Programming All of Your CNC Machines with Autodesk FeatureCAM

Aaron Williford

Technical Consulting Manager – North America

Class summary

In this class you will learn about the wide variety of machines available today, from simple 3-axis mills to complex 5-axis machining centers, and from Simple laths to multitasking turn-mill centers, wire EDM machining and more. See how feature based CAM handles all of these machine types and makes it easier to program across your shop.

Key learning objectives

At the end of this class, you will:

- See how FeatureCAM is able to program a wide range of CNC machines
- Understand how Feature based CAM allows for consistent programming on all machine types
- Easily be able to adapt your existing programs for use on other machines
- See how FeatureCAM makes optimizing your programs easy

About Me

- Technical Consulting Manager – Post Sales North America
  - Products that were previously Delcam
- Delcam for 4 years
- Previously was an Instructor of Manufacturing Technology at Colorado Mesa University
- In the shop for 10 years
  - Machinist, programmer, setup, etc.
  - 3, 4 and 5-axis mills, Lathes, Turn/Mill machines, CNC grinders

CNC machine types available

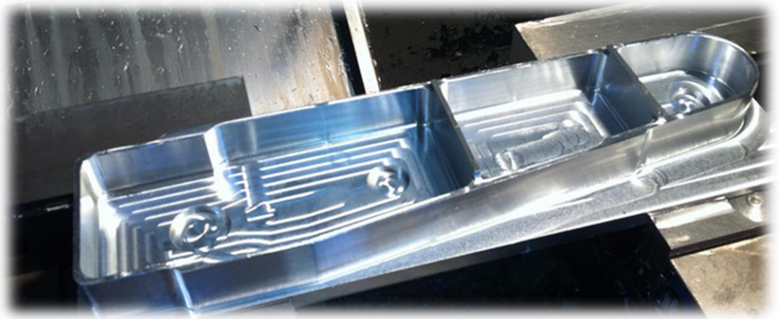
3-axis mills

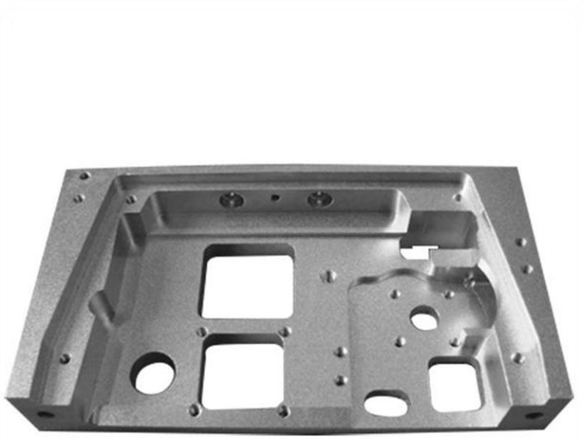
- Contain 3 axes of movement
  - X – Y – Z

Upper: Haas VF3 – small to medium
Lower: KT-Z650 - large

Type of work

- Mold making
- Aerospace
- Automotive
- General





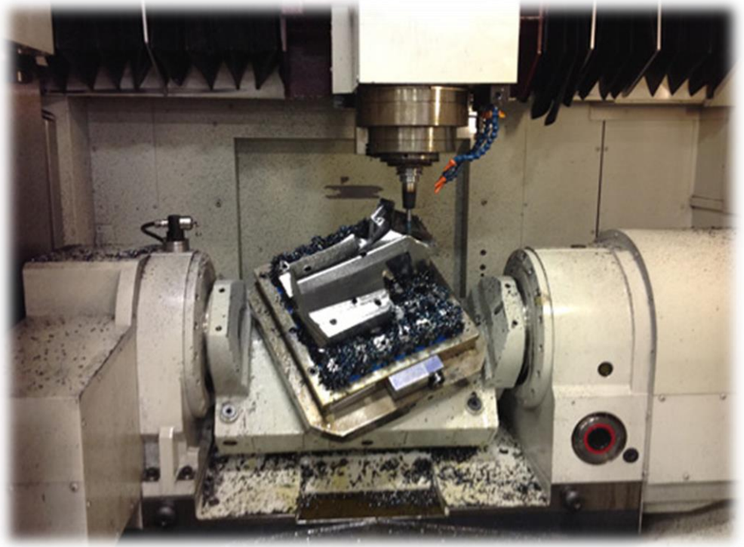
Top middle – mold making
Bottom middle – Aerospace
Right – Automotive
Left - General

