AUTODESK. UNIVERSITY

Fusion 360 for Horizontal Mills

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About the speaker

Nick Narzinski

- **Implementation Consultant at D3 Technologies**
- **Design – 16 Years**
  - Food & Pharmaceutical processing equipment
  - Recycling Conveyor systems
- **CAM – 8 Years**
  - Inventor CAM
  - Fusion 360
  - FeatureCAM
  - Powermill
- **Post Processor Development – 5 years**

About the speaker

Dave Lapthorne

- **Implementation Consultant at D3 Technologies**
- **Industry – 15 Years**
  - Large Machine Design
  - Sheet Metal
  - Reverse Engineering
  - Project Management
- **CAM – 6 Years**
  - Inventor CAM
  - Fusion 360
  - Flow & Omax Waterjet
  - Elumatec

Learning Objectives

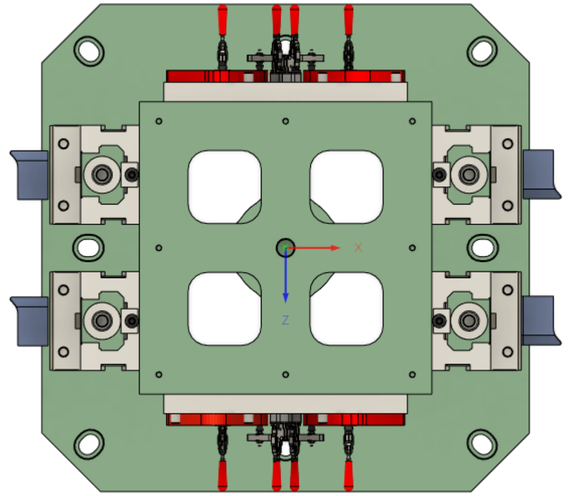
- **Learn how to create setups for duplicate parts or different parts on any number of tombstone faces.**
- **Learn how to locate your work offsets with fixtures and/or probing, while maintaining relationships between parts and operations.**
- **Discover when to use patterns on duplicate parts versus programming multiple parts as a group.**
- **Learn how to utilize post and operation properties to generate efficient code for your CNC machine tools.**

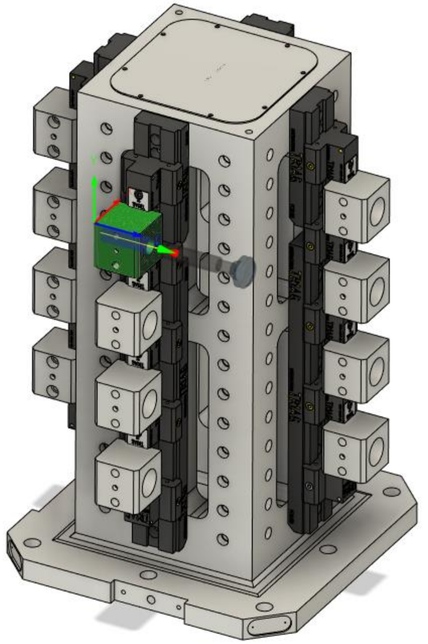
Horizontal Machining Centers – pros vs cons

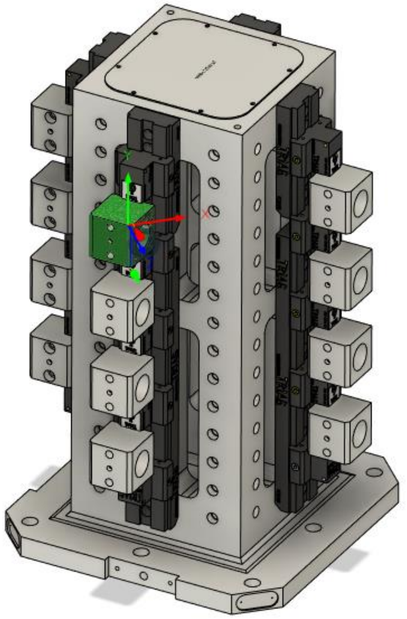
- **Advantages**
  - Gravity – chips naturally fall out of the way reducing chip recutting
  - Space saving on shop floor
  - 4th axis reduces number of setups
  - Tool changer capacity is typically much larger than VMC's
  - Flexibility to run multiple jobs per cycle
  - Automation - With addition of a pallet changer, the operator can run back to back cycles with little to no down time (Lights out?)
- **Disadvantages**
  - Machine is expensive to purchase and expensive to tool
  - Access inside machine is limited making first part runs more difficult to work through
  - Long skinny tooling and holders often needed to work on pallet sides

