

Complex tool setting at the speed motor sport demands

Renishaw's automatic tool setting and tool breakage detection systems recently installed at Hewland Engineering Ltd, are proving to be highly successful in raising productivity of transmission part manufacture for motor sport vehicles worldwide. Hewland has also used the Renishaw QC10 ballbar to provide the quality assurance requested by customers, by guaranteeing the performance of its machines.

Competitiveness essential

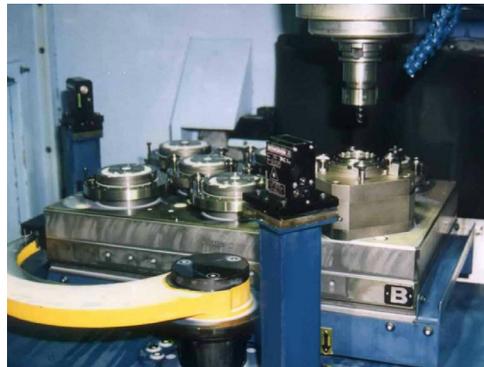
Hewland Engineering Ltd is a world-class supplier to the motor sports industry, with such success and reputation that founder Mike Hewland has been hailed as 'the father of modern motor racing transmission'. Hewland has a list of competition successes in every form of motor sport, its extensive customer list including such marques as Alfa Romeo, Ferrari, Honda, Lola, Mercedes Prodrive and Subaru.

However, it is not enough that Hewland Engineering maintains its reputation for design superiority, supreme product quality and reliability. It must also stay competitive in a world market. Hewland operates an impressively modern and spotlessly clean transmission manufacturing plant at White Waltham, Maidenhead.

Elimination of arduous, time-consuming manual work

Manual tool setting and inspection for breakages is a skilled and labour intensive business at the best of times, so any opportunity to eliminate it, if taken, will quickly pay dividends. Dave Radley, Hewland's operations director, heard the fully automated NC1 could make significant time savings, identify tool breakage without any chance of further component damage and guarantee a consistent process.

Mr Radley first saw the NC1 laser system when it was launched at the previous MACH exhibition, and was sufficiently impressed to have it installed on a busy twin-pallet Matsuura VMC. The most valuable aspect of the non-contact NC1 system is its ability to check the diameter and length of each of these delicate tools totally free from any operator involvement. With cycle times per load as short as 35 - 45 minutes, and with the company running a two-shift system, the time saved with the automated system is considerable.



Fast tool setting is made possible through the use of this Renishaw NC1 laser system. With the transmitter and receiver mounted outside the working volume, easy tool checks during machining are achieved on this twin pallet VMC



The business end of a typical half-shaft entails a lot of detailed machining, which is made much easier by the use of a Renishaw NC1 laser tool setting system

Tool breakage detection

“Added to this”, says Mr Radley: “The automatic checks for tool breakage at rapid feed rates and the ability to check each facet of a multi-faceted tool, has helped bring significant reductions in the need for rework, and has also helped to further raise the already high levels of quality assurance”.

In this application, the transmitter and receiver unit have been located diagonally across the table so they don't obstruct easy changeover of the pallets. Typical components include clutch rings machined from steel forgings - eight-up at each setting, with thousands produced each year. Only four tools are needed at each setting: 1) a two-balloon-type roughing cutter; 2) an 8 mm diameter end mill; 3) a form cutter; and 4) an engraving tool. The components produced on this machine are built into the company's 'Classic' range of gearboxes which have been in continuous production since the 1960s, through to modern 'off the shelf' and bespoke gearboxes for single seater cars, World Rally cars and Le Mans cars.

Further productivity and quality improvements on a wide range of applications

Such was the success of the first installation that a second system was quickly put into operation on a Daewoo Mynx vertical machining centre employing a number of different small and delicate tools. This machine is used for producing a variety of high precision details on different components including some intricate cam tracks on selector barrels.

Other work involves using some very distinctive cutting tools, such as a form tool with a radius face, for features on the ends of transmission half shafts. The entire profile of the cutter must be checked to ensure the component accuracy, rather than just length and diameter, which is only possible with the Renishaw NC1. The machine uses special Renishaw software routines to achieve this, a process that would be extremely difficult if it had to be carried out manually.

