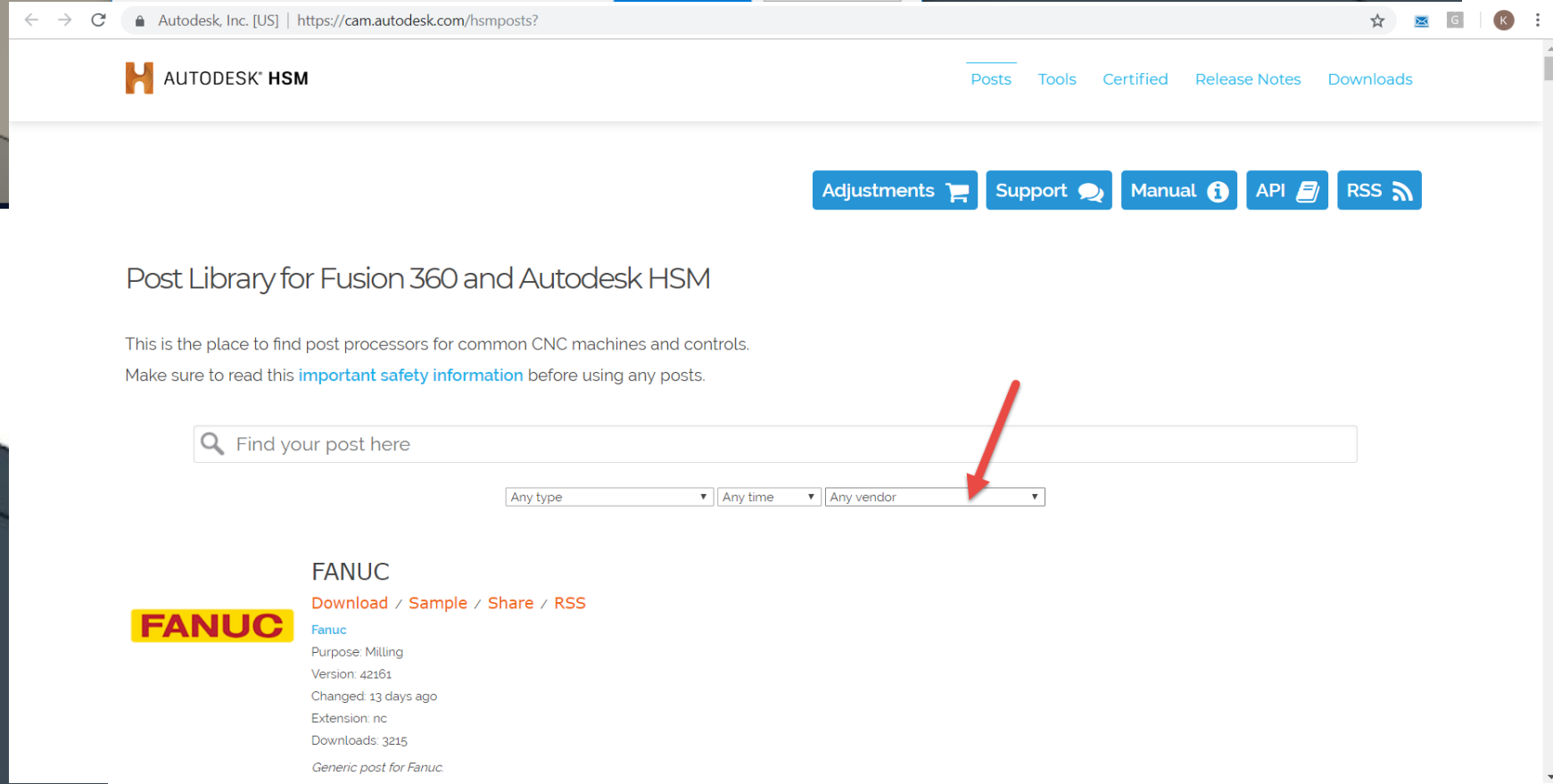
Program comment: Test Fusion

Unit: Document unit

Reorder to minimize tool changes: ☐

Open NC file in editor: ☒

Search for posts in our Autodesk HSM post library



Autodesk HSM

Post Library for Fusion 360 and Autodesk HSM

This is the place to find post processors for common CNC machines and controls. Make sure to read this [important safety information](#) before using any posts.