4-axis mills

- Contain 4 axes of movement
  - X – Y – Z
  - Rotary Axis
- Can be simultaneous or positional (3+1)
- Can be Horizontal machining centers
- Bolt on rotary tables
- Bolt on indexers

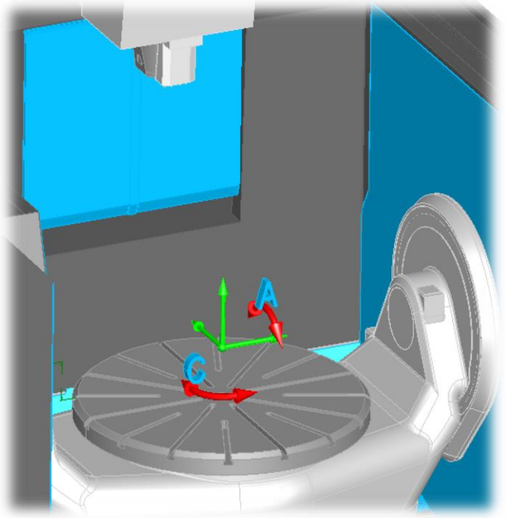
5-axis mills

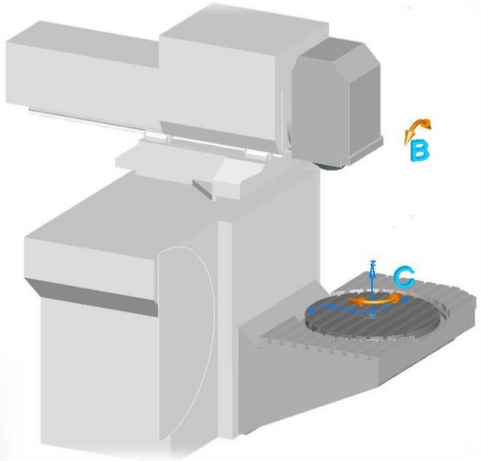
- Move simultaneously in 5 axes
  - X – Y – Z
  - Two rotary axes
- Can be simultaneous or positional (3+2)
- Reduces the number of setups required
  - Reduced production time
  - $$

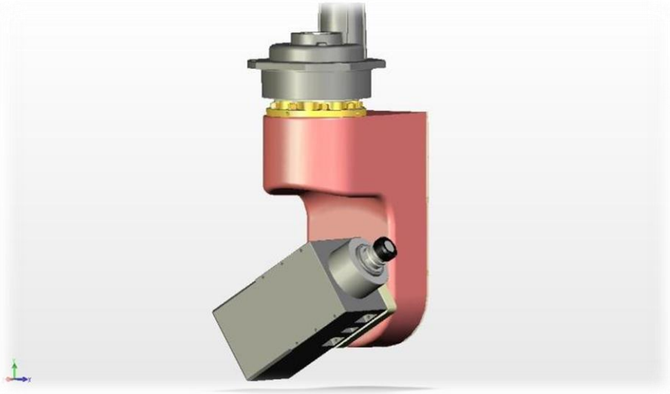


5-axis mills configurations

- Table – Table
- Head – Table
- Head – Head
- Can be purpose built 5 axis
  - Bolt on 5 axis table – table configurations
- Can include basic turning functionality