With components being wet-machined, the unique MicroHole™ protection system comes in for particular praise, providing a stream of air through the beam apertures to protect them from coolant and swarf, without affecting accuracy. To prevent coolant drips from triggering the beam, Renishaw has developed its own 'drip rejection' software and Mr Radley was happy to confirm it is very effective.



Clutch rings (left) for Hewland's gear box assemblies and spares are machined on a Renishaw-equipped twin pallet Matsuura VMC

Quality assurance through guaranteeing machine performance

Hewland was using another CNC machine, 20 years old, that suffered from a significant amount of backlash in one axis. They had been quoted £5000 to replace machine components likely to cause the backlash, but took this opportunity to run a trial test with the Renishaw QC10 ballbar.

The QC10 ballbar continuously, and very accurately, measures the radius of a circle described by the machine in 2 of its axes. Once this test has been performed, which takes a matter of minutes, the software that controls the test also analyses and diagnoses the results. Analysis is given of 21 different machine variables, with suggestions of corrective action. The whole procedure, including initial set-up, takes about 10 minutes of machine time.

When a test was run on Hewland's machine, the ballbar software identified the exact amount of backlash, along with the axis and direction of travel. The appropriate entry on the machine's axis compensation register was amended by this value, which immediately corrected the errors caused by backlash.

With the success on the first machine Ken Wallace, Quality Manager, decided to buy a ballbar system, which is used right across Hewland's machine shop to qualify the wide variety of machines. Ken adds “A major customer required us to provide traceable proof of our quality assurance, Renishaw's QC10 ballbar gave the guarantees they sought on the machine's performance.”

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Renishaw plc

New Mills, Wotton-under-Edge,
Gloucestershire GL12 8JR
United Kingdom

T +44 (0) 1453 524524

F +44 (0) 1453 524901

E uk@renishaw.com

www.renishaw.com

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Renishaw worldwide

Australia

T +61 3 9521 0922

E australia@renishaw.com

Austria

T +43 2236 379790

E austria@renishaw.com

Brazil

T +55 11 4195 2866

E brazil@renishaw.com

Canada

T +1 905 828 0104

E canada@renishaw.com

The People's Republic of China

T +86 21 6180 6416

E china@renishaw.com

Czech Republic

T +420 548 216 553

E czech@renishaw.com

France

T +33 1 64 61 84 84

E france@renishaw.com

Germany

T +49 7127 9810

E germany@renishaw.com

Hong Kong

T +852 2753 0638

E hongkong@renishaw.com

Hungary

T +36 23 502 183

E hungary@renishaw.com

India

T +91 80 6623 6000

E india@renishaw.com

Indonesia

T +62 21 2550 2467

E indonesia@renishaw.com

Israel

T +972 4 953 6595

E israel@renishaw.com

Italy

T +39 011 966 10 52

E italy@renishaw.com

Japan

T +81 3 5366 5316

E japan@renishaw.com

Malaysia

T +60 3 5631 4420

E malaysia@renishaw.com

The Netherlands

T +31 76 543 11 00

E benelux@renishaw.com

Poland

T +48 22 577 11 80

E poland@renishaw.com

Russia

T +7 495 231 16 77

E russia@renishaw.com

Singapore

T +65 6897 5466

E singapore@renishaw.com

Slovenia

T +386 1 527 2100

E mail@rls.si

South Korea

T +82 2 2108 2830

E southkorea@renishaw.com

Spain

T +34 93 663 34 20

E spain@renishaw.com

Sweden

T +46 8 584 90 880

E sweden@renishaw.com

Switzerland

T +41 55 415 50 60

E switzerland@renishaw.com

Taiwan

T +886 4 2473 3177

E taiwan@renishaw.com

Thailand

T +66 2 746 9811

E thailand@renishaw.com

Turkey

T +90 216 380 92 40

E turkiye@renishaw.com

UK (Head Office)

T +44 1453 524524

E uk@renishaw.com

USA

T +1 847 286 9953

E usa@renishaw.com

For all other countries

T +44 1453 524524

E international@renishaw.com

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