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/id/eprint/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

1. Introduction
Currently there is an absence of a best-practise 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.

2. Objectives and Goals
This project will develop a best-practise framework with beneficial features derived from well established Software Engineering & Business Methodologies. The framework will, with due reference to ISO, also provide a method for producing the evaluation metric based upon the captured data including consideration of the uncertainties within the measurement procedures. In addition to the framework, a software package will be developed that incorporates the framework and can be used throughout the calibration process from design to verification.

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.

ISO 17025
General Requirements for the competence of testing and calibration laboratories.

ISO 230
Test code for machine tools.

ISO 9000
Quality management systems.

ISO 10012
Measurement management systems.

British / International Standards
Both British and International Standards must be identified and then enforced. This is a critical part to the calibration process as it is imperative for most organisations to maintain BS/ISO compliance.

Instrumentation
Historical Data
Technical Data

Analysis
Verification
Execution
Implementation

Output Parameters

Renishaw X180
Wyler Zeromatic
Renishaw QC10

Data Capture
Data Processing
Input Parameters

Relocated position
(Andrew Longstaff, 2010)
(www.machinery.co.uk, 2010)
(www.themachinery.co.uk, 2010)

Simulating tomorrow’s professionals

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

Non-rigid

Geometric
Thermal