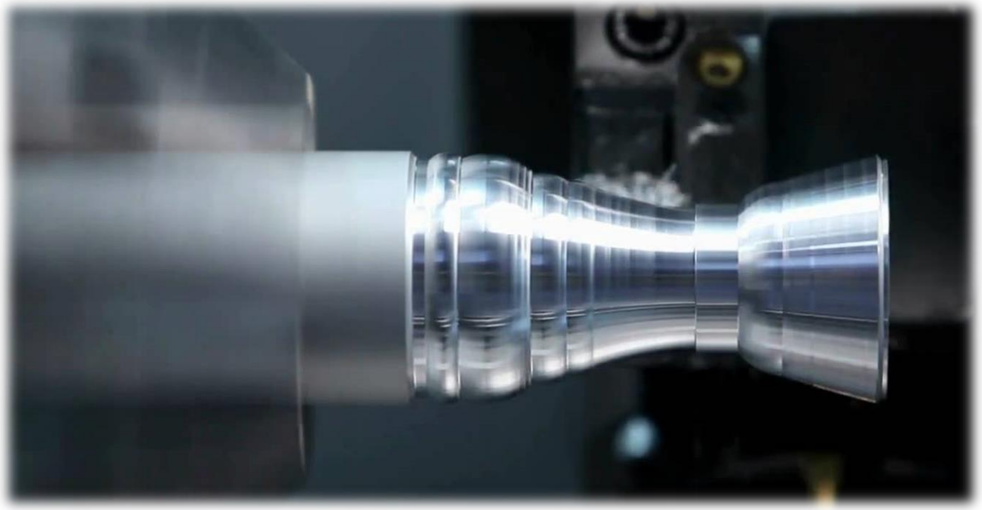




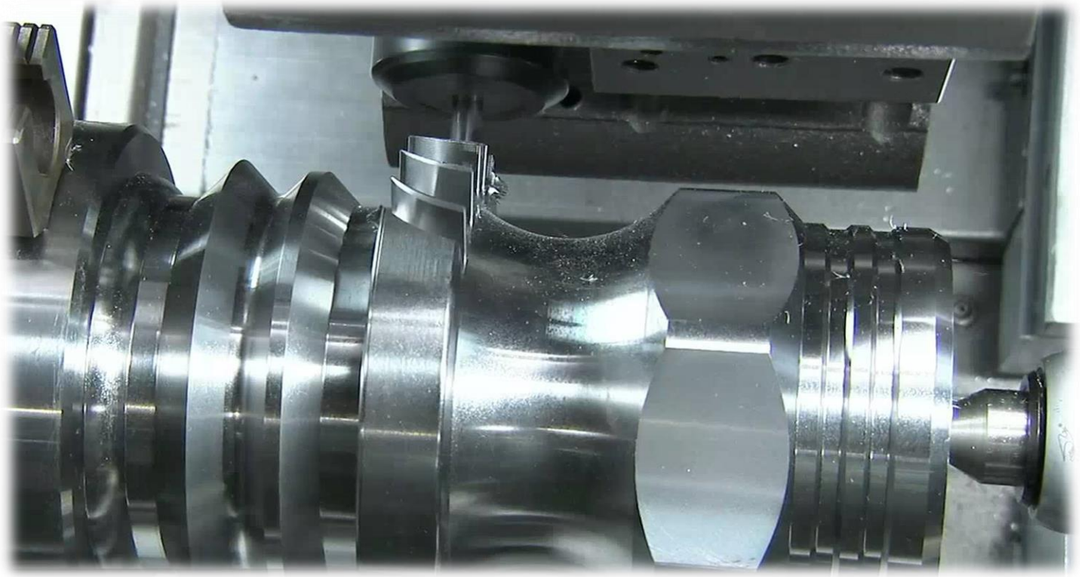


Turning centers

- Commonly referred to as lathes
- Move 2 axes simultaneously (usually X and Z)
- Cylindrical parts
- Can have multiple turrets
- Can have multiple spindles