Creating Setups

- **Center of pallet – 1 Offset for entire cycle**
  - Very quick setup
  - Stock must be located in a repeatable, known location
    - Perfect fixture, pallet perfectly square and faces equal distance from center of rotation
  - Programmed coordinates do not match drawing
- **One work offset tracked with DWO or Call OO88 equivalent**
  - Quick setup
  - Pallet must be perfectly square and faces equal distant
  - Programmed coordinates are usable to operator
- **New work offset, new location for each face**
  - Lots of setup time for operator
  - Easy to bring parts in tolerance with work offsets
  - Programmed coordinates easy to read
- **New work offset, same location for each face**
  - Good mix between quick setup and easy to adjust with work offsets
  - Programmed coordinates are usable to operator

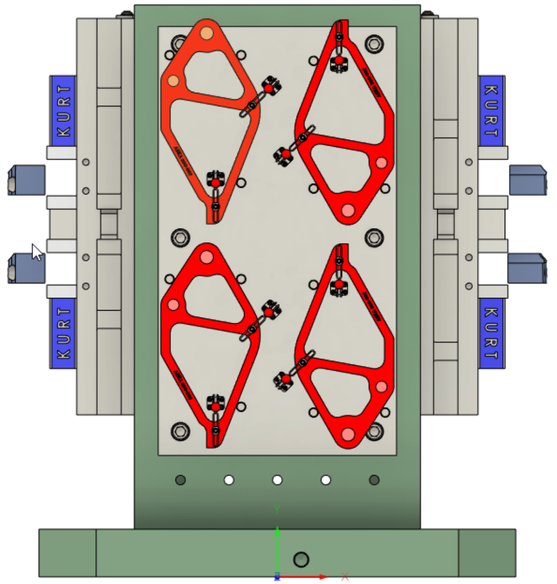


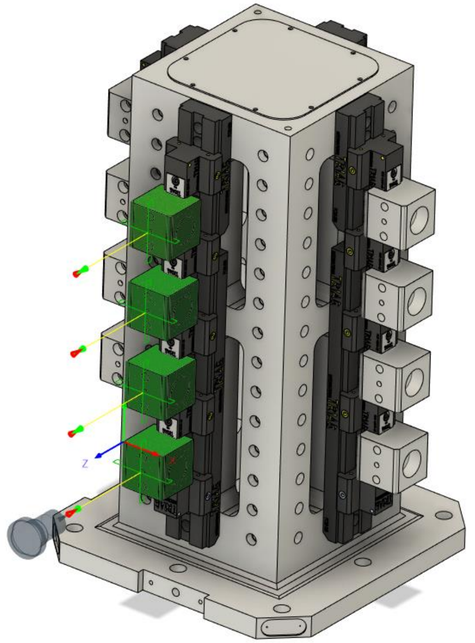




Locating Work Offsets

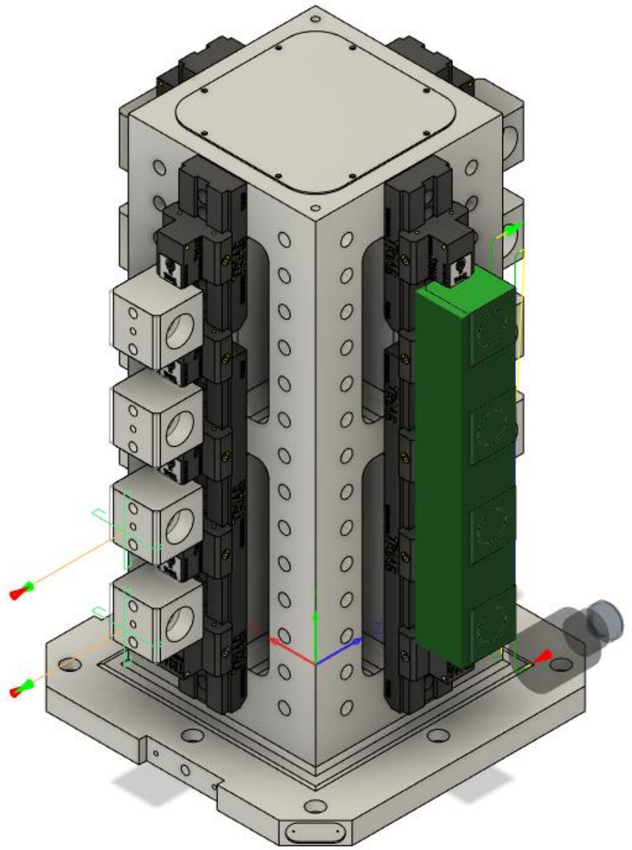
- **Use a qualified fixture**
  - Probe feature on the fixture
  - Use G10 or equivalent to specify offset location
  - Known center of pallet location in Y axis
- **Probe work offset**
  - Probe each part/pattern of parts on each indexed face
  - Probe part on one face and use fixture tracking or dynamic work offset functions
- **Operator locates each offset**





