University of Huddersfield Repository

Parkinson, Simon, Longstaff, Andrew P., Fletcher, Simon, Allen, Gary, Crampton, Andrew and Myers, Alan

A novel framework for establishing a machine tool quality metric

Original Citation


This version is available at http://eprints.hud.ac.uk/9346/

The University Repository is a digital collection of the research output of the University, available on Open Access. Copyright and Moral Rights for the items on this site are retained by the individual author and/or other copyright owners. Users may access full items free of charge; copies of full text items generally can be reproduced, displayed or performed and given to third parties in any format or medium for personal research or study, educational or not-for-profit purposes without prior permission or charge, provided:

• The authors, title and full bibliographic details is credited in any copy;
• A hyperlink and/or URL is included for the original metadata page; and
• The content is not changed in any way.

For more information, including our policy and submission procedure, please contact the Repository Team at: E.mailbox@hud.ac.uk.

http://eprints.hud.ac.uk/
A NOVEL FRAMEWORK FOR ESTABLISHING A MACHINE TOOL QUALITY METRIC

Engineering Control and Machine Performance Group
S. Parkinson, A. P. Longstaff, S. Fletcher, G. Allen, A. Crampton, A. Myers

1. Introduction
Currently there is an absence of a best-practice framework for engineers to use when performing a full machine tool calibration. When performing the procedure of machine tool calibration it is imperative that care is taken to ensure that the results are accurate, the process is repeatable, and a full traceability chain is maintained. In addition, there is also no standard method of machine evaluation by the use of a single metric. This would be highly beneficial for reporting on the quality of the machine and the testing procedure.

ISO 9000 Quality management systems.
ISO 10012 Measurement management systems.
ISO 17025 General Requirements for the competence of testing and calibration laboratories.
ISO 230 Test code for machine tools.

3. Current Procedure
Problems with the current procedure
• Ignorance of British and international standards as well as industrial best practises.
• Complacency with working procedure could result in efficiency gains not being realised.
• Little consideration is taken to measurement uncertainties.
• Poor design and implementation can lead to the lack of traceability.
• No indication of the machine’s quality based upon the calibration process.

4. Novel Framework
How
Adopting aspects from well established Software Engineering and Business Methodologies to produce a diverse but rigorous framework to apply to the process of Machine Tool Calibration.

Benefits
• Framework maintains consistency with British and International Standards.
• Quality Metric allows for evaluation of the machine.
• Rigid design process allows for the traceability chain to be maintained.
• The accuracy and repeatability of the test is improved by ensuring the test’s validity.
• The most efficient method of calibration is always taken.

British / International Standards
Historical Data
Instrumentation
Test Type
Analysis
Design
Implementation
Executive
Verification

Framework

Historical Metrology Instrumentation Data stored both centrally and remotely in an anonymous fashion to its source for other users of the same instrumentation to use.

Input Parameters
Output Parameters

Analysis
Design
Implementation
Execution
Verification

Geometric
Thermal
Non-rigid

Wyler Zeromatic
Renishaw QC10
Renishaw X180

ISO 2005
ISO 9000
ISO 10012
ISO 17025

Data Processing
Data Capture
Instrumentation Selection

(www.machinery.co.uk, 2010)
(Wyler, 2010)
(Andrew Longstaff, 2010)
(Naeem Mian, 2010)