Turn/Mill Machines



- Turning centers that include live tooling
- Some include Y axis
- Some include B axis
  - Include 5 axis capability

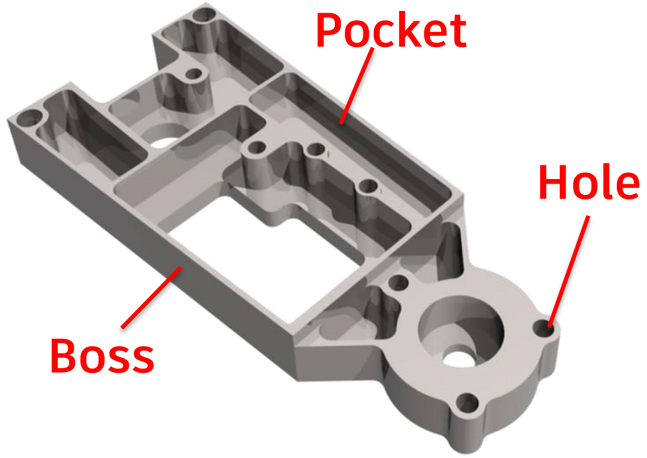
Wire Electrical Discharge Machining (EDM) Machines

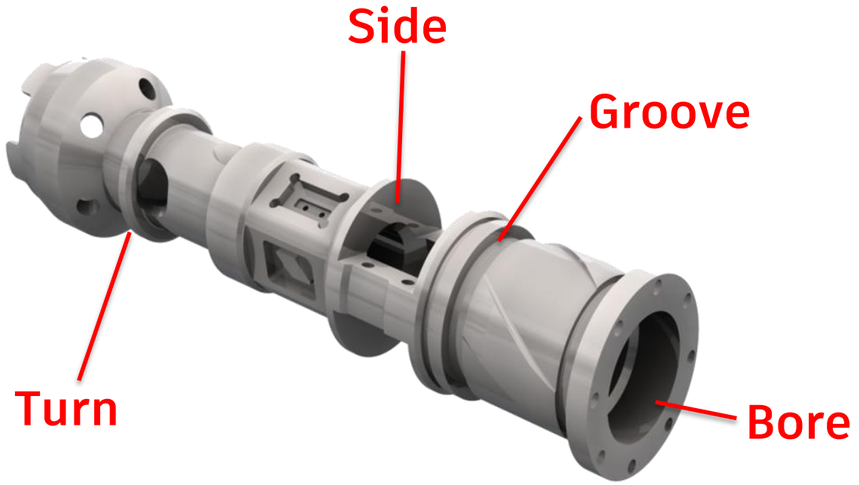
- Allows for machining of harder materials
- Cut inside and outside profiles using a wire and electric current
- Allows for smaller radius cuts on profiles

What is a Feature and why use them in CAM?

Feature

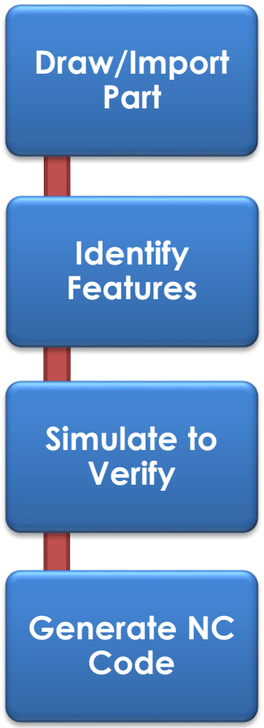
- A FEATURE is an entity that is used to describe an individual section of a part/product
- Every part is made up of one to several FEATURES





