MEASUREUP

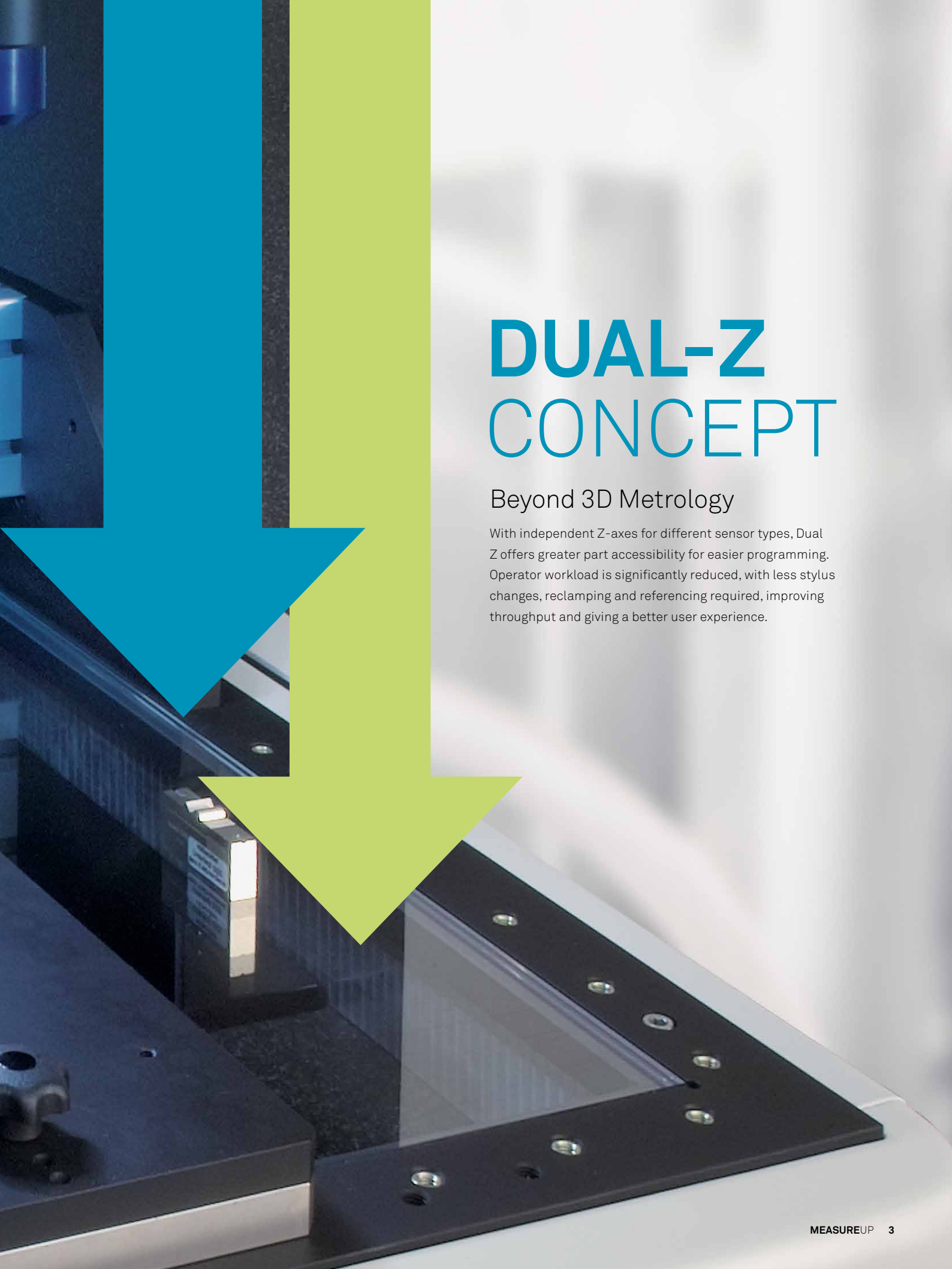
Hexagon Metrology Magazine | Edition 1/2015

#QUALITY AUTOMATION

Inspiring Metrology

HEXAGON METROLOGY

CLOSE UP



DUAL-Z CONCEPT

Beyond 3D Metrology

With independent Z-axes for different sensor types, Dual Z offers greater part accessibility for easier programming. Operator workload is significantly reduced, with less stylus changes, reclamping and referencing required, improving throughput and giving a better user experience.

EDITORIAL

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@NorbertHanke

Sometimes, when I hear about the latest amazing technology or download a really useful smartphone app, I wonder what someone from a hundred years ago might think of it. If the innovations around us seem like huge steps forward now, then imagine what our ancestors would make of them. But how do we make sure that technology is always taking us in the right direction?

Inside this issue of **MEASURE**UP, we take a look at one of the key themes in metrology today – **automation**. Asked about technology as a business improver, Bill Gates famously observed that automation applied to an efficient operation will magnify the efficiency, but automation applied to an inefficient operation will also magnify that inefficiency.

At Hexagon Metrology, we talk a lot about **quality automation**. That is not just automation for quality control, but automation that is itself quality. It means developing systems that don't simply automate tasks that can be done already, but instead push the limits, giving our customers unprecedented speed, accuracy and performance.

We believe that good automated solutions are those developed in synergy with the technology and processes they are there to support. Our cover story explains how this philosophy led to the successful launch of our 360° SIMS system and why working this way keeps us focused on progress towards longer-term goals.

Elsewhere this issue, we speak to Hexagon Metrology's Asia Pacific management team about trends in their local market and look ahead to this year's inaugural HxGN LIVE Hong Kong edition. We also introduce you to some of the young employees hoping to shape the future of Hexagon Metrology and answer your questions about calibration and maintenance for metrology equipment.

Happy reading

Norbert Hanke
President and CEO, Hexagon Metrology

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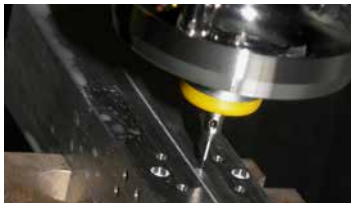

ALSO IN THIS ISSUE

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HIGHLIGHTS

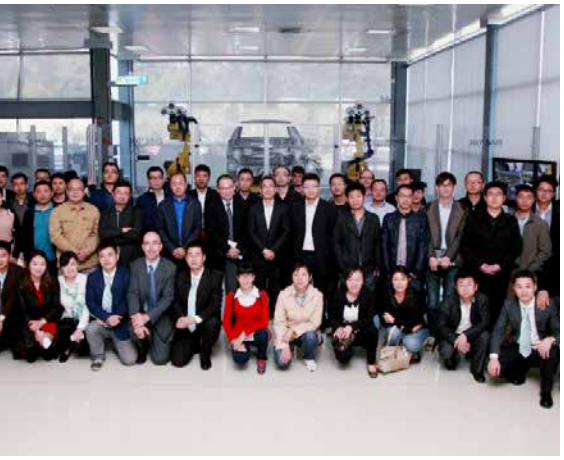
Reviewing all the news, events and stories from the last few months at Hexagon Metrology.

Innovative automotive solutions on show in Qingdao

Over 60 representatives from major automotive manufacturers attended Hexagon Metrology's Smart Inline Measurement Solutions forum event, which brought the latest quality control technology for automobile car body and sheet metal inspections to China.

