

Shop floor metrology and process data

- critical enablers for smart manufacturing

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Paul Maxted
Director of Industrial Metrology Applications
Renishaw plc



Global manufacturing challenges and opportunities...

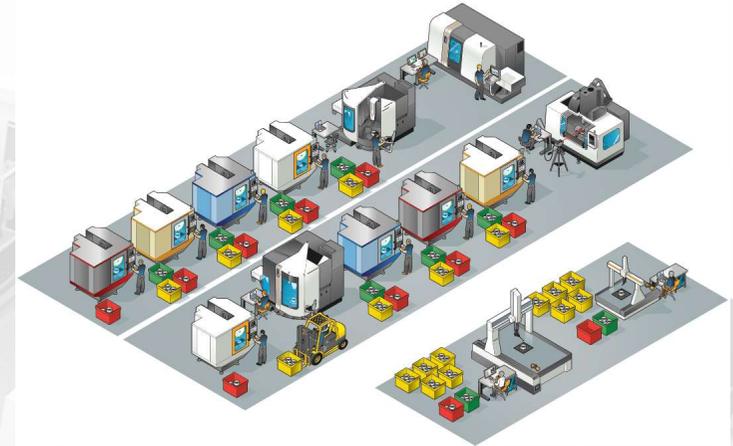
- More CNC automation – increased utilisation, reduced labour
- Skills shortages – availability of traditionally skilled people
- Cost effective reshoring and flexible, resilient supply chains
- Digitalisation – technology and software across manufacturing (Industry 4.0)
- Reduced product life cycles, frequent design iterations and efficiency
- More focus on sustainability, reuse and environmental impact of manufacturing...

...These will drive the Metrology requirements for future factories.

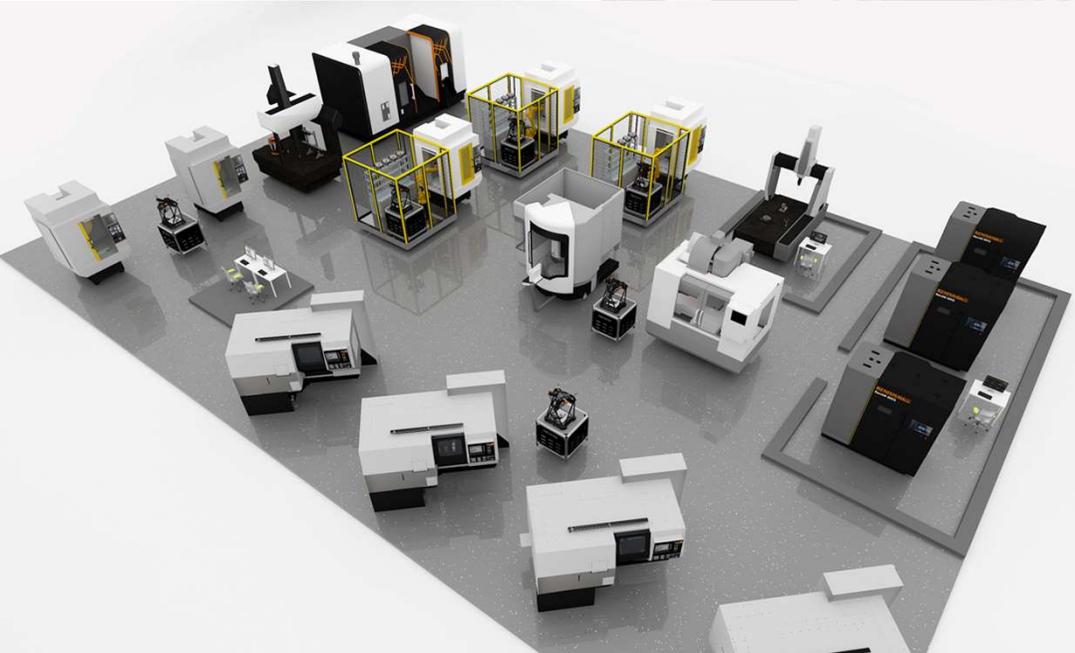
Bringing metrology to the shop floor

A Traditional CNC factory

- Remote Quality function
- Delays in availability of measurement data
- Low productivity / infrequent measurements
- Quality blindspots
- Skilled interpretation for process control
- Manual intervention & update
- Barrier to full automation of CNC processes