How does FeatureCAM Use Features

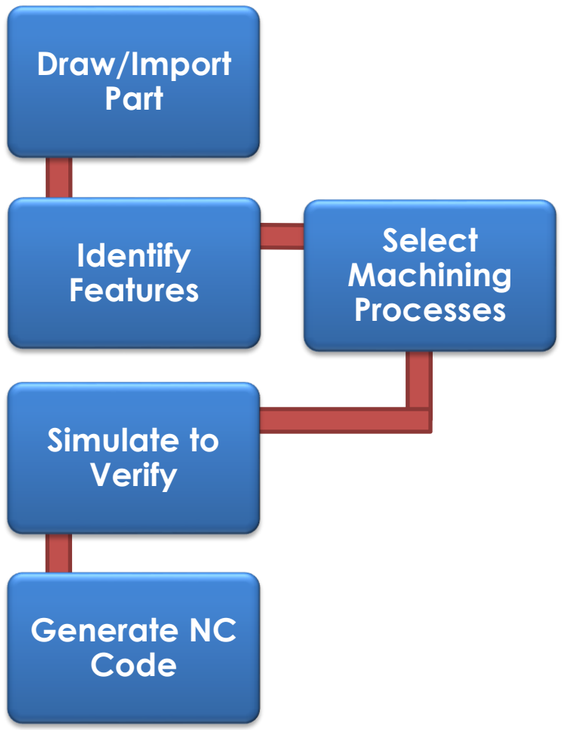
- Use common shop terms
- Describe the end resulting feature



FeatureCAM Automatically:

- Determines necessary Operations to completely machine the features
- Selects all tool sizes
- Calculates Speed/Feed rates
- Determines Stepover and Z increments
- Generates Toolpath