Find your post here

Any type | Any time | Any vendor

**FANUC**

Download / Sample / Share / RSS

Fanuc  
Purpose: Milling  
Version: 42161  
Changed: 13 days ago  
Extension: nc  
Downloads: 3215  
Generic post for Fanuc



# Fusion 360

## Turning CAM Fundamentals





# Fusion 360

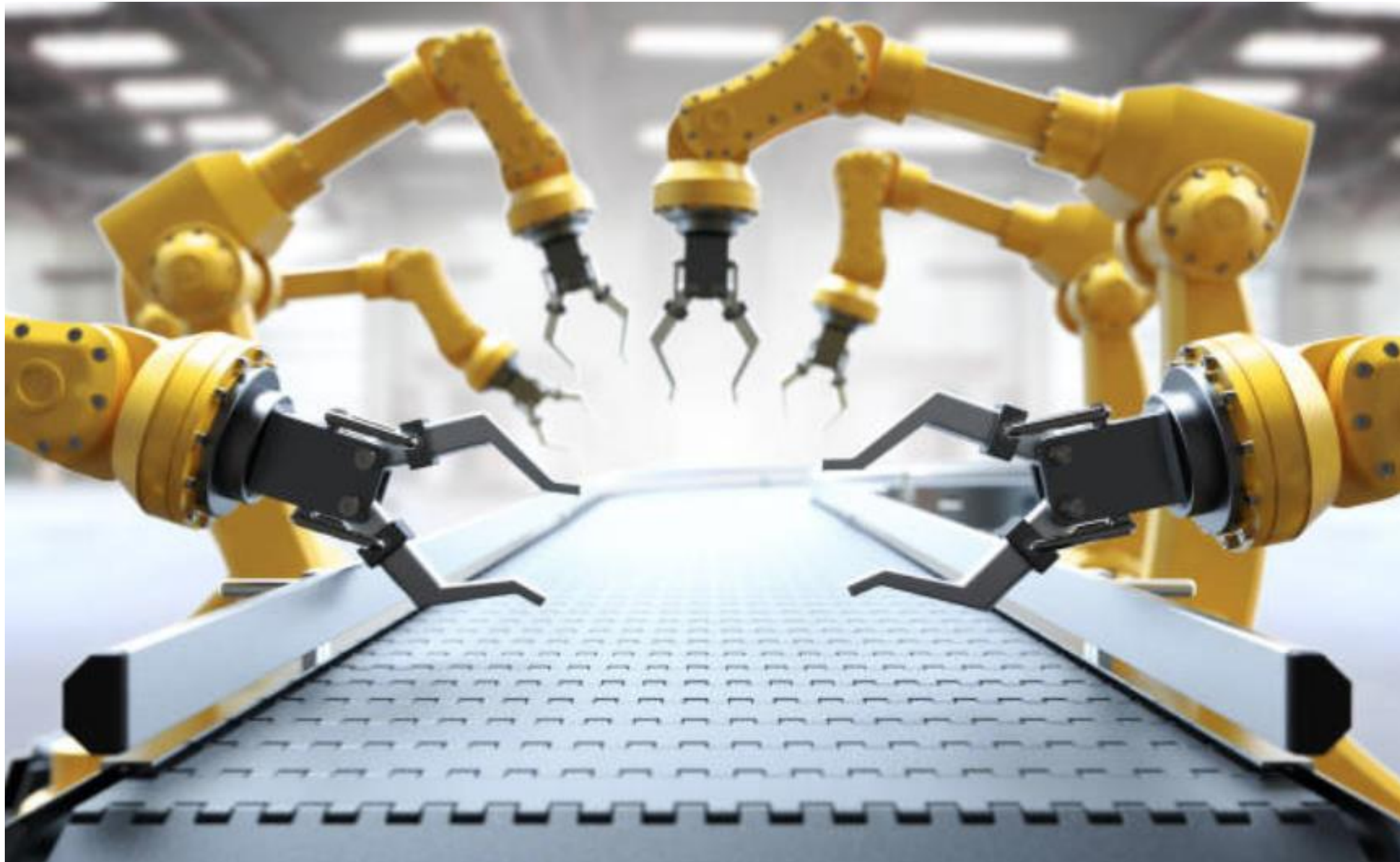
