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Transform your manufacturing performance with help from the process control experts

Increase automation and gain more throughput from your existing assets

Reduce rework, concessions and scrap

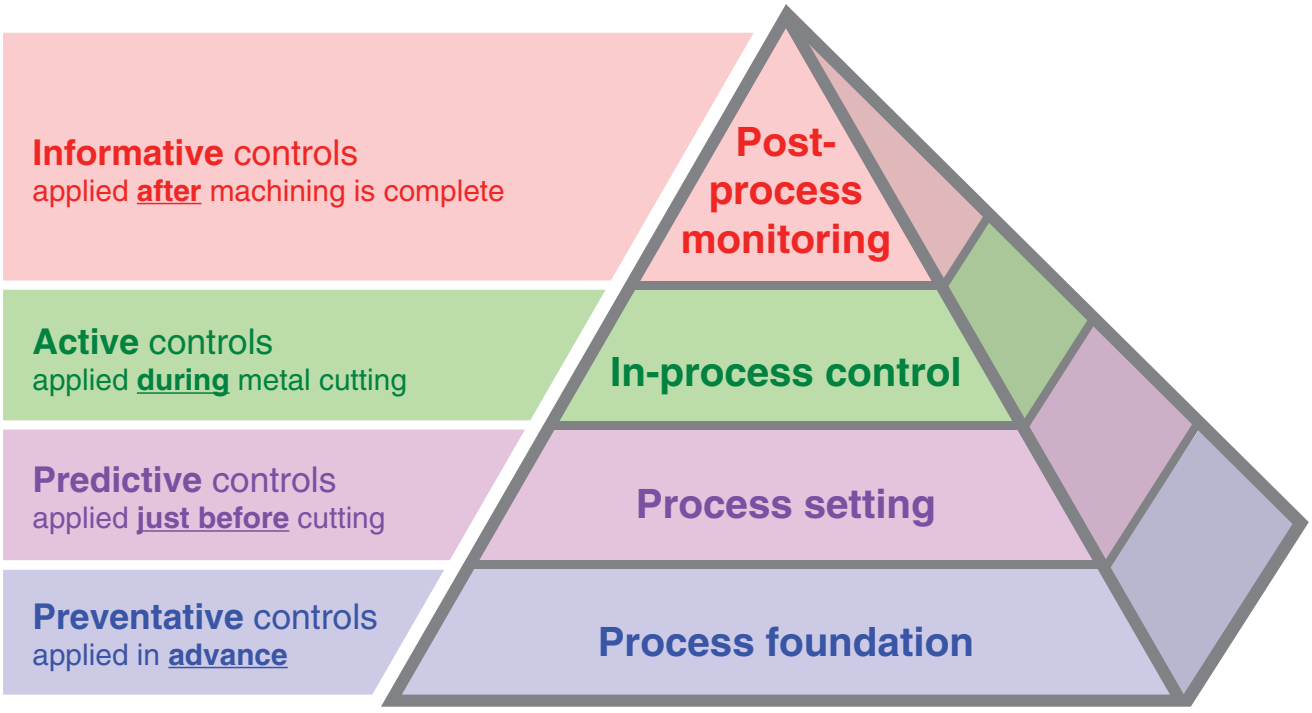
Increase your capabilities and traceability

Process variation is the enemy of competitiveness and profitability. It causes waste and inefficiency, leads to high quality costs and manning levels, and results in late deliveries and poor traceability.

The secret to consistent, automated and productive machining is to understand where variation comes from and to deal with it at source.

Renishaw's *Productive Process Pyramid*™ provides a framework within which to identify and control variation in your factory, backed by innovative technology, proven methods and expert support. Renishaw can help bring your goal of 'green button' or 'lights out' machining into reach.