Amongst the attractions was the first exhibition of the 360° Smart Inline Measurement Solutions automated white light inspection system at the Qingdao demonstration centre. The system impressed observers with its efficient data processing and root cause analysis functions.

In addition to 360° SIMS, the event featured keynotes and presentations of other leading Hexagon Metrology hardware solutions, while delegates were also invited to test the smart Metrology Management System (MMS) in the software zone. "This event's success again demonstrates Hexagon Metrology's commitment to supplying customers with the most advanced technology to speed up industry development and help our customers to share the benefits of this technology," said Zhou Liang, Executive President of Hexagon Metrology China.



Ultra-portable laser trackers reach new areas

Hexagon Metrology has unveiled its next generation laser tracker range including the Leica Absolute Tracker AT960, a walk-around coordinate measuring machine that fits in a single flight case. The AT960 answers customer demand for a genuinely portable laser tracker with high-speed dynamics and six degrees of freedom (6DoF) capabilities.

With a complete range of Leica laser tracker accessories built into the device, the AT960 measures to a Leica T-Probe, Leica T-Scan or reflector straight out of the box. Hot-swap battery function and IP54 certification for use in even the toughest workshop conditions mean the AT960 really can be taken anywhere. Also new to the range is the Leica Absolute Tracker AT930, a 3D version of the AT960, which offers unprecedented dynamic capabilities and real-time operation to make measurements quick, accurate and easy for the user.

"The new AT960 and AT930 laser trackers feature the latest electronics and optical technologies. Leveraging the recent developments of PowerLock, absolute interferometry and optical miniaturisation we are able to release next generation portable products based on proven features," explained Duncan Redgewell, General Manager, Leica metrology products.

Industry leaders attend Brazil HQ inauguration

Business dignitaries joined Hexagon Metrology customers, partners and staff to celebrate the opening of its new South American headquarters in São Paulo, Brazil. Guests were welcomed by Danilo Lapastini, Vice President of Hexagon Metrology South America, who spoke about the need to continue offering better services for customers:

"Today, we are a market leader, and our challenge is to grow and provide solutions to all our customers while maintaining the values at the heart of our business."

ABIMAQ (Brazilian Association of Machines & Equipment Manufacturers) President, Carlos Pastoriza, discussed the progress of metrology over the years

HxGN NEWS
HEXAGON GLOBAL NETWORK

and praised Hexagon Metrology's attitude in expanding services nationwide. Gleiton Damoulis of Volkswagen Anchieta highlighted developments in the optical

measurement field, before Luiz Moan from ANFAVEA (National Association of Motor Vehicle Manufacturers) closed the ceremony, observing: "Brazil's solution is called investment and this is what Hexagon Metrology is doing."

After Mr. Lapastini cut the inaugural ribbon, guests were able to tour the site and visit the showroom to see the latest Hexagon Metrology equipment. The new 3,600 square metre location has a customer training room and meeting facilities as well as improved logistics and production space.

Top industry award for 360˚ SIMS

Leading automotive industry publication AutoRevista has recognised Hexagon Metrology's 360˚ SIMS system as transformational technology, honouring the inline solution with its Technological Innovation Award.

This prestigious prize has been rewarding excellence in innovation since 2006. Presented during the 24th edition of the Automotive Industry Manager of the Year Award ceremony at the Intercontinental Hotel of Madrid, the award was accepted by Per Holmberg, President of Hexagon Metrology EMEA. Also in attendance were managers from the 360º SIMS development team, and members of the local technical team from Spain, led by Jordi Edo, Director of the Hexagon Metrology affiliate for Spain and Portugal.

The jury awarded the prize to Hexagon Metrology, acknowledging the "extraordinary advances in dimensional metrology technology that has provided this solution for white light measurement – 360° Smart Inline Measurement Solutions (360° SIMS). This proposal is radically transforming quality and production management parameters in the car industry."

30 years of success for QUINDOS

Hexagon Metrology's QUINDOS dimensional metrology software is celebrating three decades of shipments. Following two years of development, the first version of QUINDOS was officially unveiled at the Microtecnic Show in Zurich, Switzerland in September 1984.

When the first customers took delivery of their software in the second quarter of 1985, standard monitors displayed 80 characters on 24 lines and hard drive capacities were typically less than 100 MB. Despite these humble platforms, QUINDOS developed rapidly to become the powerful measurement and evaluation software it is today.

Originally launched for use with Leitz CMMs and measuring microscopes, ▶

as well as WILD theodolites and photogrammetric systems, QUINDOS has adapted and evolved throughout its history. During the 1990s it was ported to run first on UNIX systems and then on Windows. The hardware support was gradually extended to include Brown & Sharpe and DEA machines, and today the latest QUINDOS 7 edition supports all Hexagon Metrology measuring devices and sensor types as well as all major CAD formats.

Finnish office welcomes Scandinavian customers

Hexagon Metrology Finland opened its doors to the public with an Open House event at the new Helsinki facilities.

The two-day event was the first opportunity for Hexagon Metrology customers in Finland to visit this new location and featured an introduction to the company along with the official opening of the demonstration room.

As well as the technical facilities, the centre has its own conference suite which will host events such as metrology workshops, solution presentations and networking opportunities in the coming months and years.

"In opening this excellent facility in Helsinki, Hexagon Metrology is making a long-term commitment to its customers in Finland, and it was fantastic to welcome so many of them to the Open House." said Peter Lindström, General Manager of Hexagon Metrology Finland. "The demonstration area will enable us to show our customers the latest metrology technology and solutions for their industry, and we will also be able to offer local training and support services."

Win a ticket to HxGN LIVE 2015

There's still time to enter the **MEASURE**UP competition for your chance to win a trip to Las Vegas or Hong Kong with Hexagon Metrology.

This year Hexagon stages two HxGN LIVE events for the first time, promising an exciting lineup of interactive sessions, hands-on training, inspiring keynotes and networking opportunities. **MEASURE**UP is offering one lucky reader the opportunity to see the latest developments in metrology and quality control technology in action with free registration for the Metrology Track at the HxGN LIVE event of their choice.

Over the last three years, what Hexagon Metrology product or service has been the biggest revelation for your business and why?

The deadline for entries has been extended to 11 May 2015. The winner will be selected by the competition panel and will receive one conference registration worth $1,349 with flights and accommodation included. Terms and Conditions apply; further details are available on the contest website. ■

TESTIMONIALS

“Hexagon Metrology has helped us to improve the reliability of our processes with significant gains in reducing the time to set up the machine, and reducing rework and scrap line.”

Marcelo Noé, Quality Manager
MDA do Brasil, Brazil

“Programming with PC-DMIS software is very efficient. With Hexagon Metrology, we‘re sitting pretty. The software hotline is outstanding!”

Willi Littau, Measurement Technician
pretema GmbH, Germany

IN **YOUR** WORDS

Taking a look at the world of Hexagon Metrology through the eyes of our customers.

“We did not realise how behind schedule we were until we purchased the 4.5.4 SF CMM. I’ll never forget saying to myself on the first day we had the machine, ‘If we had this machine a year and a half ago, we would already have thousands of units in the field’.”

John Pawloski, Vice President
Jewelers Machinists Co. Inc., USA

“We improved our internal processes and the quality of the company’s services after we bought a Hexagon Metrology measuring arm.”