Bringing metrology to the shop floor

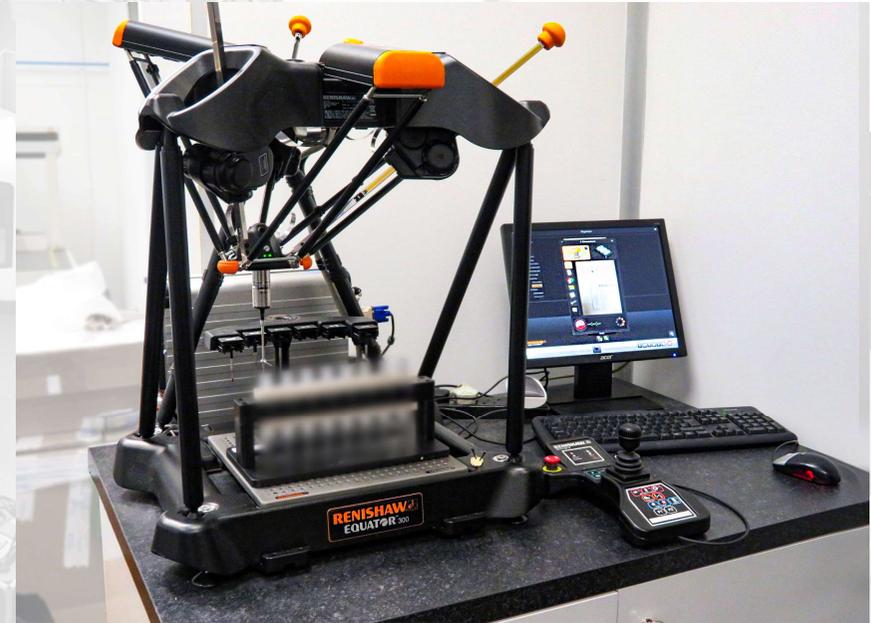


Smart factory

- Point of manufacture measurements
- Real time, closed loop feedback
- Quicker response & control
- Fewer quality issues
- Automated process – less skills
- Metrology enabled automation
- Higher productivity



Integrating metrology in CNC processes



Machine setting

Tool setting

Part setting

Tool
breakage
detection

On machine
measurement

Off machine
measurement

Tracking and
control

Adjust tooling

Automation of CNC manufacturing



Factory automation reduces manual loading and part handling activities...



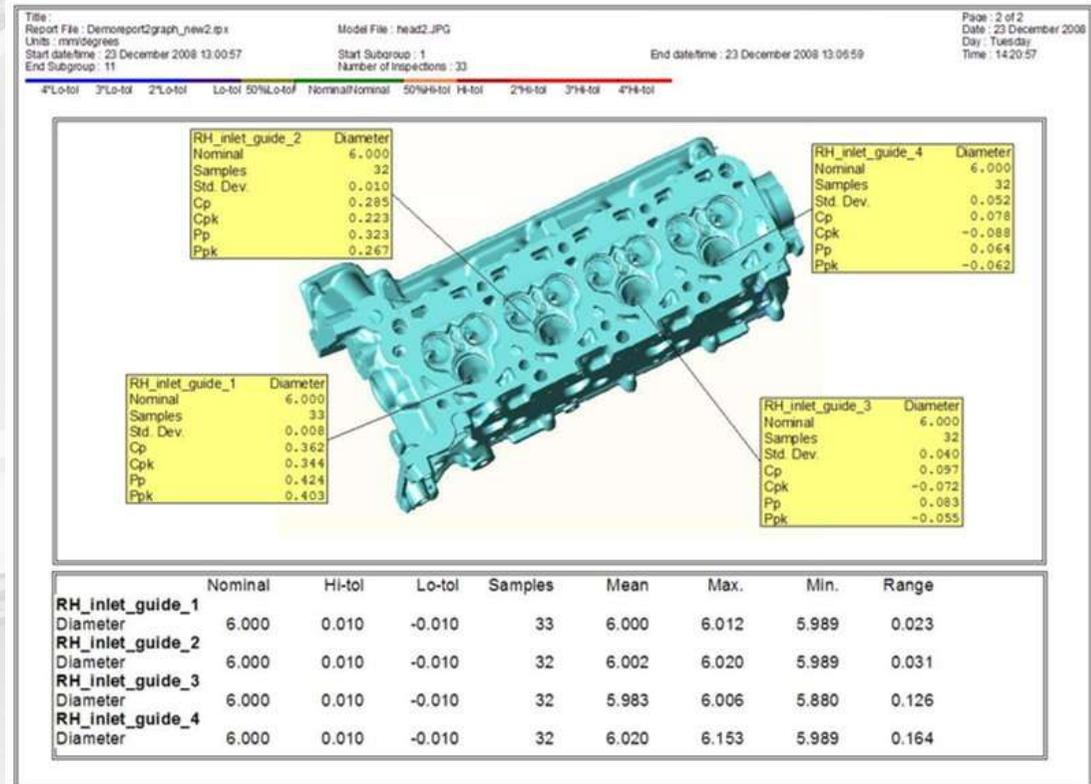
Integrated metrology automates remaining manual processes...



