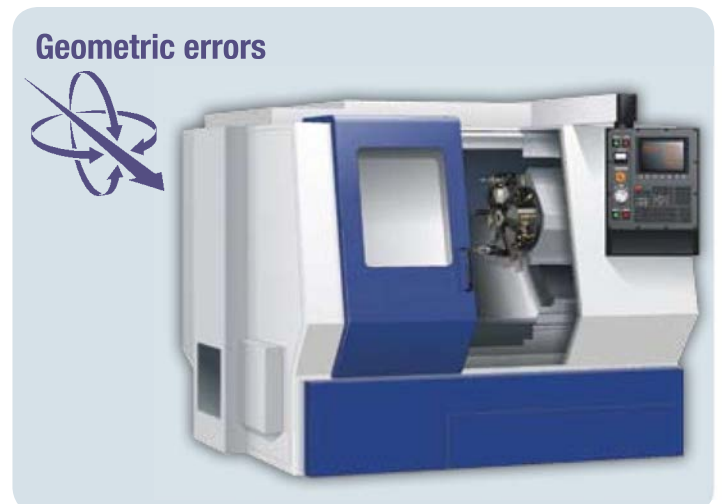
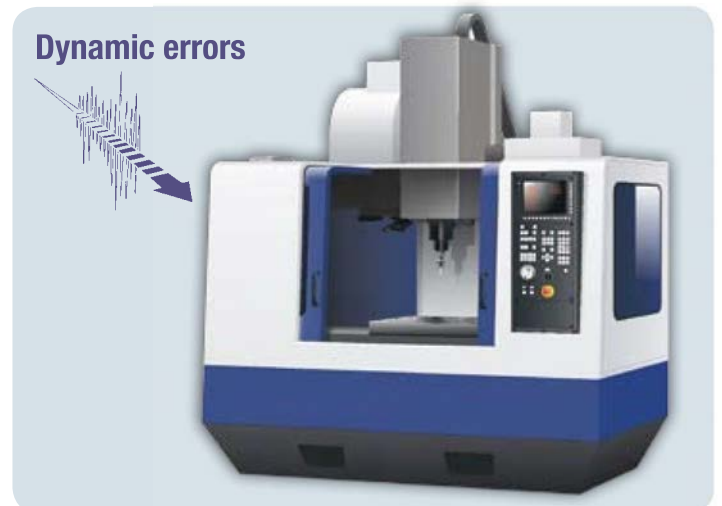


Time to take control

Unlock the maximum performance of your machine tool and gain greater control over your manufacturing process!

> Increase availability > Improve performance > Guarantee quality



Why you need MPEOM™

Today, many UK manufacturing companies face pressures to reduce lead times, operating costs and improve production quality. Today's globalisation and rapidly changing technologies demand radical new approaches towards manufacturing.

You may already know the problematic areas within your manufacturing processes and can see the impact they have on your competitiveness, but are you just looking at the symptoms of deeper underlying problems?

CNC machine tools are becoming ever more sophisticated and in some cases are in a technological "black hole".

Even with newly purchased machines, capabilities are not fully understood, machine optimisation is often neglected and fault finding of process issues can be both time consuming and costly.

Understanding your machine tool

The complexity of a machine tool can be broken down into its intrinsic parts.

The three major inputs to a machine tool are mechanical, electrical and metrological, which contribute to power, speed, accuracy and reliability.

All of these are inter-related and must be considered together when optimising any machine tool, regardless of size and performance.