## Milling CAM Fundamentals





# Fusion 360

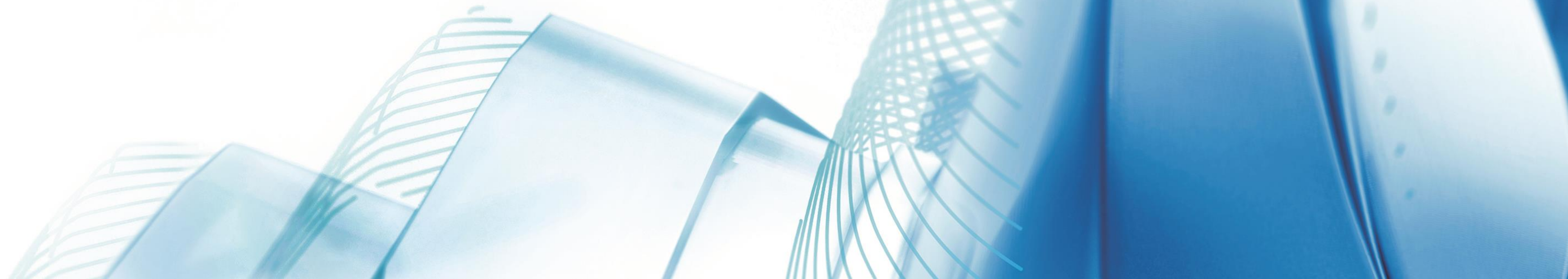
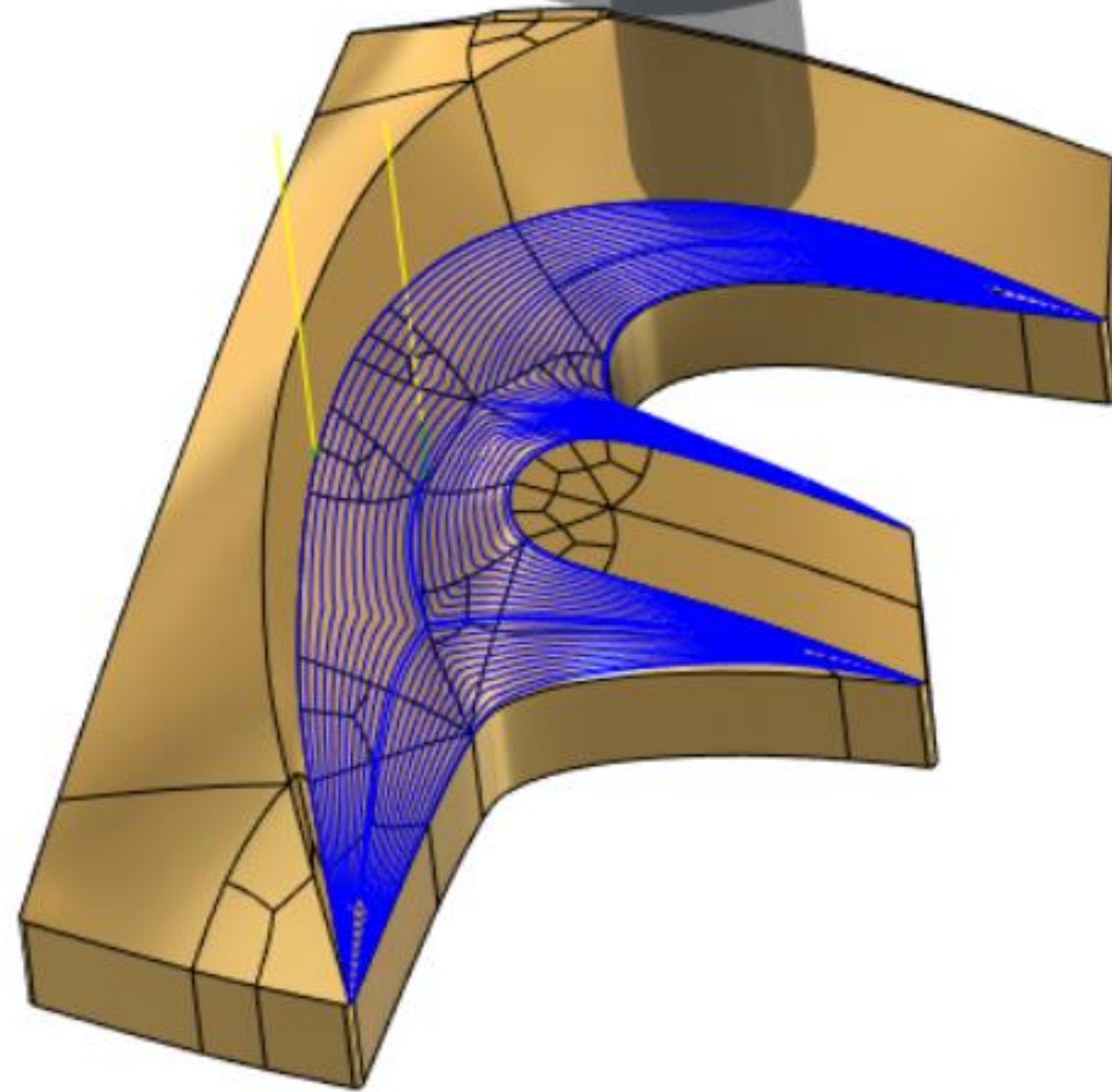
## Efficient Workflows...