Process Based CAM Approach

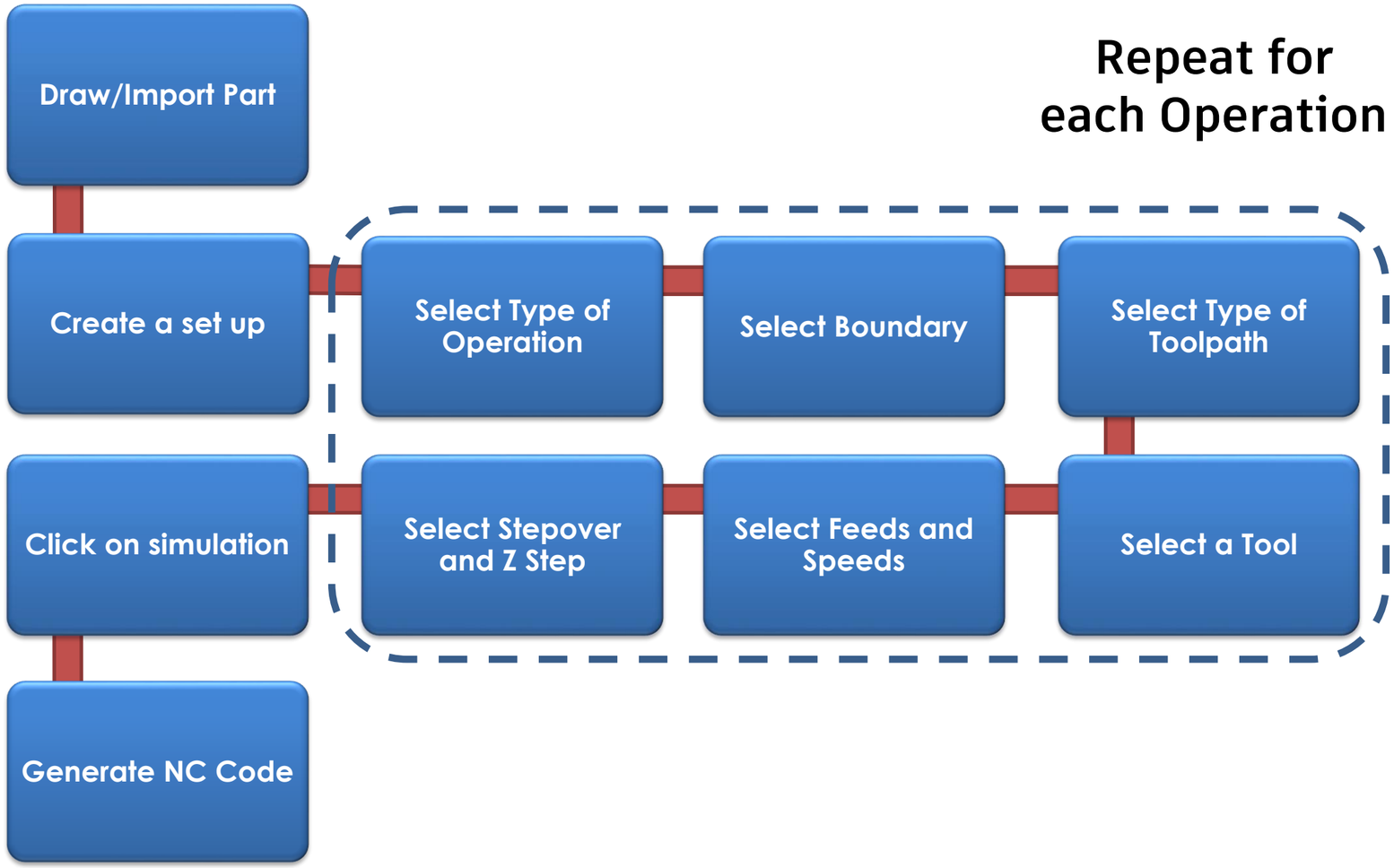


Are you Done?

You still need to verify that:

- The Process has the correct operations
- The process has the correct size tools
- The process has the correct Feeds and Speeds
- The process has the correct Stepover & Z increments

Traditional Operation-based CAM Method



Programming on different machine types

3 axis mills

- Feature based machining and CAM
- Automatic Feature Recognition (AFR)
- Interactive Feature Recognition (IFR)
- How does FeatureCAM use features?
- Ensuring you are using tools that you have in your machine
- Automatically ordering machining operations
- Manually ordering machining operations

Plate Machining 2 part example

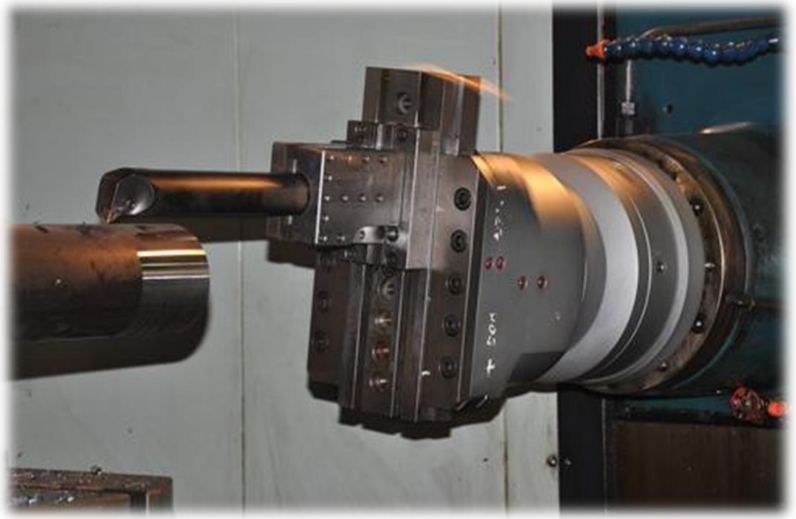
4 axis mills

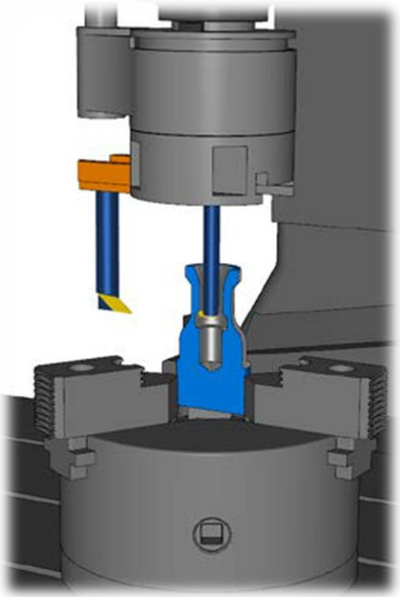
- Consistency of programming style
- Tombstone machining
- Wrapping capability