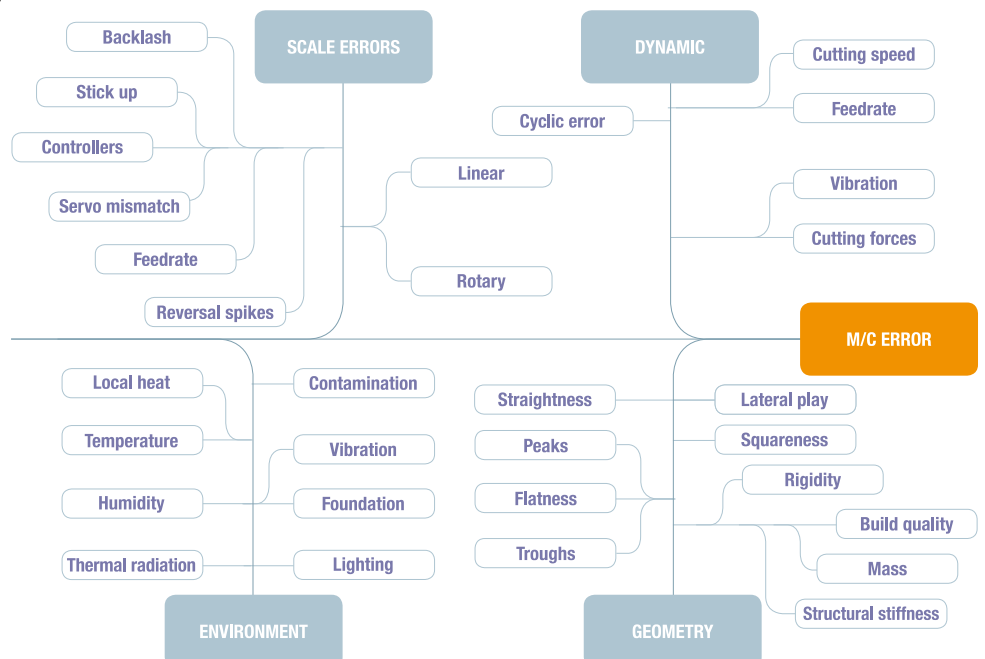
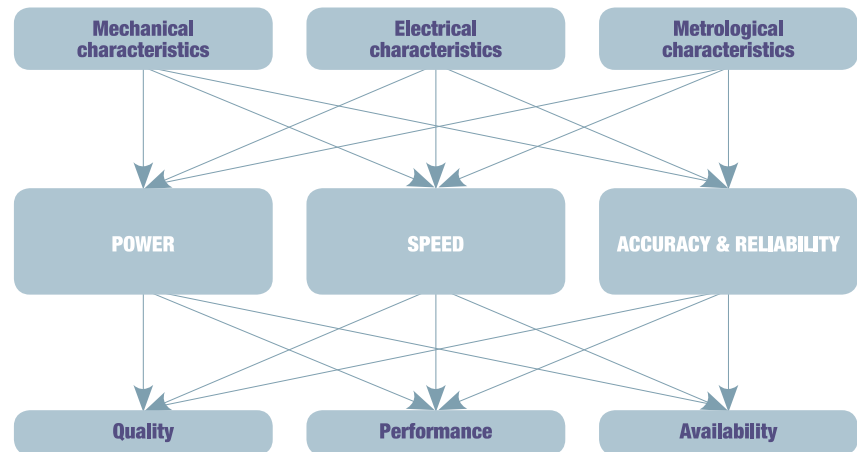
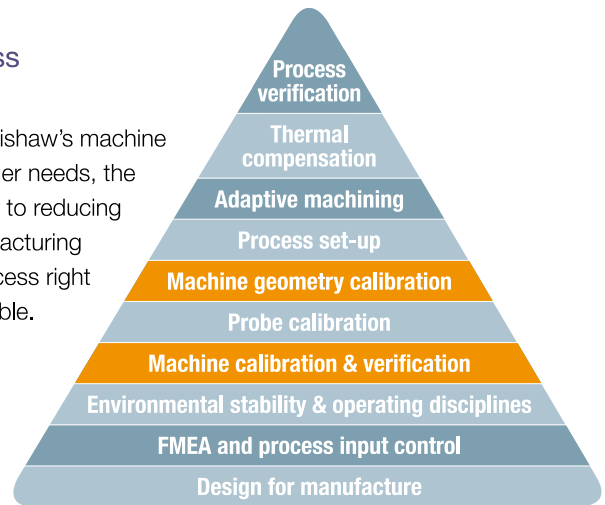
Sources of non-conformance

Mechanical, electrical and metrological characteristics can be easily analysed into their key components by systematically inspecting the machine tool.

The machines can then be optimised with a systematic and traceable method.

Where do you start? – The Productive Process Pyramid™ (PPP)

Developed over years in Renishaw's machine shop, and to answer customer needs, the PPP is a ten stage approach to reducing waste and variation in manufacturing processes – making the process right and keeping the process stable.



The MPEOM™ process – six steps to improved machine capability

MPEOM – Machine Performance Evaluate Optimise Monitor, is a total productive maintenance system that encompasses and addresses all integral facets of a machine tool, irrespective of age, size or performance. Built on years of extensive knowledge of machine tool maintenance and optimisation, this new lean system has the potential to **unlock the maximum performance of your machine tool** and provide you with **greater control over your manufacturing process**.

Stage 1 – Pre-assessment review

What are we expecting from the machine?

- > Analyse the part in detail
- > Analyse the processes involved
- > Understand the part tolerance requirement
- > Analyse current concessions
- > Analyse current machine reliability issues
- > Set goals for the optimal machine condition

Stage 2 – Machine condition evaluation

What is the machine's capability?

Once objectives have been set for the machine, it is then evaluated:

- > Assessment of the main mechanical, electrical and electronic components
- > Assessment of the machine geometry to ISO or OEM specification
- > Assessment of the machine measuring systems to ISO or OEM specification
- > Adjustments and optimisations to any minor mechanical and electrical machine faults
- > Adjustments to machine geometry and measuring systems

Stage 3 – Post assessment report

Will the machine make the part?