Daniel Faria, Chief Operating Officer
ENGTELCO, Brazil

“The measuring machine and the control and inspection software are very easy to use, but our applications are often rather complex and above all very varied. The advice provided by the Hexagon Metrology application engineers has been essential for us.”

Federico Bortolami,
Owner and Technical Director
BP Riduttori, Italy

ACCESS ALL AREAS

The last few years have seen a definite shift in approach to quality control in industrial manufacturing. Process innovations and developments in metrology equipment have moved inspections out of the quality room and progressively closer to the line. The result is a reduction in the time taken to collect data, obtain information and act to correct issues. However, in industries where inline automation is integral to production, even near-the-line controls are no longer close enough.

The automotive industry is the original driver of automated production technology. Since the progressive assembly line was first introduced in car plants, automation has been a standard, albeit developing, area for the industry. Metrology has also become an important part of automotive manufacturing, but where previously the development focus was on process control, production monitoring and robotic guidance, the concept of inline 3D metrology is now making a real impact.

When Hexagon Metrology unveiled 360° Smart Inline Measurement Solutions (360° SIMS), it confirmed the arrival of inline metrology by offering a fully automated body in white inspection system to effectively turn part of the production line into a quality room. With OEMs seeking the highest possible throughput without compromising on quality, the prospect of automating more comprehensive and accurate measurements reliably in shop-floor conditions is certainly an attractive proposition.

360° SIMS is an integrated solution which can be installed directly into a production line, removing the logistical cost and time spent relocating parts to the quality room. Combining non-contact 3D measurement with automation technology, it uses robotic white light inspection to measure challenging automotive geometries to typical tolerances of +/- 0.5 mm. To design additional cell configurations

In the automotive world, automation is a key driver of progress. As Hexagon Metrology extends its 360° SIMS system from body in white to closure applications, **MEASURE**UP explores how automated inline inspection is reaching new areas of the factory.

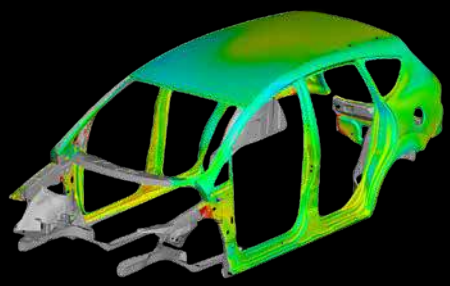
and capabilities, Hexagon Metrology has partnered with inos, part of the Grenzebach Group.

Both Hexagon Metrology and inos have established track records in the automotive industry, but 360° SIMS marked a different concept for both – bringing technologies together to form a complete solution around existing production equipment. The system uses automated delivery mechanisms to bring parts to the cell, where robot-mounted white light sensors use rapid-exposure vision technology to gather highly-accurate dimensional data which can be analysed in real time, ensuring that the inspection process is quick enough to take place in the line without creating a bottleneck.

"Our initial vision was to reach into the production environment and combine our measurement process with the inline process control methodologies," explained Tal Vagman, Director of Automated Solutions Strategy at Hexagon Metrology. "The 360° SIMS inline concept was designed in consultation with customers, and we originally developed the body in white system as this was where automotive OEMs felt most benefits could be found. However, the integration experience we've gained since launch has enabled us to extend the solution into the sub-assembly lines as well."

Perhaps the most remarkable thing about the 360° SIMS concept was the number of new innovations which came out of the development phase – amongst them a patent-pending RPS measuring device which allows the accurate and repeatable alignment of complex parts for measurement. The new closure inspection configurations continue this innovative trend, enabling parts such as doors, bonnets and boot lids to be measured automatically too.

Cells can be configured in a number of ways. For example, a full stack of parts could be brought to the cell by an autonomous device and the factory programmable logic controller (PLC) would recognise the part type to trigger the correct inspection programme. Fixed sensors can also be used to check serial numbers for a 'smart object' approach. The first robot would unstack ▶



the parts, either loading them on to a fixturing system or gripping them for measurement directly. The white light sensor would be mounted on a second robot and inspect to the program identified by the PLC. Once inspection is complete, the part could be returned to the stack or sorted according to measurement results.

The 360° SIMS closure inspection cell outputs the same real-time dimensional data as the body in white system, giving clear advantages for comparing data centrally, and the two together have the potential to revolutionise flush and gap control. With such emphasis placed on closure quality in the automotive world, the system is an exciting prospect for the body shop, and its customisable nature suggests it's only a matter of time before this inline concept reaches other areas of the factory, from powertrain to final assembly. ■

Image
Powerful reporting tools give a full overview of the production quality results to users around the factory.

WEBINAR REVIEW

Hexagon Metrology: Fast, rich and actionable 3D process control

A diverse audience of automotive industry professionals and leaders joined an interactive online webinar to explore the future of inline measurement. Hexagon Metrology automated solutions experts Tal Vagman and Giacomo Barilà hosted the session, which also showcased some of the key technologies and solution benefits of the 360° SIMS concept.

Barilà began by introducing Hexagon Metrology's global presence and the wider solution portfolio of the company. He went on to explain how synergies between products have helped develop more effective solutions, highlighting exactly the process which led to the development of 360° SIMS, before handing over to Vagman for an in-depth look at the technologies involved.

Citing recent research confirming the desire of manufacturers to move quality control into the line, Vagman first explained how 360° SIMS has been designed to meet this demand.

Starting with an overview of the white light sensor technology, he offered an illustrated guide to how this optical measurement system works. He also explained why it is ideally suited to use with robots in a shop-floor environment, concluding with an operational video from a major global automotive manufacturer in China.

Vagman also identified a number of customer challenges and pain points before giving participants a live tour of the 360° SIMS software ecosystem. Explaining the modular setup, he demonstrated how the package features help users to alleviate issues in production operations all around the factory, revealing the significant time savings experienced by early adopters. Finally, Vagman answered a number of customer enquiries in a lively question and answer session.

Watch the Webinar Recording
http://hex.ag/G1Flv

TOOL RUNNINGS

Britain's number one skeleton racer of the last 20 years relies on Hexagon Metrology and Vero Software to help him keep the sport's leading athletes at the top of their game. **MEASURE**UP hit the slopes to talk reverse engineering and machine tooling with equipment pioneer, Kristan Bromley.

When not hurling himself down bobsled tracks at 90 miles an hour on a small high-tech sled, Kristan Bromley designs and manufactures sleds for 22 nations preparing for the next Winter Olympics, including Britain, Norway, Russia, Switzerland and Korea.

He has one world championship under his belt, two overall world series titles, numerous British national titles, and is a three-time European champion. In 2008 he became the first man in history to win the World Championship, European Championship and World Cup in the same season. The British media nicknamed him Doctor Ice because he gained a doctoral degree from Nottingham University with a thesis entitled "Factors affecting the performance of skeleton bobsleds". ▶

Read more about how the ROMER Absolute Arm helps drive faster skeleton racing.
http://hex.ag/GSd94

Bringing sliding to the masses

Kristan's company, Bromley Sports, ships between 100 and 200 bespoke sleds to athletes around the world, but is currently moving into the recreational arena, having designed and developed a patented sled for an exciting new snow activity, Baseboarding.

"Over the next two to three years we're changing from purely providing a low volume, highly customisable Olympic-governed sled, to manufacturing up to 10,000 Baseboards for a mass market. Our mission is to become the most advanced sliding sport product manufacturer in the world," explains Kristan. And he says VISI, from Vero Software, is a critical aspect of the company's future. "It's absolutely vital for creating both high-precision performance parts and carbon fibre lay-up tooling."