...Capture Them









# THANK YOU EVERYONE FOR ATTENDING

- Reminder .....please complete your class surveys. Your feedback is much appreciated.



# Stay Connected !



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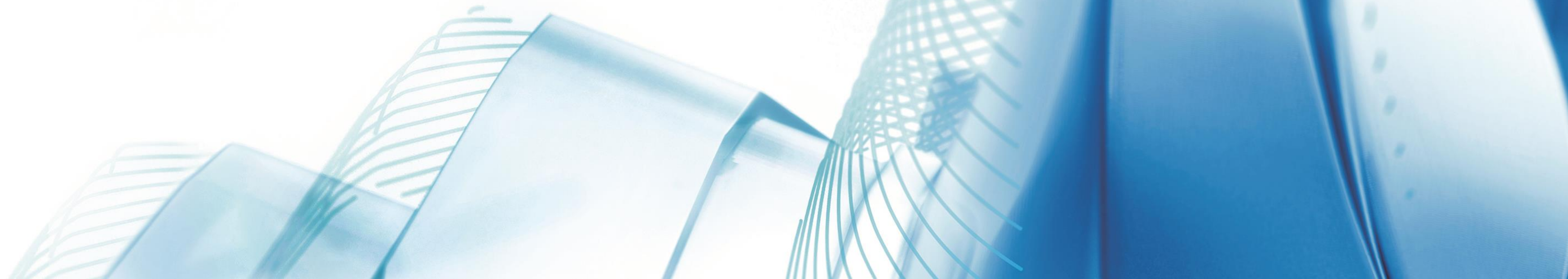
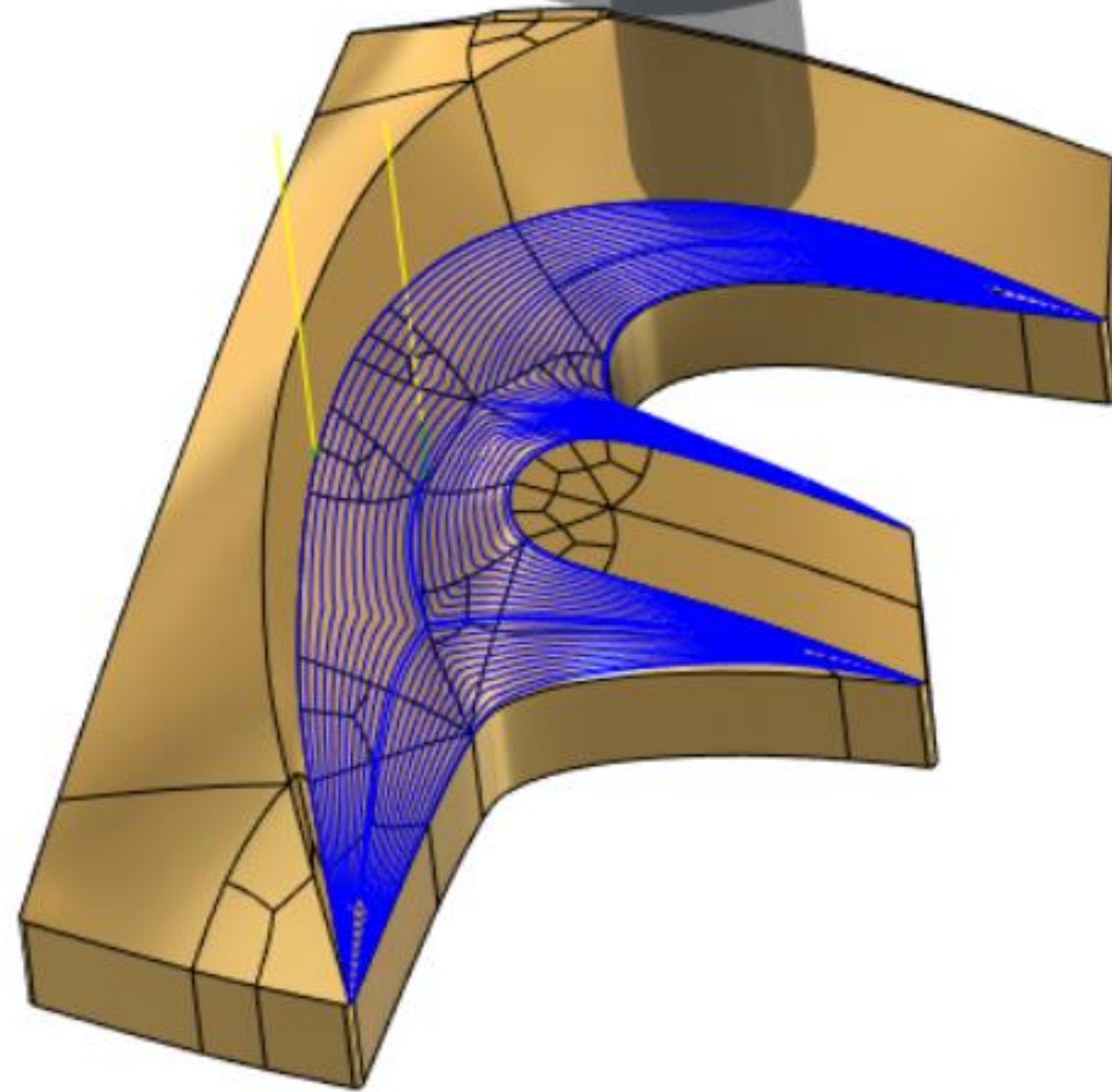
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