INNOVATION MATTERS

ISSUE: 2023

RENISHAW
apply innovation™

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Contents

Discover Renishaw, our people, culture and values

We're Renishaw, a global engineering and scientific technologies company with expertise in high-precision manufacturing. For almost 50 years, we've been using our first-hand experiences in precision engineering to help us develop evermore innovative ways to solve our customers' problems. This commitment to innovation is what pushes us forwards.

As a leading manufacturer ourselves, we directly understand the challenges facing our customers, wherever they're based. This is underpinned by a global service and support network designed with your needs firmly in mind (see page 34). To succeed, we must be in tune with the needs of the changing world around us, from the industries we serve, to the communities in which we operate.

We're dedicated to innovation with the aim of making a positive impact and creating new products that allow our customers to succeed. Indeed, our mission is to 'always improve' and 'do things differently'. 'Apply innovation' isn't just our strapline; it's our DNA and it's what gets us up in the morning, makes us who we are, and drives us forward with purpose.

We hope you enjoy learning more about us and discovering what we do and how we do it here at Renishaw. We welcome you into our world in which innovation truly matters...

AEROSPACE engineering

Automated manufacturing solutions for the aerospace industry

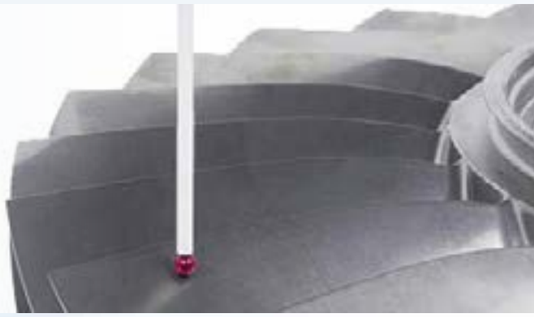
Increased use of automation technologies is helping to positively transform aerospace manufacturing despite significant global challenges. Find out how solutions for CNC process automation can be applied to aerospace component manufacturing.

In recent years, the aerospace manufacturing industry has faced significant change and disruption, which has compelled businesses to adapt and apply fresh thinking to their operations. Rising demand for more fuel-efficient aircraft has resulted in a growing product mix and increased variability of parts. There are several key factors that continue to prevent the industry's growth and capacity to cope with fluctuating demand. These trends include the skills crisis and dependence on labour; supply chain disruption and component shortages due to backlogs and, of course, the global pandemic. However, these challenges can be tackled with the help of flexible CNC process automation solutions.

There are many processes in a CNC factory that require skilled people: setting up machining processes, making measurements and adjustments, keeping dimensions under control, monitoring processes throughout the day and reacting to tool wear, tool breakage, cutter deflection and process drift. The expertise required to support CNC machining processes, however, includes highly technical skills and experience acquired over many years. The global shortage of engineers entering industry is one of the biggest challenges manufacturers face today and a key reason why the aerospace industry is fast-tracking its adoption of process automation.

The automation of CNC processes is a global requirement driven by the need for increased efficiency, productivity and cost-competitive manufacturing. It delivers the consistency, predictability and productivity benefits that provide a platform for sustainable manufacturing.

Automation of all aspects of process control, adjustment and decision making are critical to unlocking the potential capacity of a factory without adding the requirements for specialist skills and added costs. If you could automate the skilled processes we mentioned earlier, you could switch off the lights and leave the machines running overnight with confidence.



How can Renishaw help?

We're proud to have been born out of the aerospace industry. When Rolls-Royce was unable to find a device with the accuracy needed to measure the instrumentation pipes on the Olympus engines that powered Concorde, our founder, Sir David McMurtry, built one. The touch-trigger probe was a revolutionary technology that became our first product.

Efficiency and safety remain fundamental requirements across the aerospace industry. We help suppliers undertake repeatable, traceable, efficient manufacturing to the finest tolerances. We do this throughout the supply chain so that every component, not just safety-critical ones, meets its design intent.

We provide flexible CNC machine tool automation solutions to automate tasks traditionally carried out by skilled operators. Introducing industrial metrology enables you to automate tasks such as machine performance assessment; machine, tool and part setting; on-machine measurement; tooling adjustment; part verification, ongoing tracking and control of variation, and more.

No other industrial metrology company offers the breadth of technologies to support full end-to-end control of automated CNC machining processes.

On-machine probing

Time is money. Time spent manually setting and inspecting parts is better invested in machining. Renishaw probing systems eliminate the costly machine downtime and scrapped parts that are associated with manual setting and inspection.