Baseboarding has recently been introduced at the Whistler Olympic Park in Canada, and Kristan describes it as "bodyboarding on snow" – sliding down a groomed run on a patented board providing optimal ride dynamics, keeping the rider close to the snow with a low centre of gravity. "The Baseboard has a low-friction curved base and parallel runners which create a highly agile board with easy-to-learn steering using feet and subtle upper body movements. It's a safe recreational way for families visiting snow resorts to experience the head-first ride position of skeleton racing – which is an amazing adrenalin rush."

Although the Baseboard is extremely light, it is strong and stylised. "The product is underpinned with thermoplastic composites, creating a super-tough 3D structure that can withstand temperatures of -30°C."

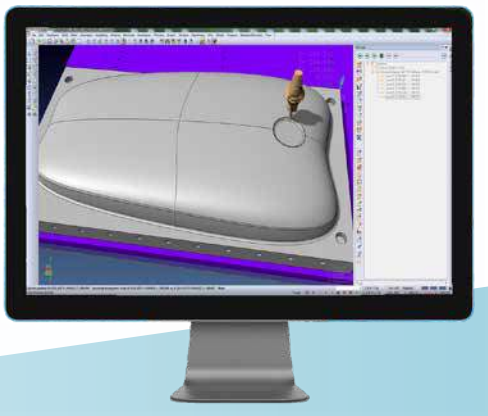
Winning mentality

Bromley Sports made its name in the highly-competitive world of skeleton racing. "We're giving athletes the tools to fight for Olympic medals, and VISI is absolutely pivotal in creating maximum-performing sleds by pushing boundaries to improve performance. Reducing aerodynamic drag by five percent can cut an athlete's time by one, two or even three tenths of a second, and that's enough to take them from tenth place right through to gold."

With more than 60 carbon fibre and stainless steel components in the skeleton sled, and the prospect of mass producing Baseboards, Kristan says it was important to bring the whole operation in-house. Previously, most of the tooling work was sent to subcontractors, but he realised that by bringing tool design and manufacturing in-house they could create new designs, develop products faster and innovate more efficiently.

Tools for the job

To achieve this improvement, they invested in a Doosan DNM 650 VMC retrofitted with a Nikken fourth axis rotary table, driven using VISI's multi-axis machining capability, meaning they



Left Image
Kristan Bromley scans a carbon fibre sled using the ROMER Absolute Arm.

Above Image
VISI from Vero Software plays a part in the manufacturing of every component for Bromley sleds and Baseboards.

See VISI from Vero Software in action at Bromley Sports.
http://hex.ag/GScfr

can develop complex tooling as well as machining prismatic style components. "The VISI team were instrumental in explaining how the software works and getting us up and running with our machining centre. The engineers' machining knowledge was invaluable, and without their support we wouldn't have been able to get our products out there so quickly, helping athletes win medals in the World Cup."

The company, established by Kristan and his brother Richard in 2000, now uses VISI for every component in the skeleton sleds and Baseboards. "And it's not just the components that go into making up the products. We develop everything that supports the manufacturing process in VISI as well – the tooling and jigs."

Uniting athlete and equipment

Rules for the skeleton sled are set by the Fédération Internationale de Bobsleigh et de Tobogganing (FIBT), the sport's international governing body, but allow for the use of a variety of materials to come together to make a high-performing product. "Technology is one of the key parts of an athlete's performance. In the same way that a Formula 1 driver can't win the world championship without the best car, a skeleton racer would really struggle to win Olympic medals and world titles without the best sled technology."

The development process includes ensuring that the sled is tailored to an individual athlete's body. "We design it around the athlete's own ergonomics, reflecting the pressure points of their shoulders and knees." Bromley Sports uses Hexagon Metrology's ROMER Absolute Arm with integrated laser scanner to reverse engineer the athlete's form. "We scan an athlete's body shape and generate accurate mesh data for Computational Fluid Dynamics analysis in less than an hour."

Engineering efficiency

Once the design is completed in Creo, the file drops seamlessly into VISI and can be used to work on machining strategies. "Although VISI is extremely powerful and flexible, it's also simple to use. When we're machining new tooling for the carbon fibre composites, being able to approach that particular tool with different machining strategies, and having the ability to manipulate those cutting paths, is critical. To achieve the precision we need, we've found we can't hit a tool with a 'one toolpath suits all' approach. We need to tailor those toolpaths and the cutting strategy to reduce machining time and produce a part with a high level of surface finish that requires minimal hand polishing."

And he says VISI's simulation capability ensures they have the mould and toolpaths ready for perfect, accurate and collision-free machining before they start to cut.

Defining Bromley Sports' association with VISI, Kristan says the software means they can build sleds with greater precision and to the required tolerances. "Gaining performance is all in the detail, and as an organisation trying to help athletes win Olympic medals we need the world's best, to help the world's best." ■

Above Image
Perfectly formed: The Bromley Baseboard's patented design is strong and stylised but also extremely light.

Right Image
Baseboarding offers a completely new and exhilarating sliding sport experience.

EASTERN PROMISE

To celebrate the upcoming debut of the HxGN LIVE conference in the Asia Pacific (APAC) region, **MEASURE**UP interviews influential figures from Hexagon Metrology about growth in the market, technology trends and what the conference means for APAC customers.

Lim Boon Choon
President
Hexagon Metrology Asia Pacific

MEASUREUP: **True globalisation demands focused localisation. What are the plans for the APAC region going forward?**

One of the global banks advertises itself as the world's local bank. I would like think of us as the world's local metrology company. In the last few years, we have invested heavily in bringing development and manufacturing, as well as technical centres and calibration facilities, to our region. For example, we produce laser scanners in our own factory in Japan, and we are among the pioneers of metrology equipment manufacturers in India. We have already opened new facilities in Japan, Korea, Indonesia, Singapore and Vietnam, and more will follow in the next few years as our footprint continues to grow.

MU: **Other metrology companies are also trying to expand here. What is Hexagon Metrology's advantage over them?**

Hexagon Metrology has the widest portfolio of metrology solutions in the world, which allows us to provide the most suitable solution for each individual customer. As well as best-in-class products, we recognise that customers want complete solutions with good local services. This is why we have added 30% more staff in the last two years, including skilled engineers and technicians to better support our customers.

MU: **What is Hexagon Metrology's greatest challenge in APAC and what strategies do you have in place to overcome it?**

Hexagon Metrology is a leading metrology company with many outstanding products. However, many customers still think of us in terms of the individual companies that we

have acquired. One customer told me he thought we were representing various companies. I said no, we own these companies. We need to help customers understand that the many famous brands which have become a part of Hexagon Metrology give the company its history, but that it is the synergies and developments that come from bringing them together that are the future.

MU: **Business outlooks suggest that opportunities are changing. What will drive growth over the next decade in the APAC metrology market?**
Asia remains one of the fastest growing regions in the world. China has been the world's factory for the last three decades and will continue to grow strongly. But signs are that developing countries like India, Vietnam and Myanmar and more mature markets like Singapore, Malaysia and Thailand are attracting more and more investments to our region. Economic powerhouses like Japan and Korea continue to invest heavily in developing nations, so businesses like ours will hope to capitalise. By bringing new technologies, like our automated solutions, to the region, we can support this growth.