Metrology for quality control

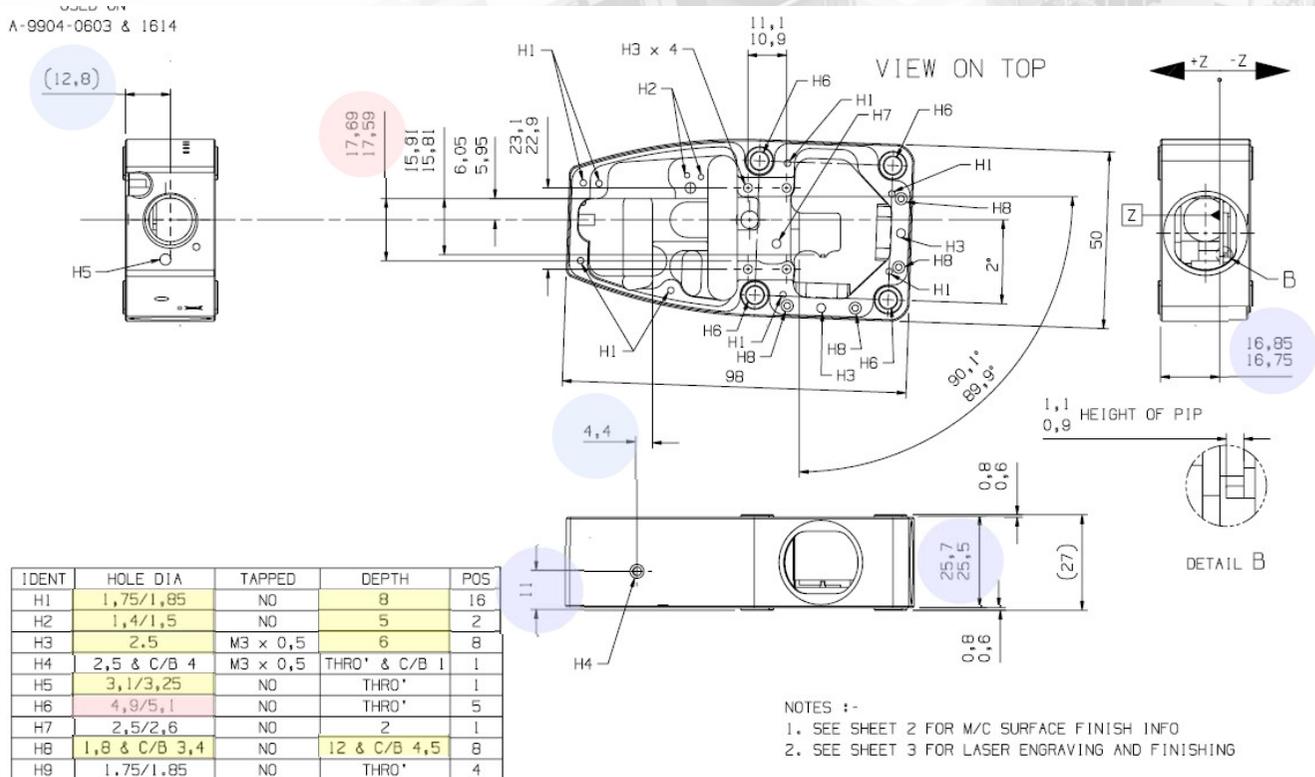
Quality control

- All dimensions and tolerances on model / drawing
- Manufacturing method unknown
- Mandatory in some industries
- Often in remote inspection room
- After the part has been completed
- Delayed results and action