4-axis Cutter Body example
4-axis Tombstone example

Mills with Turning Heads

- Consistency of programming style
- Often very large Horizontal machines
- Offset a turning tool from centerline
- Can have multiple tools





Turning Head example

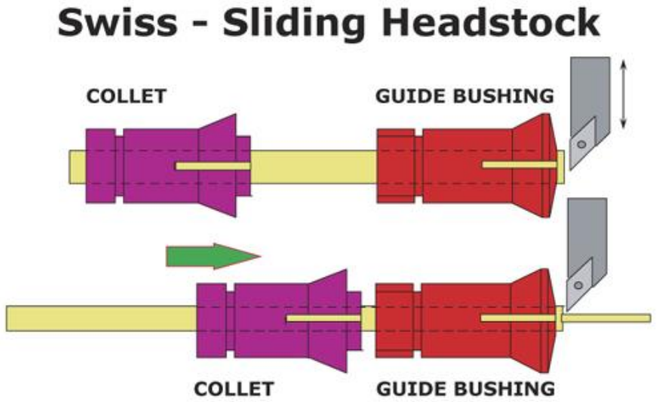
5-Axis example

Turn and Turn/Mill

- Using common turning terms
- Using the same milling feature types
- Single turret
- Multi turret
- Single spindle
- Sub spindle
- Steady rest
- Tailstock