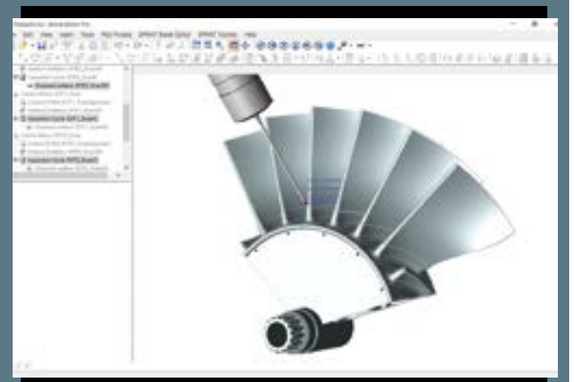
Keep your machining process under control with our SPRINT™ technology

Our SPRINT technology for high-speed, high-accuracy scanning on CNC machine tools is critical for accurate 5-axis machining tasks used in complex aerospace component manufacture. It can be used to check your machine tool's kinematics, locate the part and then locate it relative to those machine kinematics. After machining a feature, you can use the probe to scan the whole surface of a machined feature, compare this with your design tolerances and update the machining process accordingly.

Measure complex aerospace components with Productivity+™ Blade Toolkit

The Productivity+ Toolkit offers high-speed, accurate measurement, with exceptional definition of high-curvature surfaces, such as leading and trailing edges. Applications including in-process blade measurement and root blending of bladed disks can be automated and implemented with ease.

High-speed scanning with the Productivity+ Scanning Suite allows organisations to re-think the use of on-machine process control measurement in high-value aerospace CNC manufacturing tasks.



Automation enables aerospace manufacturers to reduce manual intervention and integrate real-time analysis to improve quality and connectivity across the supply chain.

AEROSPACE
engineering

CMM inspection

Manufacturers throughout the global supply chain, rely on our world-class CMM probing systems to achieve traceable measurement of parts throughout each aircraft, including engines, landing gear, wings and airframe. We offer the most advanced CMM multi-sensor system for part inspection and a range of software tools to assist in path planning and data collection, through to data presentation and analysis.

REVO® 5-axis measurement system

Historically, precision measurement has required multiple devices, with speed often limited by fundamental CMM design constraints.

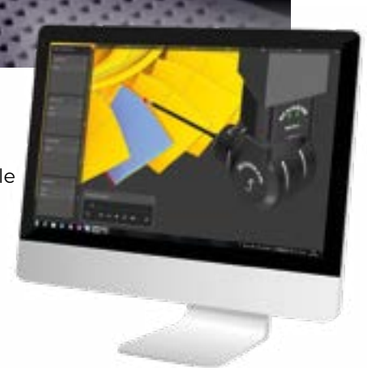
Renishaw's REVO® system overcomes the CMM speed versus accuracy challenge with patented 5-axis technology. It offers a range of interchangeable sensors, including tactile touch-trigger and scanning, surface finish, ultrasonic thickness and non-contact vision measurements, on a single CMM.

The REVO system sets the standard for fast, accurate and flexible multi-sensor CMM measurement, without compromise.

RSP3 provides the REVO system with 3D scanning (x,y,z) and crank stylus capabilities.

Get engine blade data with MODUS™ Blade planner

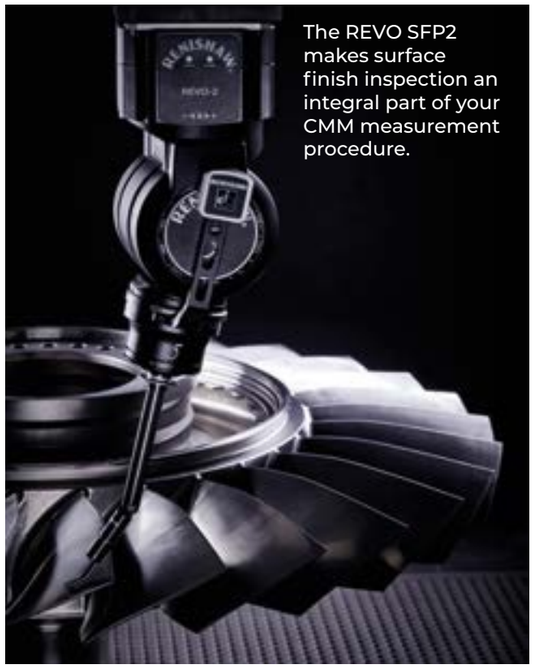
Our MODUS metrology software provides a powerful platform for 5-axis measurement. Part of MODUS Planning Suite, Blade planner is a software module for collecting data about aerospace blades. The full blade inspection option enables you to plan sweep scans on concave, convex, leading and trailing edge surfaces. The settings and measurement strategies allow you to customise and optimise measurement paths. The Blade software modules can prepare a CMM for end-to-end data collection and analysis.