Metrology for process control

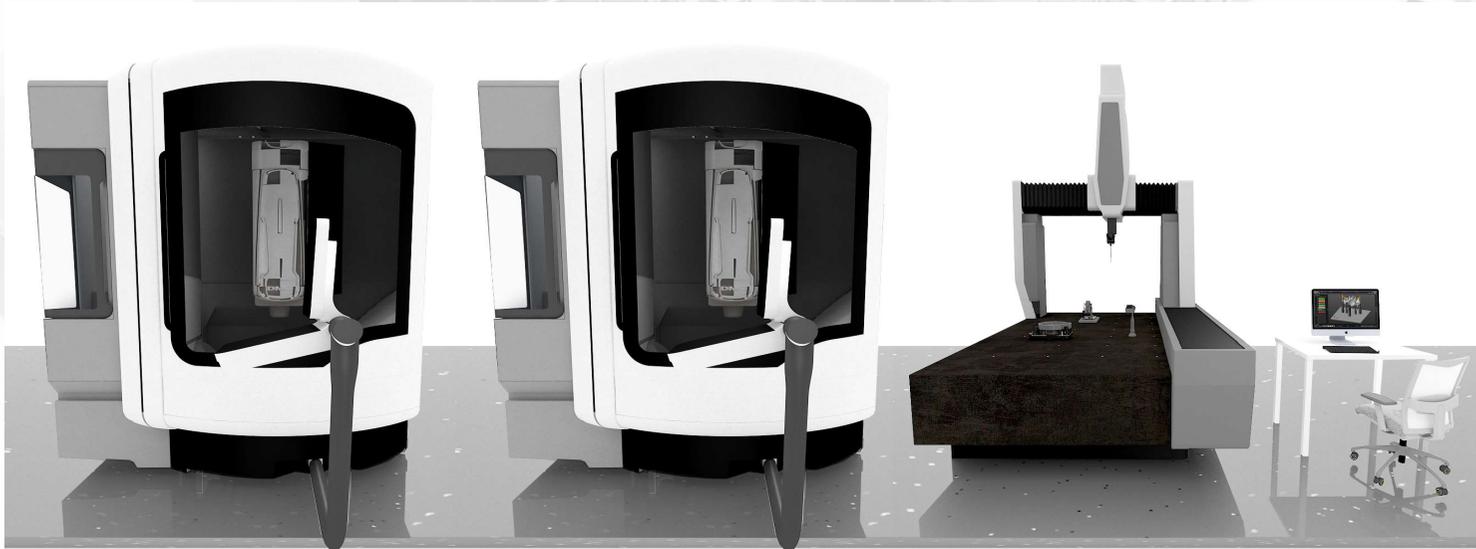
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Process control

- Limited number of dimensions have impact on a CNC process
- Tool offsets
- Work offsets
- Tool performance (size, position)
- Immediate action on data
- Point of manufacture metrology