The Productive Process Pyramid™



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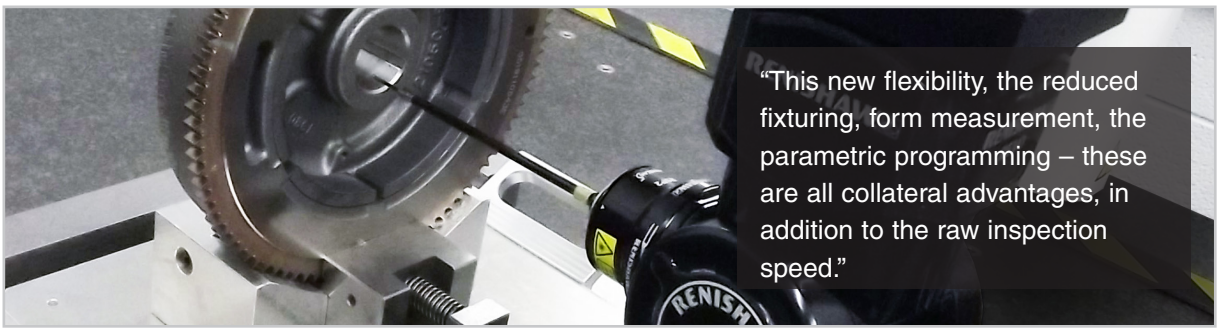
Increase throughput from your existing assets

If your machines are overloaded then you may be facing a sizeable capital investment to make up the shortfall. Either that, or a large sub-contract bill. Or worse still, you might find yourself turning away profitable work.

But what if you could extract more throughput from the machinery you already have?

- ✓ defer capital expenditure
- ✓ reduce your sub-contract and overtime bills
- ✓ pursue additional business



Case study IN216: Kawasaki, USA

You can inspect parts 3 times faster on your CMMs using the latest 5-axis techniques.

Versatile gauging systems provide rapid verification of medium and high volume parts.

✓

Adaptive process control enables parts to be made 'right first time', so capacity needn't be set aside for re-work and re-makes.

Automated in-process measurement means your machines will no longer be waiting for operators to re-start them.

✓

Automated setting using probing can be up to 10 times quicker than manual methods, freeing up more time for cutting metal.

Probing is also predictable - you'll know how long setting will take and can plan accordingly.

✓

A machine that is 'fit for purpose' will deliver consistently good parts and will suffer fewer unplanned stoppages.

This means more time available for metal cutting and also allows your maintenance staff to stop fire-fighting and become more proactive.

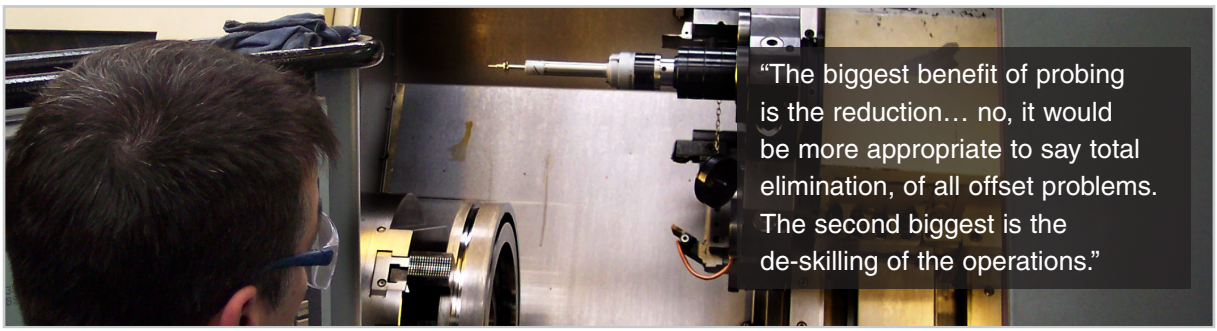
✓

Increase automation and reduce human intervention

Are you reliant on skilled operators to keep your machines running, leading to high labour costs and a substantial overtime bill? Or perhaps your engineers are tied up with shop support rather than working on new processes?