The REVO-2 RVP probe adds non-contact inspection to the existing touch-trigger, high-speed tactile scanning and surface finish measurement capability of the REVO system, allowing full inspection of parts and features unsuitable for tactile measurement.

Measure internal part features with our RUP1 ultrasonic probe

This ultrasonic probe increases the multi-sensor capability of the REVO® 5-axis measuring system. The RUP1 probe measures thickness, which is ideal for aerospace components with inaccessible internal features, such as hollow blades and landing gear components. The RUP1 probe uses an innovative elastomer tip ball to provide excellent coupling between the probe and the material without a liquid medium or coating.



The REVO SFP2 makes surface finish inspection an integral part of your CMM measurement procedure.

For further information on how Renishaw can support aerospace manufacturers, visit **www.renishaw.com/aerospace**

CASE STUDY

KES Machine

Machine repair specialist invests in Renishaw multi-axis calibrators to expand its services

To become the go-to calibration service provider to its customers, KES Machine LLC has expanded its relationship with Renishaw. By investing in our XM-60 and XM-600 multi-axis calibrators, KES has expanded its services to quickly obtain accurate data and provide high-quality calibration and probing services.

To watch the case study video, visit

www.renishaw.com/kes

Background

After moving from Poland, in 2000 Greg Kordalski founded KES Machine LLC in Connecticut (USA). Since then, the business has been helping engineering and manufacturing companies maximise productivity and minimise downtime with its accredited calibration and repair services. KES technicians help machinists solve geometry errors, lead screw errors and repeatability concerns — sometimes the team can diagnose errors before they become critical problems, saving downtime.

While the company initially focused on CNC service work, in 2008, it invested in its first Renishaw ML10 laser system and began developing its calibration services. Based in Newington, Connecticut, the company works with machine tool builders, importers, distributors and end-users, primarily in the aerospace, defence, nuclear and medical sectors across the region.

In 2019, KES opened a Polish subsidiary to support manufacturers there. ***"Since I was born in Poland, I visit quite frequently, so this is why I chose Poland as the first country on the European continent,"*** explains Kordalski, founder of KES. ***"However, this does not mean that the expansion of the company in Europe will be limited to Poland."***

The company offers in-house and on-site repair services, as well as monthly maintenance contracts to keep equipment operating at optimal efficiency and accuracy. In 2016, KES obtained ISO 17025 certification and became a fully capable calibration service company.

"ISO 17025 accreditation demonstrates our capabilities to our customers," explained Kordalski. ***"Showing that we follow industry requirements for testing and calibration enables us to provide a value-added service to engineers and ensures all our equipment is up-to-date and our technicians offer the best service to customers."***

Challenge

Component quality is dependent on machine performance. Without understanding a machine's error profile, it is impossible to have confidence that components will fall within specification during manufacture. KES works with high-precision industries, such as aerospace, defence and medical. It aims to be the go-to calibration service provider and deliver the solutions its customers are asking for. This led KES to investigate volumetric machine tool compensation and explore the systems available on the market.

"In the past few years, we have seen manufacturers invest in more automated machining systems," said Kordalski. ***"Probes and calibration are key to the success of these systems, so we've seen a growing interest in the annual calibration of equipment and machines using probing systems."***

"KES Machine has always been at the forefront of technological advancements. Accuracy, software, and support are important factors when looking for new products. When we see equipment that makes processes more accurate and efficient, we go in that direction."

Krzysztor Siergiejczyk, Head of KES Machine in Poland explains, ***"After having a good experience working with Renishaw in the USA, when opening the Polish subsidiary, we quickly established contact with Renishaw Poland. We were the first company in Poland to adopt Renishaw's XM-60 and we have a big ambition to take care of customers within the European market over the upcoming years."***

Image credit: Mechanik Media

CASE STUDY

KES Machine

Solution

We have had a long-standing relationship with KES. As Kordalski explained: ***"When Renishaw comes out with a new product, it sparks our interest. As a result, we've worked with Renishaw for many years."***

When he founded KES, Kordalski purchased his first ML10 laser and QC10 ballbar from Renishaw. Since then, KES has purchased a range of our equipment, including XL-80 laser systems, XR20 rotary calibrators, off-axis rotary software and QC20 ballbar systems. The company is also an advocate of our machine tool probes, tool setters and broken tool detection systems, and is a full-service representative of Renishaw products.

KES ultimately selected Renishaw XM-60 and XM-600 multi-axis calibrators for ease of use, flexibility and the ability to capture large amounts of data. KES can use the equipment on both CNC machine tools and CMMs to perform volumetric compensation. This laser measurement system is capable of measuring errors in six degrees of freedom along a linear axis, simultaneously from a single set-up. It provides a powerful diagnostic tool to measure all geometric errors in the axis from a single capture.