MU: **Automation seems to be the next step for dimensional metrology, and Hexagon Metrology has a number of solutions on offer. How do you think this will impact on APAC?**
The movement towards inline measurements and integration between the quality department and the manufacturing process is going to be hugely important in years to come. Take for example Hexagon Metrology's 360° SIMS – the inline metrology concept that allows customers to check sheet metal parts accurately within a few minutes instead of hours as in the past. This is a game changer, and customers who are early adopters of this technology will gain a significant advantage in throughput and production costs. We already have orders from key automotive manufacturers and we are sitting on the edge of a big change in the philosophy of how cars are inspected.

MU: **Which industries do you expect to be the initial adopters of fully-automated solutions?**
Certainly the automotive sector – I believe the word "automation" was coined by an automotive manufacturer! Automotive is also Hexagon Metrology's largest sector, so for us, automating metrology in the industry that invented automation makes sense. But to be clear, we have automated solutions that are suitable for just about any industry – from large aerospace parts to miniscule chronograph components. Automation covers such an extensive and flexible field of applications that possibilities exist in such diverse industries as electronics, semiconductors and medical. It's a new and exciting direction that can take us to places we have not been before.

MU: **Can you share with us the advantages these industries will gain from these solutions?**
Our customers have a long list of requirements, which we are more and more capable of satisfying as technologies develop. They are looking for 100% part quality inspection with improved throughput, productivity, quality and particularly the predictability of quality in real time. Going inline significantly reduces work handling, operation time and required space. Most of these points we are addressing today at levels beyond what most of our competitors can provide.

MU: **What is the future of industry and how do you think Hexagon Metrology will change the metrology landscape?**
Automation, integration, robotics and cybernetics are the way of the future. Hexagon Metrology has a long experience of automating and integrating hardware. The priority now is the automation of the data our systems produce. Large point clouds will be required for detailed analysis of any application, these need to be filtered and turned into diagnostic tools to enable customers take smart decisions quickly with statistical information to back them up. Exciting developments are in progress, and we hope to show these to our APAC customers at the 2015 HxGN LIVE event in Hong Kong. ▸

HxGN LIVE
HEXAGON'S GLOBAL NETWORK

MEASUREUP asked five Hexagon Metrology business leaders from across the APAC region for one message they would like to communicate to customers thinking of attending the HxGN LIVE conference in Hong Kong in November. Here's what they said.

"HxGN LIVE is a precious opportunity to see the width of business, future direction and depth of technology of Hexagon. This Hong Kong event will be great for customers from Korea who want to better understand Hexagon Metrology's automated solutions with strong software integration."

Han Park, General Manager – Korea

"This event is a great opportunity for our Thai and Indochina customers to experience the solutions of the Hexagon group. The conference is not only Hexagon Metrology, but also Hexagon Geosystems and Hexagon Technology. And it's only 2 hours from Bangkok!"

Taveesak Srisuntisuk, General Manager – Thailand, Vietnam and Philippines

"HxGN LIVE will showcase Hexagon capabilities to you. It is a good platform to witness the latest technology trends and product offerings, and will surely help our visitors in their decision-making processes."

Anup Verma, Managing Director – India

"Bringing the HxGN LIVE conference to APAC demonstrates Hexagon's commitment to supporting the needs and goals of customers in the region. Don't miss this opportunity to be part of the first HxGN LIVE Hong Kong!"

Leong Kim Huat, General Manager – Singapore, Malaysia, Indonesia and Australia

"HxGN LIVE is the conference that gathers industry experts and leaders from all over the Asia Pacific region to share experiences, learn and network for success. We are looking forward to seeing you in Hong Kong in November!"

Takashi Isaji, General Manager – Japan

DID YOU KNOW

ROBOTIC REVOLUTION

Automation is everywhere. **MEASURE**UP steps outside the world of metrology to see how autonomous and smart devices are changing people's day-to-day lives.

1

2

3

The word robot conjures a whole range of different images, from the utopian dream of android assistants to the relentless robotic armies of science fiction wreaking havoc on humanity. While these ideas take the concept of automation to the dramatic extreme, it's surprising just how far automation has spread in everyday life. Judging by these examples of pioneering automated technology, it won't be long before there's a robot in every home...

1 Ordering tablets via a tablet

At a hospital in Poland, patients are being nursed back to health with the help of a rather unusual pharmacist. A robot dispenser has joined the pharmacy at Sosnowiec, ensuring that vital treatments are delivered correctly. Patients wear a wristband with a unique barcode, which the doctor scans before entering the prescription details on a tablet computer. The information is sent to the robot, which sorts, packs and labels the medication before dispatching it to the right ward. The robot also manages pharmacy stock and ensures medicines are not dispensed after their expiry date.

2 Shop until you drop?

Not if you have the help of a robotic shop assistant! A hardware store in California, USA has introduced robots to help customers find exactly what they are looking for. Designed to improve customer experience in the store, they guide people to the right department and provide stock information. The robots verbally greet people and respond to voice commands, while a visual part recognition system means customers can even show the robot an example of what they want. With the ability to map the store automatically they know when items are relocated, while collision avoidance systems ensure safety for customers and robots alike.

3 Parked bumper to bumper

A German airport has made driving round the car park looking for a space a thing of the past, installing an automated parking system and increasing capacity by over 50%. Instead of parking in a bay, visitors simply drop off their car and a vehicle transporting robot – a kind of forklift system – picks it up and delivers it to a slot in the car park. The robot lifter's incredible manoeuvrability can place cars more precisely than they could be driven, plus smart system software selects a position based on the owner's return date so drivers never get blocked in!

JUSTIFY ROI BEFORE YOU BUY

When you're searching for a solution to your latest manufacturing challenge, you will find several potential options. You know the right one will save time and money, but you still need to justify the expense to management. **Jeff Freeman**, Director of North American Sales Operations at Hexagon Metrology, explains how to prove ROI prior to purchase.

Companies don't buy capital equipment on impulse. Your experience and intuition are simply not enough to justify capital investments. If you want to buy technology, you need to prove the benefits gained from the investment. There are a variety of methods that can be used to determine if a technology is a viable option for a company.
One such method is the Return on Investment (ROI) Methodology. The ROI Methodology is a systematic approach to evaluate programmes, and has been adapted through years of trial and error. The process includes several components:

- Knowing the time period (in years) your company uses to justify capital equipment purchases.
- Financially proving improved performance over present performance.
- When calculating ROI for a project or task, consider both tangible and intangible benefits.
- Consider your company's budget cycle. Most companies have an annual budgeting process, which may or may not correspond with the calendar year.

Plugging in the numbers is the easy part; getting the numbers is harder. Don't do this alone. Recruit as much help as you can get. Bring in someone from every aspect of the company to help, and keep in mind that there is no better ally than someone from the accounting group. The more people are involved, the easier the process.

ONLINE
ROI CALCULATOR
Visit **www.hexmet.us/justify** for an ROI calculator, white paper and video example.

