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In-process datum setting

Problem

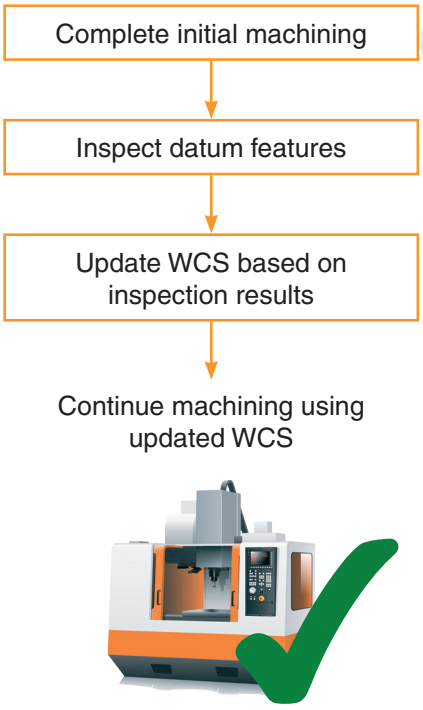
Although a machining process may have accurate part set-up at its start, events and effects during the process may require a work co-ordinate system (WCS) to be re-defined or updated before the machining operation is completed. Stress relief and thermal effects may cause part alignment to change after machining activities, or features to be machined may depend on new datum features produced in the same operation. If new datum features do not exist during the original part setting task then it is impossible to set a WCS based on those features at that time, and if part alignment or form changes significantly during machining then it may be prudent to check part alignment and update a WCS mid-process.

Solution

Use a workpiece inspection probe to measure datum features then store feature or part locations in the CNC in order to reset a current WCS, or define a new WCS automatically. This procedure can be carried out whenever it is required during a machining process.

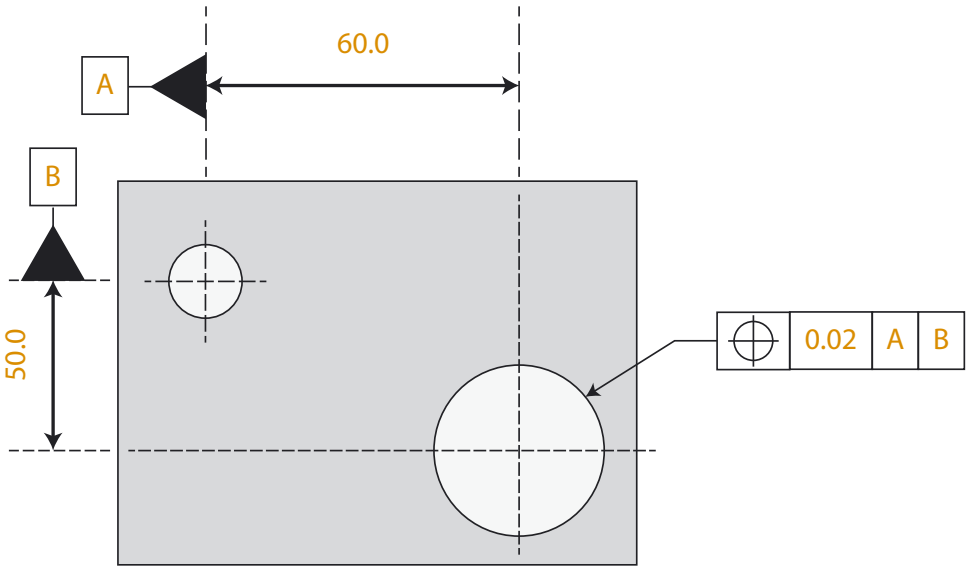
Benefits

Updating a WCS mid-process improves machining accuracy and eliminates sources of variation in position of, and alignment between, features produced by the same machining operation. It can be achieved with high accuracy, no manual intervention and little time requirement.



Example

Two holes - one large and one small - are to be produced during a single machining operation. The position of the large hole is tightly toleranced to the position of the small hole. In this situation, the position of the large hole will depend on the capability of the processes used to produce both holes.



A strategy to account for variation in the machining processes would rough machine both holes, finish machine the small (datum) hole, then use a probe to inspect the small hole in order to reset the WCS based on the position of the finished small hole. The large hole could then be finish machined using the updated WCS.

Sample Productivity+™ probe software program

G-Code Block: Finish_Machine_Small_Bore	Finish machine the small bore to its final size.
Inspection Cycle: Measure_First_Feature Measured Circle: Circle1_Datum_Position Machine Update: Update_WCS1_X_Y_Relative_to_Circle_1	Measure small bore diameter. Update the WCS using the X and Y error.
G-Code Block: Fininsh_Machine_Second_Feature	Finish machine the large bore using the updated WCS.

Sample Inspection Plus software program

N10	
	Finish the machining of the first hole
N20	
T1 M6	Select the probe
G54 X0. Y0.	Start position
G43 H1 Z100.	Select length offset
G65 P9810 Z-10. F3000	Protected positioning move to Z-10
G65 P9814 D6. S1.	Cycle checking a 6 mm diameter bore and updating G54 work offset
G91 G28 Z0.	
G90	
N30	
	Finish machine second hole with updated WCS

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