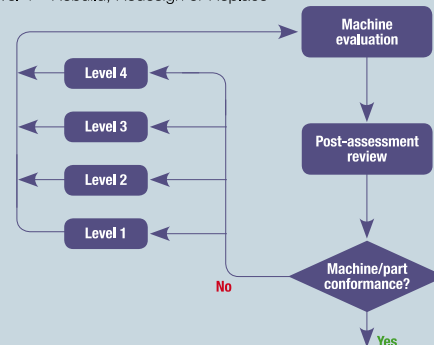
- > Detailed factual report on machine condition and process expectation
- > Identify non-conformances
- > Control through concession
- > Report forms basis of standards of operation
- > Method of test traceability
- > Red, amber, green critical system
- > Simplified explanation of complex error components

Stage 4 – Machine condition optimisation

How do we do it?

The optimisation of the machine can be a sub-cycle within the MPEOM process. This is a push system offering a solution to all machine non-conformances:

- > Level 1 – Non-intrusive error correction
- > Level 2 – Intrusive error correction
- > Level 3 – Advanced error correction
- > Level 4 – Rebuild, Redesign or Replace



Stage 6 – Go/No-go system

How do we keep what we have?

Regular Go/No-go checks can be used to monitor critical machine accuracy components and act as valuable predictive maintenance tools.

Machine specific Go/No-go system:

- > Renishaw QC10 ballbar system
- > A process specific artefact
- > Machine probing

Stage 5 – Post-optimisation review

Where are we now?

Post optimisation data is collected showing the machine at a benchmark optimised state:

- > Continuous improvement plan
- > Preventative maintenance schedule created
- > Benchmarked data used for root cause analysis in the event of a failure



The MPEOM™ proposal

MPEOM is the start of a culture-changing journey

Training

Training is a key part of MPEOM, providing operator and maintenance staff with the core MPEOM skills. The training can be customised for any manufacturing plant, where qualifications are available up to BSc degree level.

The training modules available include:

- > Fundamental mechatronics
- > Mathematics for engineering
- > Control and diagnostics of CNC machines
- > Mechatronics for CNC systems
- > Industrial applications of CNC systems
- > Geometric alignment of machine structures
- > Machine tool metrology
 - Laser calibration
 - Ballbar analysis
 - Volumetric analysis

Where would you start?

A typical “start up” for MPEOM would consist of:

- > Identifying a target cell at your site
- > MTT carrying out the MPEOM process – with your maintenance and production staff
- > Establishing a training plan – for your existing staff and apprentices
- > Establishing a capacity model based on your current resources
- > Setting up Go/No-go systems with operator staff training
- > Planning roll-out for other cells in the same site or one machine type across the company

Equipment

Tools that are required for the MPEOM process mainly involve machine geometry and accuracy measurement equipment.

Depending on the machine configuration this can involve the use of:

- > Renishaw laser calibration test equipment
- > Renishaw QC10 ballbar test equipment
- > Touch probe and machine calibration software
- > Thermographic imaging equipment
- > Vibration analysis equipment
- > Dial test indicators
- > Precision squares
- > Straight edges
- > Precision levels

Implementation

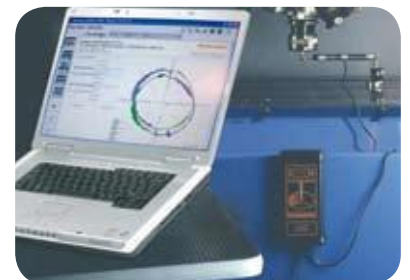
MPEOM relies on a change in culture – it includes guiding you through the following implementation steps:

- > Ownership of the system
- > High-level commitment from management
- > Understanding the long term strategy
- > Change management
- > Production, Quality and Maintenance working as a team
- > Commitment to training
- > Performance tool (OEE) in place

RENISHAW 
apply innovation™

QC10 ballbar

QC10 ballbar provides a simple, rapid check of a CNC machine tool's positioning performance to recognised international standards. Quick and simple to use, with powerful results allowing users to benchmark and track performance of their machines and to quickly diagnose problems that require maintenance.



XL-80 laser calibration

Fast and extremely portable, the XL-80 system provides accuracy, reliability and durability in day-to-day use. The XL-80 system software allows measurement and analysis of linear, angular, rotary, axis, flatness, dynamic, straightness and squareness.



Machine probing

Machine tool probe solutions can help reduce set-up times by up to 90% and improve your process control.

Renishaw provides solutions for tool setting, broken tool detection, component set-up, in-cycle gauging and first-off inspection of parts, with automatic offset updates.