What impact would lower direct labour and shop support costs have on your competitiveness?

- ✓ automate manual setting and measurement processes
- ✓ reduce direct labour costs
- ✓ redeploy staff into proactive engineering roles



Case study IN207: Castle Precision Ltd

Modern inspection technologies enable fully automated inspection of even the most complex parts, often in a single set-up.

This reduces the need for skilled inspectors to oversee quality assurance checks. ✓

In-cycle gauging gives your machine tools the intelligence they need to make decisions for themselves, enabling extended periods of 'lights out' machining, boosting your productivity. ✓

Setting processes that use on-machine probing can be fully program controlled, so that skilled operators are no longer needed to take measurements, make calculations and input offset changes. ✓

Regular checks of the condition of your machines with powerful diagnosis of the source of any errors, means that you can minimise reactive maintenance effort and focus on valuable preventative work. ✓

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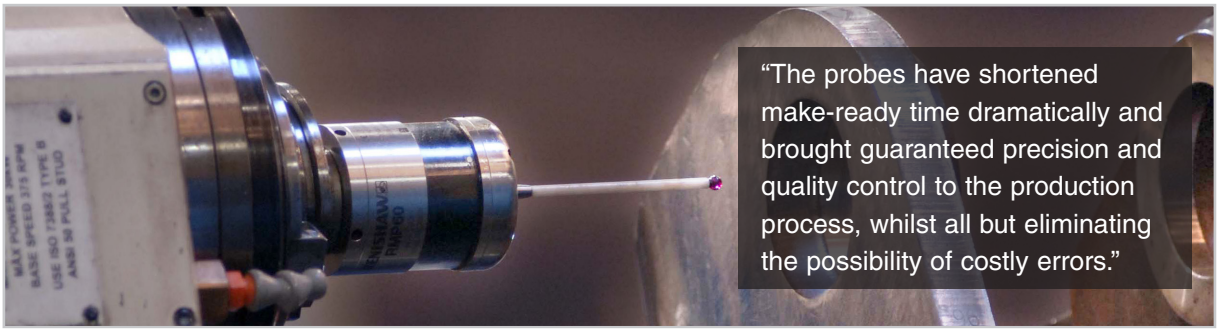
Reduce rework, concessions and scrap

Scrapping parts is always painful - it's a waste of time, effort and materials. Similarly, rework and concessions lead to late deliveries, fire-fighting and overtime.

If you could largely eliminate such quality costs, how would this help your responsiveness and profitability?

- ✓ improved conformance and consistency
- ✓ lower unit costs
- ✓ shorter lead times



Case study IN209: JCB, UK

On-machine verification can detect component non-conformance before the set-up is broken down, so any remedial work can be performed there and then.

Versatile gauges situated next to the machine provide rapid feedback, reducing process variation.

✓

Probing the size of the component at key stages of the machining process allows process parameters to be adjusted.

This centres the process and reduces part-to-part variation, thus increasing process capability and reducing non-conformance.

✓

Removing the influence of the operator on the setting process eliminates a major source of non-conformance and means you can be confident that parts will be 'right first time'.

✓

The condition of your machines may account for up to 25% of your non-conformance. If you optimise and maintain the precision of your machines, then you can be sure that they are not hurting your quality.