Start with the right questions
Like many daunting tasks, the best place to start is by identifying opportunities for improvement. A natural place to begin is with your current technology. After all, no one knows your current processes better than you. Is the current process productive? Are there any bottlenecks? Is old technology getting in the way of productivity? For example, at one time a company may have been forced to use a coordinate measuring machine (CMM) to meet a customer's requirements or to acquire new business. The smallest investment was made, most likely a manual CMM, to satisfy the requirement at the time. Today the number of parts measured may have increased and manual measurement may cause a bottleneck in the process. Could a newer automated CMM do the job more efficiently? Is data being gathered and utilised effectively?

Compare against current processes
Next, establish a baseline for comparison by starting with your current measurement processes. Map the current process to establish a baseline by which all analysis and evaluations will be measured. Consider the experience curve and how it relates to your current process. Document to a level needed in order to exceed the justification of the purchase.

Now that you have a baseline, choose the basis for comparative measurements. Select the parts to be documented as part of your baseline. Consider the size and complexity of the part, the quantity of parts, as well as part numbers, and document each step or task in the process. Don't overlook anything – often we know a process so well that we combine steps or skip them altogether.

Now calculate the costs associated with each part, including recurring costs as well as non-recurring costs.

Go upstream and downstream in your processes. Look at each process and its associated costs. Gain a thorough understanding of how your current process affects upstream and downstream processes and their related costs. Document your findings. Compile your analysis and take a good, hard look at the data. What do you see? Do you have a complete picture of the process? If not, fill in the gaps. If so, it is time to compare other measurement technologies against the baseline for their suitability.

Evaluate the options
Benchmark each potential measurement technology against the baseline and against each other. Use the same approach that was used to establish the baseline, again considering how processes upstream and downstream will be affected. Rank the possible solutions by performance, price, capability and how each compares against your ROI requirements. Select those technologies that have the best suitability and ability for justification and repeat the upstream/downstream comparison process for each. The role of the measurement technology suppliers is important here. Suppliers have the solutions and data needed for comparison purposes, while a supplier's applications engineers have the knowledge to operate the equipment.

Select your preferred solution, as well as other options. Perform ROI calculations. Collect the information for your analysis and prepare the documentation and justification. Finally, submit the ROI analysis and documents for approval.

Persistence pays off
Budget for new technology may not be approved at the first attempt. In smaller shops, where the owner runs the business, the process may be a bit less formal and move more quickly. The owner sees the immediate benefit to the business and decides to make the purchase. In larger companies, with formalised annual budgeting processes, it may take one or more budgeting cycles to procure the equipment. Metrology technology is often not the first priority, so you may have to work harder to justify the purchase.

"Bring in someone from **every aspect** of the company to help."

Still, the data collected during verification can be used to improve manufacturing and verification throughput, eliminate scrap and reworking, and reduce material and design costs. All of this will improve profitability. Unless you incorporate what you have learned during the verification process and integrate it into all of your business processes, you cannot maximise the investment. ■

LET'S GET **SOCIAL!**

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@HexMetrology

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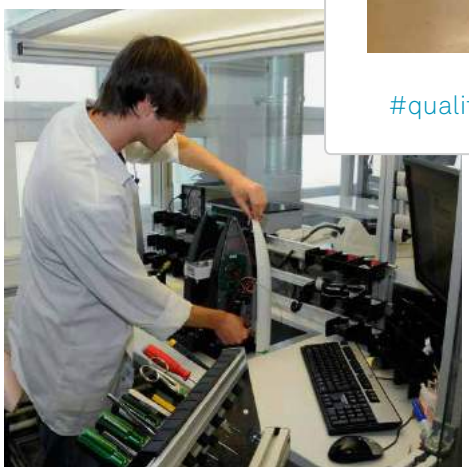


#lasertracker

#CMM

#innovation

#welovewhatwedo

#precision

TRIALS AND CALIBRATIONS

Mike Blake

A coordinate measuring machine (CMM) in proper working condition can make the difference between shipping a good part and a bad part. **MEASURE**UP asked one of Hexagon Metrology's Service Managers, Mike Blake, to answer your questions about keeping CMMs running at optimum performance.

Q: I need to move my CMM. Can I do it myself?

A: The short answer is no, it's not a good idea. Most stationary CMMs require an expert to relocate them, and they all require some level of disassembly and bracketing prior to moving.

A CMM is an expensive and delicate machine with many intricate parts, including scales, encoders and precision air bearings, which can easily be damaged if not handled correctly. Because the air supply is disconnected when a machine is moved, the air bearings are in direct contact with the way surfaces. If the CMM is not properly bracketed before moving, you risk damaging the bearings or the ways. And to be clear, we don't suggest you try to move a machine with the air turned on either!

Also, when you relocate a CMM – even just a few feet – it is best practice to have it levelled and recertified. Once a CMM is moved, the calibration is void and it must be recertified. So if you're planning on moving a machine, try to synchronise the move with your regular calibration interval. Hexagon Metrology's service engineers are experts at CMM relocation, whether you are moving the machine across the plant or across the country. We can make sure the job is done right every time.

The exception to the rule is if you have a shop-hardened CMM on a stand with wheels or a shop-floor CMM like the TIGO SF or the 7.10.7 SF from Hexagon Metrology. Models such as these are designed to be relocated very easily, as long as they are moved short distances across a level floor. Any type of CMM that has to be moved to a different level, particularly by lift, should be recertified at its destination.

Q: Does it matter who calibrates my CMM?

A: Yes. Many third-party service companies claim they can calibrate your Hexagon Metrology CMM for almost nothing, but buyer – beware! Many of these companies do not have the ability to calibrate our CMMs. They simply do a few tests and tell you how the machine is measuring without adjusting anything. There are even some service companies that attempt to make physical adjustments, which is the worst thing they can do.

Hexagon Metrology CMMs are adjusted using our proprietary software compensation map, which enhances the accuracy of your CMM to be the best it can be. When a software-compensated CMM is adjusted physically, the integrity of the software map is compromised and the measuring accuracy

is lost. Your only option then is for Hexagon Metrology to fix your compensation map, generally by remapping the CMM – a process that can take up to five days. Suddenly, that great deal from the third party doesn't look so great.

Don't cut corners with your CMM. After all, it is your ultimate referee for shipping good products or bad products. You would never take an expensive sports car to a cheap oil change place where the technicians have no factory training. So why not use Hexagon Metrology to service your Hexagon Metrology CMMs? Our factory-trained technicians are among the most highly-skilled in the industry. They know the product inside and out, they have the proprietary tools, software and methods, and they will do your calibration right.

Q: Do I really need to calibrate my portable measuring arm?

A: We would recommend it. Many of Hexagon Metrology's ROMER Absolute Arm products come equipped with a nationally-accredited length standard, which enables a customer to periodically confirm that their system is measuring to the specified accuracy and repeatability. We also provide instructions on how to perform these tests. Remember, accuracy cannot be verified by repeated measurements of a single point or by the simple measurement of a sphere. Accuracy is a length measurement from point A to point B and should be verifiable within a volume.

By sending your equipment in for a calibration, you are getting an independent certification that your arm is performing optimally. We follow a prescribed routine, using specialised fixtures and artefacts, and work to a proven methodology. We have the ability to exercise the system through its entire range of motion and provide you with certifiable results throughout the whole measuring volume.

Hexagon Metrology's dedicated arm calibration labs can also provide certified calibrations, so you can be truly confident in your measurement results. We can include 'as found' data with every calibration so you have a full history for your arm. We also include full preventive maintenance on all arms during the calibration at no additional cost. This extra check is important as it can uncover any minor issues and keep your arm running in optimal condition with minimal downtime.