Using Patterns vs Program Individually

- **Fusion is flexible in allowing multiple parts to be programmed individually or with patterns.**
  - Can also mix and match these for optimal efficiency
- **Another option is to post out setups to multiple offsets**
  - These will not simulate



Post/Operation Properties

- Post Properties
  - Set offsets
    - Haas e.g.: N10 G90 G10 L20 P5 X-12.3633 Y-12.2736 Z-11.1262
    - Okuma e.g.: N10 VZOFZ[1]=-9.8425
  - Turn on/off homing between work offsets
  - Set Pallet Face with a variable
  - Call pallet number
- Operation Properties
  - Clamp codes for specific operation
    - Heavy drilling or milling
  - Spindle Load monitoring

```
%
O1001
(T1, )
(T5, F)
(T6, 5/16-18 UNC)
N10 (TOMBSTONE SETUP B ANGLE)VC1=0
N11 VZOFX[1]=0.
N12 VZOFY[1]=0.
N13 VZOFZ[1]=-9.8425
N14 VZOFB[1]=VC1
N15 G40 G80 G90 G94 G17
N16 G20
N17 G00 Z400.
N18 M21
N19 G00 B0.
N20 M20

(Bore2)
N21 G116 T1 ()
N22 T5
N23 S3000 M03
N24 G15 H01
N25 M21
N26 G00 B0.
N27 M20
N28 M08
N29 M120
N31 G00 X-2.9182 Y22.4566
N32 G56 Z7.7559 H01
N33 Z7.2441
N34 G01 Z7.1654 F15.748
N36 G41 X-2.9556 Y22.4192 D01
N37 G03 X-2.9182 Y22.3818 I0.0374
N38 X-2.9919 Y22.4695 Z7.1085 J0.0748 F31.496
N39 X-2.9916 Y22.4708 Z7.03 I0.0737 J-0.013
N40 X-2.8534 Y22.4192 Z6.9948 I0.0734 J-0.0143
N41 X-2.8541 Y22.418 Z6.9162 I-0.0648 J0.0374
```

Fusion 360 Demo