Turning and Turn/mill example

Swiss Turning

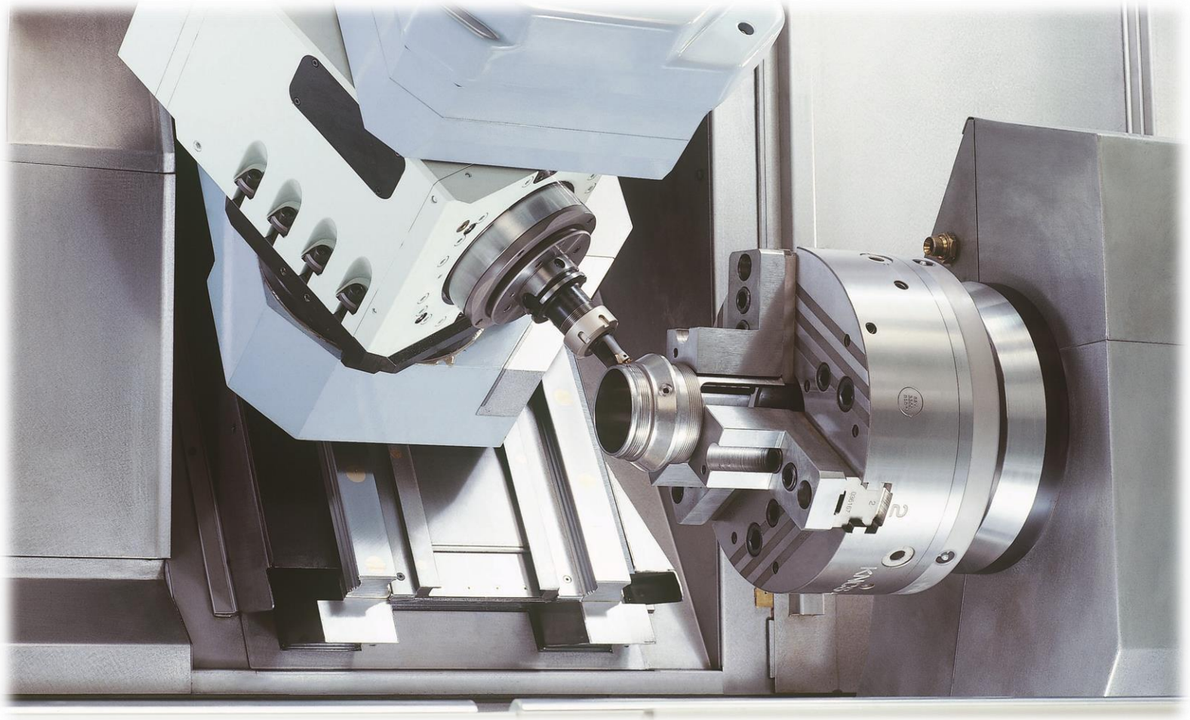


- Small precision components
- Sliding headstock
- More rigid setup
- Programming using the same terminology as turn and mill parts

Swiss turning example

2 axis Wire example
4 axis Wire example

Optimizing Multi Tasking Programs



Why?

- Several turrets
- Simultaneously machining on main and sub spindles
- Simultaneously turning the same profile with upper and lower turrets
- Simultaneously milling opposite sides of a part

Advanced Turn/Mill Optimization Demo

Using completed programs on different machines

Why?

- Often necessary for one reason or anther
  - Machine that the product is typically run on is down or busy
  - Programed with one machine in mind, determined that you could not use that machine for size limitation

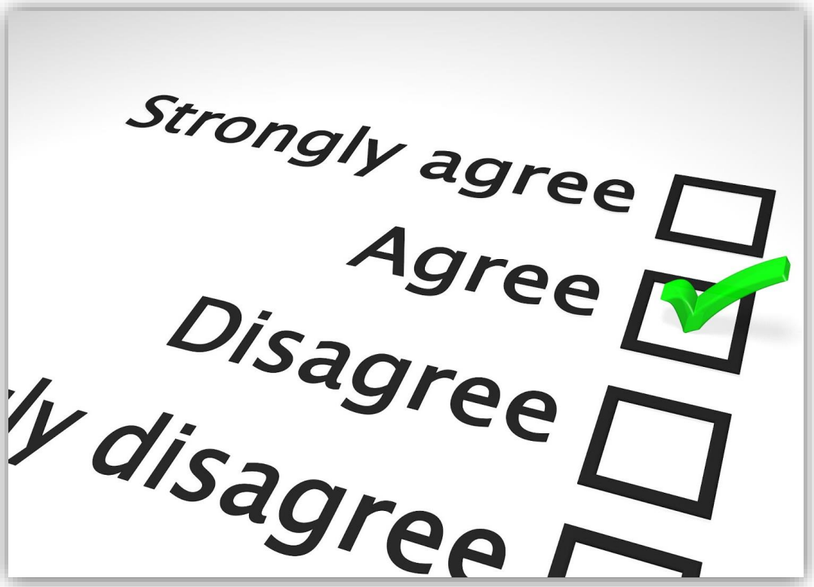
Changing Machines Exercise

Summary

- See how FeatureCAM is able to program a wide range of CNC machines
- Understand how Feature based CAM allows for consistent programming on all machine types
- Easily be able to adapt your existing programs for use on other machines
- See how FeatureCAM makes optimizing your programs for you machines easy

How did I do?

- Your class feedback is critical. Fill out a **class survey** now.
- Use the AU mobile app or fill out a class survey online.
- Give feedback after each session.
- AU speakers will get feedback in real-time.
- **Your feedback results in better classes and a better AU experience.**



More Questions? Visit the AU Answer Bar

- Seek answers to all of your technical product questions by visiting the **Answer Bar**.
- Open daily from **8am-6pm Tuesday** and **Wednesday**; **8am-4:30pm Thursday**.
- Located outside **Hall C, Level 2**.
- Meet Autodesk developers, testers, & support engineers ready to help with your most challenging technical questions.