RENISHAW
apply innovation™

Part presence check

Problem

Where a manufacturing operation is performed on a series of duplicate components, a machining program may attempt to machine items that have already been removed or are not loaded. This wastes time and reduces the flexibility of the machining operation.

This applies to situations where:

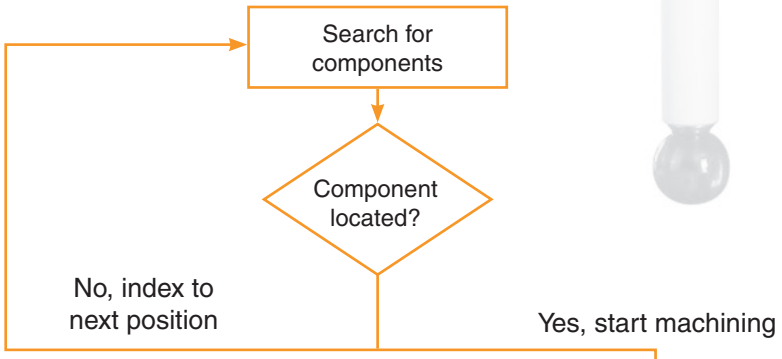
- Several identical components are mounted to a fixture, but only a selection are to be machined
- A single billet is used to machine multiple components, each using different machining programs
- Automatic location of the next component to be machined is required

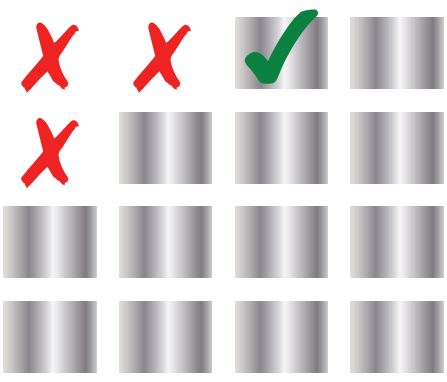
Solution

Use a spindle probe to identify which components are actually present and should be machined. The probing results can be used to control program logic that determines whether to machine a component or to skip machining if no part is present.

Benefits

- Reduces cycle time as only identified in-place components are machined
- Encourages the machining of small, variable size batches, increasing flexibility on the shop floor





Component block

AP202

Part presence check

Example

When machining multiple components from a single billet of material, for example a small component such as watch gears, it is sometimes necessary to identify the next valid position to machine. A single billet may be used for multiple programs and it is not always an efficient use of time for an operator to manually set the position for machining. Instead, a spindle probe can be used to test the component and identity where parts have been removed, and the location of the next part to be machined.

An incise™ *billet showing machining areas*

In the Renishaw incise™ dental system, several dental copings are machined from a single billet of zirconia. This leaves areas of a billet that are not available for machining. Using a 'Part Presence' pattern would allow incise™ to locate areas of the billet that are available for machining.[1]

Alternative solutions

- Manually locate the next available component or area for machining prior to each machining operation, but this is:
  - slow and prone to operator error
  - causes a production delay for every new component set-up
- Use an automatic tracking system to identify the component and keep a separate 'map' of which areas to machine. However, this is:
  - expensive to set-up
  - potentially error-prone as the machine is not using data that it gathered

[1] The actual incise™ system software allows the system to keep track of the regions available for machining because of an advanced billet tagging method. However, this is a good example of where a spindle probe would avoid the need to develop external component tracking.

RENISHAW
apply innovation™

Example: billet with multiple material locations

Sample Productivity+™ Active Editor Pro probe software program

G-Code Block: Set_WCS_for_first_component_pos G-Code Block: Set_var_100_counter_to_zero Label: Program_loop_start	Output the WCS for the first component position on the fixture and set #100 (which is used as a counter) to zero. The label that identifies program start is displayed.
Inspection Cycle: Cycle1_with_UseActiveWCS Measured Point: Point1	In the active WCS, measure a point in Z to determine if the component is present.
If: Point1.Position.Z LT 0 Then: Goto: No_component_Jump_machining	When Z is less than 0, no component is present: skip the machining program.
G-Code Block: Machine_component Label: No_component_Jump_machining	Where component is present, machine component.
If: #100 LT 16 Then: G-Code Block: Increment_WCS_for_next_component_pos Goto: Program_loop_start	If #100 is less than 16, increment the WCS for the next component position on the fixture, jump back to the program start for the next component check. If this is the 16th (last) component position on the fixture, the program ends.

Sample Inspection Plus software program

This program assumes that there is an incremental distance of 10 mm in the X-axis between each part location. It checks the first position and if there is no part present, it loops back and checks the next position until a part is found and then carries on machining. Program will stop on the M00 command when last component is machined.

