Jie Gu, J Appl Mech Eng 2016, 5:3(Suppl)
http://dx.doi.org/10.4172/2168-9873.C1.003

Computerized numerical control compensation

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Machine tool accuracy and repeatability is one of the most important considerations for manufacturing parts with the required quality for consistent performance in their assemblies. One of the most challenging areas has been the ability to quickly identify and evaluate the quasi-static and dynamic machine errors and apply the corresponding error compensation models. Because there are many challenges associated with some methods, including the cost in design, analysis and control of precision machine tools, the compensation method has been the most effective approach to control part quality. However, error compensation by measurement of geometric errors is greatly affected by the error modeling and error measurement methods. Volumetric error calibration for a machine tool could require significant machine downtime to implement. The cutting tool pressure, clamping force distort the part while it is machined even with a well calibrated machine tool, resulting part dimension deviate from the specification. This paper presents the development of a global and local offsets combination, so to adjust the machine tool error and part distortion. The part deviations measured by Coordinate-measuring machine machine is presented in an electronic version. A software COMP is developed. COMP reads the CMM report electronically, and analyzes the input and machine tool cutting process, and solve for global and local offsets. The offsets are put into machine tool; the next part is well within the statistical requirement. COMP connects the part deviation directly to the machine tool adjustment. COMP compensate all sources of errors without even know what types of the errors are as long as they are repeatable. COMP is used in GM production lines with typical volume of over 1000 part per day. The compensation process is automated and COMP is very user friendly.

Biography

Jie Gu has completed his PhD in 1997 from Oakland University, Rochester, USA. He is now Sr. Project Engineer at General Motors, and also guest Professor at Oakland University and Han Dan University. He has published 60 papers on CNC compensation, machine tool, and experimental mechanics. He is awarded a dozen patents; some of them are made into software which controls the quality for mass production in automotive industry.

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