Manufacturing process data



Part information

Conformance

Process outcomes



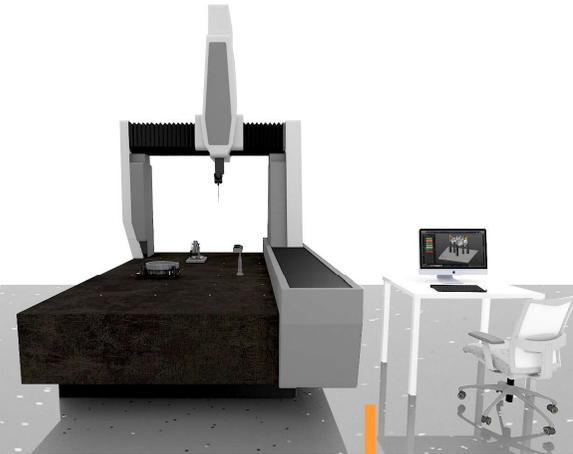
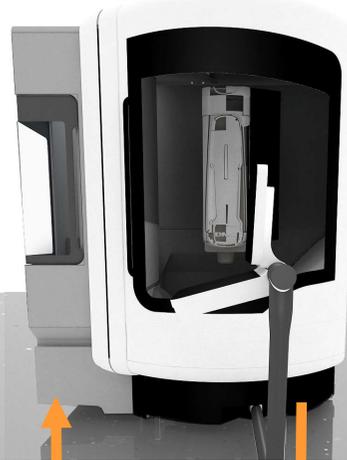
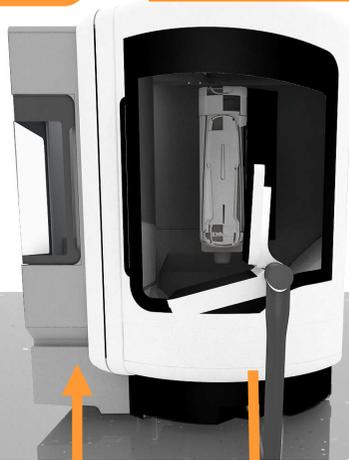
Manufacturing process data



Current status

Machine performance

Job performance



Device / machine information

Post process information

In-process information

Pre-process information

In-process information

Part information

In-process information

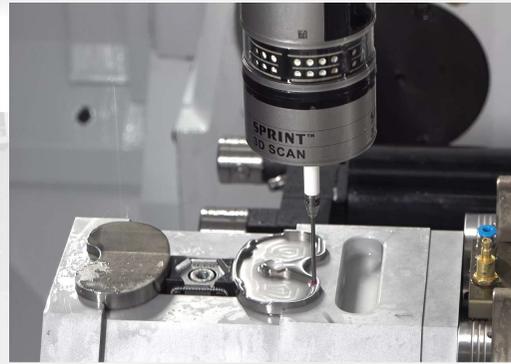
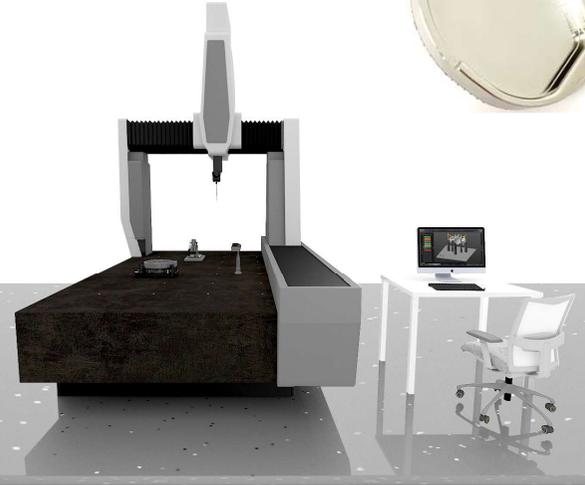
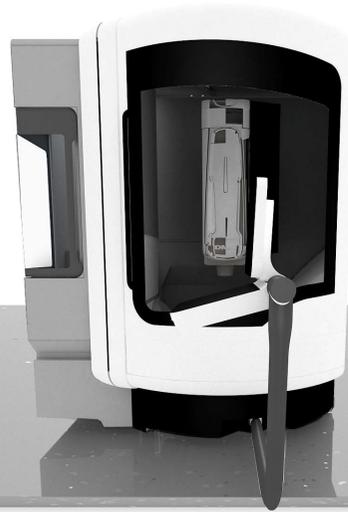
Pre-process information

Post process information

Device / machine information

Device / machine information

End to end process and quality data...



Process and design optimisation...