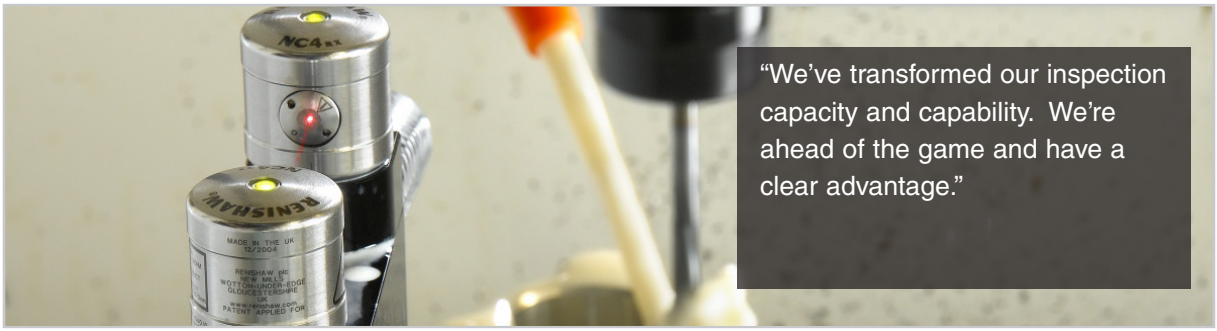
✓

Enhance your capability and take on more work

Customers are demanding ever more complex work, whilst regulations are driving greater traceability throughout the manufacturing process. Are your capabilities keeping pace with the needs of your market?

Do you need a cost-effective way to boost the capability of your machining and inspection processes?

- ✓ offer your customers state-of-the-art capabilities
- ✓ take on more complex work
- ✓ meet customer demands for traceability



Case study IN108: ANT Industries

Renishaw's 5-axis technologies transform the capability of CMMs, supporting fast, flexible measurement with the option of multi-sensor functionality (such as surface finish measurement).

High volume parts can be inspected on the shop floor with full traceability using Renishaw's innovative versatile gauging systems.

✓

With less part-to-part variation as a result of more effective process control, you will have the capability to take on more demanding work.

Automated process feedback can also provide traceability, giving you the option to log process updates so that you have a full record of how each component was manufactured.

✓

Automated setting using probes will allow you to set up complex components, with no need for costly precision fixtures.

This means you can respond quickly to new customer requirements by rapidly introducing new processes.

✓

Machine performance optimisation is a major contributor to improved process capability, and provides certified historical data so that you can demonstrate your capability to your customers.

✓

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Reduce your total cost of ownership

Buying and maintaining your manufacturing equipment presents an up-front and ongoing cost to your business. Are you tied to inflexible, out-dated metrology equipment with high running costs?

What impact would reduced total cost of ownership have on your bottom line?

- ✓ buy fewer, more productive machines
- ✓ eliminate expensive, inflexible custom gauges
- ✓ reduce calibration and maintenance costs

Case study IN506: Spirax Sarco Ltd

Highly productive and multi-functional, a CMM equipped with Renishaw's 5-axis technology reduces the need for further measurement equipment, minimising capital expenditure, manpower and floor space.

Versatile gauges can replace costly custom gauges, reducing ownership costs associated with the design, procurement, adaptation and maintenance of conventional gauging equipment. ✓

Effective in-process control builds confidence in the consistency and reliability of the machining process. As a result, you can minimise the level of off-machine verification that is required, simplifying process flow and eliminating unnecessary capital equipment. ✓

Probing for part setting can eliminate precision fixturing, which can be costly both to acquire and to maintain.

On-machine tool setting eliminates the need for offline pre-setters, reducing capital costs and floor space requirements. ✓

A well-maintained machine will have a longer productive operating life, reducing costly reactive repairs and re-builds, and pushing back the time when the asset will need to be replaced. ✓

Innovative process control solutions

Post-process monitoring

REVO® 5-axis high-speed scanning and multi-sensor inspection system.

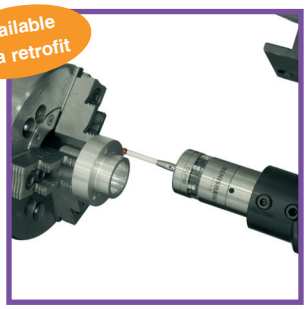
PH20 5-axis touch-trigger inspection system, suitable for all sizes of CMM.

In-process control

Workpiece inspection probes for in-process measurement of roughed and finished features.