#31=0 #32=0	Set initial position outside of part program
	Machining process
N10 T01 M06	Select the probe
G54 G0 X#31 Y#32.	Move to start position
G1 G43 Z100. F3000 H1	Apply tool offset and position above component
G65 P9810 Z0 F3000 M1.	Protected positioning move to Z0 If component is found then cycle will set #148 to 7 The probe would have been triggered but the M1. input prevents a 'PATH OBSTRUCT' alarm being generated If no component found then #148 is set to 0 (no probe trigger)
IF[#148EQ7.]GOTO30	Go to block N30 and machine component
#31=#31+10.	Adds 10 to #31 so an incremental move of 10 is achieved in the X-axis
IF[#31LE100.]GOTO10	Check that incremental shift is within the limits of the component fixturing
M00	Stop cycle if all fixture positions checked/machined
N30	Continue with part program machining

SAMPLE PRODUCTIVITY+™ PROGRAMS ASSUME THE USE OF ACTIVE EDITOR PRO 1.70.20
SAMPLE INSPECTION PLUS PROGRAMS ASSUME USE WITH FANUC TYPE CONTROLS

Renishaw plc

New Mills, Wotton-under-Edge,
Gloucestershire GL12 8JR
United Kingdom

T +44 (0) 1453 524524
F +44 (0) 1453 524901
E uk@renishaw.com

www.renishaw.com

RENISHAW
apply innovation™

About Renishaw

Renishaw is an established world leader in engineering technologies, with a strong history of innovation in product development and manufacturing. Since its formation in 1973, the company has supplied leading-edge products that increase process productivity, improve product quality and deliver cost-effective automation solutions.

A worldwide network of subsidiary companies and distributors provides exceptional service and support for its customers.

Products include:

- **Dental CAD/CAM scanning and milling systems.**
- **Encoder systems for high accuracy linear, angle and rotary position feedback.**
- **Laser and ballbar systems for performance measurement and calibration of machines.**
- **Medical devices for neurosurgical applications.**
- **Probe systems and software for job set-up, tool setting and inspection on CNC machine tools.**
- **Raman spectroscopy systems for non-destructive material analysis.**
- **Sensor systems and software for measurement on CMMs (co-ordinate measuring machines).**
- **Styli for CMM and machine tool probe applications.**

Renishaw worldwide

Australia
T +61 3 9521 0922
E australia@renishaw.com

Austria
T +43 2236 379790
E austria@renishaw.com

Brazil
T +55 11 4195 2866
E brazil@renishaw.com

Canada
T +1 905 828 0104
E canada@renishaw.com

The People's Republic of China
T +86 21 6180 6416
E china@renishaw.com

Czech Republic
T +420 548 216 553
E czech@renishaw.com

France
T +33 1 64 61 84 84
E france@renishaw.com

Germany
T +49 7127 9810
E germany@renishaw.com

Hong Kong
T +852 2753 0638
E hongkong@renishaw.com

Hungary
T +36 23 502 183
E hungary@renishaw.com

India
T +91 80 6623 6000
E india@renishaw.com

Indonesia
T +62 21 2550 2467
E indonesia@renishaw.com

Israel
T +972 4 953 6595
E israel@renishaw.com

Italy
T +39 011 966 10 52
E italy@renishaw.com

Japan
T +81 3 5366 5316
E japan@renishaw.com

Malaysia
T +60 3 5631 4420
E malaysia@renishaw.com

The Netherlands
T +31 76 543 11 00
E benelux@renishaw.com

Poland
T +48 22 577 11 80
E poland@renishaw.com

Russia
T +7 495 231 16 77
E russia@renishaw.com

Singapore
T +65 6897 5466
E singapore@renishaw.com

Slovenia
T +386 1 527 2100
E mail@rls.si

South Korea
T +82 2 2108 2830
E southkorea@renishaw.com

Spain
T +34 93 663 34 20
E spain@renishaw.com

Sweden
T +46 8 584 90 880
E sweden@renishaw.com

Switzerland
T +41 55 415 50 60
E switzerland@renishaw.com

Taiwan
T +886 4 2473 3177
E taiwan@renishaw.com

Thailand
T +66 2 746 9811
E thailand@renishaw.com

Turkey
T +90 216 380 92 40
E turkiye@renishaw.com

UK (Head Office)
T +44 1453 524524
E uk@renishaw.com

USA
T +1 847 286 9953
E usa@renishaw.com

For all other countries
T +44 1453 524524
E international@renishaw.com

H-5650-4006-01

Issued 1111 Part no. H-5650-4006-01-C