Q: How often do I need to have my portable arm calibrated?

A: Many people ask how often to send in their ROMER Absolute Arm for calibration. The answer is not so easy. Some of the standards that our calibration labs are certified to state that an OEM is not allowed to make any such recommendations. So the simple answer is 'we're not allowed to say'. Obviously, that doesn't help very much.

Here, instead, are our practical recommendations for portable arm owners. A calibration interval will be based on the combination of several factors including the use or treatment of the system and the requirements of your company's own quality system. All of these factors can play a role in when to calibrate your measuring arm.

For example, our encoders are sealed to provide high reliability and the systems are designed to be in a shop-floor environment. However, if the arm is taking constant hits or drops, it is possible to damage the system and throw it off specification. The advantage ROMER Absolute Arm users have is that you can use the independently-certified length bar supplied to do a simple point length check at the beginning of each shift – or as often you desire – to verify whether the arm is measuring within its specification. If the arm doesn't measure up to specification, no matter what the calibration interval, it's time to send it in for a calibration. ■

CASE STUDY

TIGHT TOLERANCES

Left Image
The IRP40.40-LF in action with ultra-fine measuring ball to inspect the tiny recess.

Right Image
Patented THERMO-LOCK® technology prevents heat transfer from the spindle to the probe.

For real precision engineering there can be no weak points in the process. **MEASURE**UP investigates how using the m&h IRP40.40-LF infrared touch probe has helped Bavarian engineering company Feinmechanik Leipold achieve better efficiency and precision.

Feinmechanik Leipold specialises in complex components with ultrafine structures, which are manufactured in small series. Such tiny workpieces with miniaturised contours are also subject to particularly high precision requirements with tight tolerances. Up to now, production was complicated and consistently flawed.

While the position of the workpieces could be determined using probes, the small contours could not. Even a measuring ball with a 1 mm diameter was not small enough for the needs of Feinmechanik Leipold. "We have to measure a recess with a width of only 0.3 mm," explains owner Fredi Leipold. "It is the reference point for the toleranced dimensions of other contours. And the tolerance is only +/- 2 µm."

Manual centring with high risk of error

When it came to machining, the company could trust in the preliminary work, but the critical machining could not be mechanically measured. After milling a precise groove, the exact position of the groove edges had to be measured using a microscope mounted on a shank in the machine spindle, in order to align other geometries with respect to it. Work had to be done exactly to the micron, literally. And that requires time. Every new workpiece accrued machining times of three and a half hours. Manual imprecisions in the alignment, calculation of the centre or interpolation errors would lead to irreparable rejects. The microscope was not always stable enough to be useful, while operating the handwheel of the machine at the same time as looking into the scope often caused collisions and costly damage.

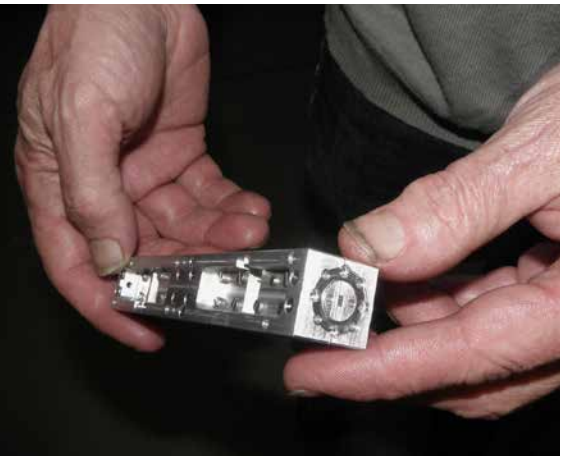
More exact work, more quickly

The IRP40.40-LF infrared touch probe from Hexagon Metrology represents a symbiosis between an m&h probe and a HP-T probe, which was originally developed for the measuring machine. By using styli with very small measuring balls, starting from 0.2 mm in diameter, even the smallest contours can be measured with very low measuring forces. This also makes the measuring unit suitable for measurement on relatively soft surfaces, sensitive materials or very narrow geometries, which would be damaged if probed with higher measuring forces. The low-force probe is sealed in accordance with IP68, so it is prepared for adverse workshop conditions. The HP-T probe is integrated in the m&h probe body, so it can communicate with the control through the existing receiver in the machine tool via the infrared diodes of the probe, and can therefore be used like any other probe. With this equipment, Feinmechanik Leipold is able to mechanically measure very small contours. The expensive measuring microscopes have become obsolete. Constant retooling is no longer necessary, "...and there are no more manual errors or calculation errors!", Leipold exclaims happily.

Patented technology prevents thermal expansion

Leipold has seen even more improvements, noting, "We no longer have deviations in the Z direction." This is because his company has purchased the THERMO-LOCK® version of the IRP40.40-LF probe, meaning that m&h-patented technology prevents the thermal expansion of the shank relative to the probe body and measuring unit. The probes are usually changed from a tool magazine at approximately 22°C to 24°C into the warm working spindle, which is usually over 40°C and sometimes even considerably warmer than 60°C near its rotor. Many probes would expand under these conditions, substantially altering the measured values. Measurements at machine manufacturers have shown that the changed-in probes, depending on their shank and size, expand by a few hundredths to tenths of a millimetre in the first few minutes after being changed into the spindle. Since the probe bodies do not necessarily have a symmetrical interior, the direction of expansion is also not necessarily linear. So in practice, the probe may warp into a kind of banana shape.

Tests at several machine manufacturers have shown that THERMO-LOCK® ▶



reduces this thermal growth to an expansion of less than a micron and the probes continue to keep their dimensions. A special insulation material, similar to glass ceramics, is built into the probe to prevent this thermal growth and offer the unique precision that has led many machine manufacturers to recommend them. Fredi Leipold agrees, saying "With the THERMO-LOCK® probe, the measured values are always absolutely constant." Considering that Leipold has to measure such minute contours, this precision is to be greatly valued. "We are already pretty well advanced when it comes to precision," he continues.

Enormous gains in productivity

Ultimately, the use of the m&h IRP40.40-LF probe with THERMO-LOCK® technology at Feinmechanik Leipold has had a multi-faceted effect, markedly improving operations. It is not only that the company can now probe even the smallest contours with certainty and precision. The possibility of everything being handled via the control not only saves time, but also prevents manual errors, both in the measurement of values and in the subsequent calculations and input of any correction values. Additional measuring equipment, such as the microscope, has become just as unnecessary as the time-consuming manual work steps. Now everything happens inside the control and in normal machining program sequences. "Reliable process stability is the most important thing in the end," emphasises Leipold. "We no longer have complaints and returns due to imprecision. Where we used to have to hope, we now know that it fits. And we have much lower costs!"

Latent sources of error have been eliminated. The machining process has become more reliable and much faster. As Fredi Leipold concludes, "What used to take three and a half hours now gets done within 35 minutes". This unexpected jump in productivity has greatly contributed toward higher capacity and much better efficiency at Feinmechanik Leipold. ■

Left Image
The intricate parts produced often have tiny features and surface details.

Right Image
The new probe has rendered scope measurements such as this obsolete.

BUILDING **BRIDGES**

Local dealers are an increasingly important part of Hexagon Metrology's worldwide presence, helping customers in new markets to access the technology they need. **MEASURE**UP asked three dealers in Eastern Europe about their relationship with the company.