TRS2 tool recognition system for rapid in-cycle checks for broken tools.

Process setting



Workpiece inspection probes for automated measurement of component position and alignment.

Contact tool setters enable dynamic setting of cutting tools on the machine tool.

Process foundation

XL-80 calibration laser error maps machine tools and CMMs to improve their precision.

XR20-W rotary axis calibrator enables verification of rotary axes when used with the XL-80 calibration laser.

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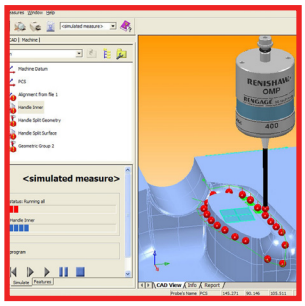
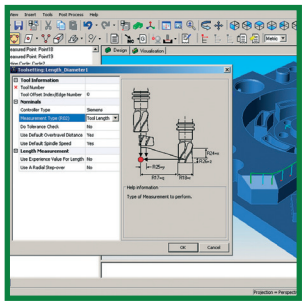
Post-process monitoring

Equator™ versatile gauge enables fast inspection of high volume parts.

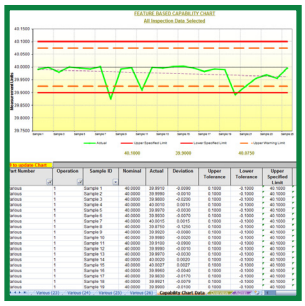


OMV software enables verification of parts before they are unloaded from the machine tool.

In-process control



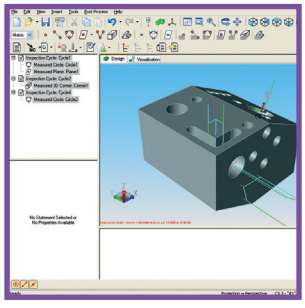
Productivity+™ with multi-axis machine support enables creative process control on 5-axis machines.



CNC Reporter provides easy access to machining performance data to maintain control and traceability.

Process setting

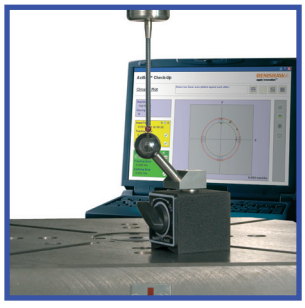
Non-contact tool setters enable rapid setting and profile checking for tools of any size on the machine tool.



Productivity+™ enables tool and part setting to be integrated seamlessly with metal cutting.

Process foundation

QC20-W wireless ballbar allows rapid condition monitoring of a machine tool's linear axes.



AxiSet™ Check-Up provides a fast, automated health check for rotary axes on 5-axis machine tools.

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About Renishaw

Renishaw is an established world leader in engineering technologies, with a strong history of innovation in product development and manufacturing. Since its formation in 1973, the company has supplied leading-edge products that increase process productivity, improve product quality and deliver cost-effective automation solutions.

A worldwide network of subsidiary companies and distributors provides exceptional service and support for its customers.

Products include:

- Additive manufacturing, vacuum casting, and injection moulding technologies for design, prototyping, and production applications
- Advanced material technologies with a variety of applications in multiple fields
- Dental CAD/CAM scanning and milling systems and supply of dental structures
- Encoder systems for high accuracy linear, angle and rotary position feedback
- Fixturing for CMMs and gauging systems (co-ordinate measuring machines)
- Gauging systems for comparative measurement of machined parts
- High speed laser measurement and surveying systems for use in extreme environments
- Laser and ballbar systems for performance measurement and calibration of machines
- Medical devices for neurosurgical applications
- Probe systems and software for job set-up, tool setting and inspection on CNC machine tools
- Raman spectroscopy systems for non-destructive material analysis
- Sensor systems and software for measurement on CMMs
- Styli for CMM and machine tool probe applications

For worldwide contact details, please visit our main website at www.renishaw.com/contact

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