Intermer

Based in Ljubljana, Slovenia, Intermer represents a number of different equipment producers, with the main focus of its sales activity on coordinate measuring machines. Operating since the late 1970s, Intermer has been a pioneer of metrology technology in the region.

"In spite of all the political and economic ups and downs that have stricken Slovenia since its independence in 1991, we have managed to sell a number of coordinate measuring machines, resulting in a Hexagon Metrology market share of about 75% with a total of 240 machines across all segments of Slovenian industry. This figure does not include any machines purchased second-hand, so it may even be higher than that. Our years of service and experience, as well as strong knowledge of the market, have made our relationship with Hexagon Metrology a mutually rewarding cooperation."

Mitja Sketa

MICRO-TOP

Established in 1991, MICRO-TOP is focused on providing a complete turnkey solution in metrology, from choosing the right instrument to full local support in the Romanian market. The company's calibration laboratory is accredited according to ISO 17025, providing quality assurance for customers based in the country.

"Our partnership began 24 years ago when we started dealing DEA coordinate measuring machines. Gradually the solutions have evolved, and of course the partner is now Hexagon Metrology. Our cooperation has always worked both ways, from the support provided by our team of service and application engineers to the excellent technical support offered by our partner. Our main advantage in working with Hexagon Metrology is having access to the latest technology and a high level of training and support."

Florin Georgescu

IMS Center

Industrial Metrology Service Center (IMS) has been working with Hexagon Metrology since December 2013. A Master Distributor for portable products and Service Centre Partner for calibration, certification and repair, IMS is the only authorised service centre in Russia. It provides maintenance and delivery of portable measuring systems, offering warranty repairs of portable arms and laser trackers, including the issue of national calibration certificates.

"The main advantage of working with Hexagon Metrology is the coordinated delivery of all Hexagon Metrology portable equipment in the territory of the Russian Federation, Belorussia and Kazakhstan. We are able to source spare part stock very quickly and we also get fast and dedicated support from Hexagon Metrology, ensuring we can serve our customers effectively."

Mikhail Ivanov

EDUCATION FOR GOOD MEASURE

Four young people, four different jobs, three different continents – but just one company. As Hexagon Metrology's global footprint continues to grow, **MEASURE**UP asked **apprentices, interns and young employees** from around the world about their work and future prospects.

CHINA

Name: Xu Goliang
Job: Portable solution engineer
Location: Qingdao
Joined: August 2014

Name: Yuan Maoxing
Job: White light application engineer
Location: Qingdao
Joined: July 2013

MEASUREUP: **What do you currently do for a living?**
Xu Goliang: I work full-time at Hexagon Metrology as a portable solution engineer.
Yuan Maoxing: And I'm an application engineer specialising in white light systems, also full time.

MU: **Where did you first hear about Hexagon Metrology?**
XG: I first heard about Hexagon Metrology from one of my customers in a previous role.
YM: For me it was my teacher, who told me that Hexagon Metrology is very famous in this industry.

MU: **What do you like most about working here?**
YM: I enjoy learning more and advancing my knowledge. And the working atmosphere is wonderful, really dynamic and positive.
XG: I like working with all the talented people in different areas. Hexagon Metrology brings us together and motivates us to shape the future of measurement.

MU: **Do you follow the company on social media?**
XG: As a newcomer, I searched for the official accounts on WeChat, Twitter and LinkedIn. On Twitter I found and followed the Hexagon Metrology and Hexagon AB accounts.
YM: Yes, I also follow Hexagon Metrology on WeChat because I like the information and articles provided by the company.

MU: **What are your plans and ambitions for the future?**
YM: As an application engineer, expertise is very important for me. I want to learn as much as possible and strengthen my professional skills. Perhaps in the near future I would like to become a sales engineer as I think I would also like that kind of job.
XG: I want to be an expert in inline measurement systems and prioritise customer satisfaction. It would be great to inspire the people around me to be proactive and efficient too.

USA

Name: James Carlson
Job: Student and application engineer
Location: Quonset Point
Joined: October 2014

MEASUREUP: **How do you balance your studies and your work?**
James Carlson: I am a full-time student at the University of Rhode Island, studying mechanical engineering. I work at Hexagon Metrology part-time when I don't have classes.

MU: **What made you want to join Hexagon Metrology?**
JC: My brother, Scott, is a systems engineer here at Quonset Point. His descriptions of his work got me interested in the company.

MU: **How was your induction into the role?**
JC: My induction into the company was really smooth. Everyone has been very accommodating and they gladly answer any questions I have.

MU: **Why do you work here alongside your studies?**
JC: I enjoy the practical applications of engineering. I can apply what I've learned in college, and work hands-on in a friendly environment to expand my knowledge of the field.

MU: **Have you followed the Hexagon Metrology social media feeds yet?**
JC: Not yet, no. I will be sure to look into it so I can keep up with what is happening in the company outside of my department!

MU: **Where do you see your career going in future?**
JC: At this point I'm not entirely sure. I have a broad range of interests, and am actively narrowing down what I want to devote my life's work to. Being at Hexagon Metrology exposes me to the work I could be doing, and will help me decide what I want in my career. I believe that your life is whatever you make it, the only thing holding you back is yourself. I hope to someday be able to start my own company.

SWITZERLAND

Name: Géraldine Studemann
Job: Student trainee
Location: Unterentfelden
Joined: October 2014

MEASUREUP: **What is your occupation at the moment?**
Géraldine Studemann: I work full-time at Hexagon Metrology as a trainee. I was involved in testing the new Leica Absolute Tracker AT960 and I do a lot of software trials. I will be here until June 2015 then I'll complete my degree in geomatics and design.

MU: **And you know Hexagon Metrology quite well, don't you?**
GS: Yes, my father worked for Kern and then Leica Geosystems for many years, so I know the whole history of Hexagon Metrology! The technology at Hexagon Metrology is very interesting and when I was searching for a trainee programme, I automatically looked here.

MU: **What can you tell us about your start at the company?**
GS: On the first day I saw all the departments and products, then it was really straight into my work. It was not easy to begin with, but turned out to be the best way to start.

MU: **What particularly interests you about your job?**
GS: The products are just great. Because of the size of the company, Hexagon Metrology offers so many different kinds of products, which is fascinating.

MU: **Could you see yourself working here in the long-term?**
GS: I would definitely love to work for Hexagon Metrology in the future! Once I finalise my bachelor's degree I would like to do a master's degree in geomatics. I see my future in product development – I'm keen to develop real useful products.

GREAT STORIES

CONTINUE AT **HxGN LIVE 2015**

Join **Hexagon Metrology** for the **Metrology track** at **HxGN LIVE,** Hexagon's annual international event dedicated to helping customers harness the power of Hexagon technologies. For the first time, **HxGN LIVE** will be brought to you from two locations – **Las Vegas** will host the conference **1-4 June**, then **HxGN LIVE Hong Kong** will take place **18-20 November.**

That's double the opportunity to take part in inspiring keynotes, unlimited networking and must-see technologies!

KEYNOTES
INSPIRING, INSIGHTFUL INFORMATION!

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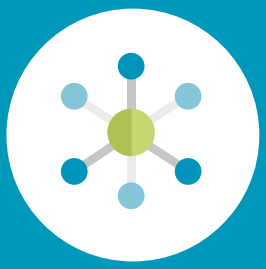

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