Additionally, the XM-600 multi-axis calibrator is designed with extra functionality, enabling it to communicate directly with our UCC controllers, and is compatible with our CARTO software suite. These features make it the ideal calibration solution for any manufacturing facility that uses both machine tools and CMMs, such as KES.

"Renishaw offers a range of calibration solutions for improved machine performance, increased machine up-time and preventative maintenance schedules," explained Jeffrey Seliga, Marketing Manager at Renishaw Inc. ***"By using the XM-60, the KES team can collect a range of measurements, including the pitch, yaw, roll, linear positioning, and horizontal and vertical straightness, in the same time it takes to collect a single measurement using conventional techniques."***

"The support from Renishaw has been outstanding."

Results

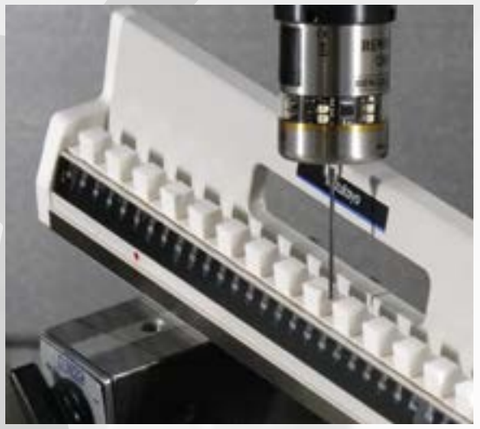
"I would say that about 80 percent of our equipment is now Renishaw," explained Kordalski. ***"Although we still investigate other brand systems, ultimately, we are looking for the best technology, and Renishaw typically wins. For example, we recently invested in the XK10 alignment laser system. While it's still a new product for us, we've already seen its benefits when testing spindle direction or when installing machines, to help adjust straightness and squareness."***

KES Machine used the XM-600 to implement CNC volumetric compensation and will soon offer CMM calibration to its customers, as well as support for Renishaw CMM hardware, as the XM-600 directly interfaces with Renishaw UCC controllers. For years prior to the release of the XM-60 and XM-600, KES typically used multiple pieces of different equipment to measure linear positioning, pitch, yaw and roll. The XM-60 manages this process with one pass and will include horizontal and vertical straightness over the completed travel. Measurements that previously took two to four hours are now reduced to under 30 minutes, depending on the length of the machine axis.

The equipment can also be used to diagnose machine errors. KES uses CARTO software, along with its own custom software, to simplify its processes. The KES team uses the 'cut and paste' feature in CARTO software to help the compensation process and saves time using the report builder feature.

"Volumetric compensation is a relatively new process in the United States, but we have had great success in the past two years," continued Kordalski. ***"We can now better support our customers and provide solutions that they demand to ensure machine precision. For example, we're now seeing some of our customers installing these solutions onto new machines and performing volumetric compensation during installation, ensuring machine accuracy from the beginning.***

"Our team is out in the field using Renishaw equipment and software daily, so we are happy to make recommendations — it is a great feeling when a new version is released, and your suggestion has been added," concluded Kordalski.



To watch the case study video, visit **www.renishaw.com/kes**

Hi, I'm Jordan and I manage customer case study development at Renishaw. I love working on case study projects because it allows me to see, first-hand, the positive and powerful impact our products can have.

Contact me today to find out how sharing your real-world success story via a Renishaw case study could help to raise your company's profile and brand recognition across a variety of promotional channels, including social media, our websites, email campaigns and brochures.

Email #casestudy to contentmarketing@renishaw.com and let's get started.

Interview

FROM OUR SHOP FLOOR

Name: Russell Peace

Job title: Plant Maintenance Manager (UK)

Length of service: 19 years

Role: Responsible for managing the Plant Maintenance operations for Renishaw's Manufacturing Services Division.

The majority of machine shop processes involve high volumes of energy usage, material consumption and waste by-products. New technologies and innovative environmental improvement strategies can optimise these areas, significantly reducing the environmental impact and operating costs. Renishaw Plant Maintenance Manager, Russell Peace, shares how his team approaches the implementation of new technologies and environmental initiatives within Renishaw's UK machine shops.

Why embrace new technologies and environmental initiatives in your machine shops?

To successfully introduce technologies that solve the challenges faced by our industry today, we must first improve our understanding. Once we fully understand the problem and its impact on processes, we can implement the best solution for optimising productivity. For example, acquiring accurate data by carrying out energy logging or reviewing equipment performance using our Computerised Maintenance Management System (CMMS) may enable us to solve energy-related challenges.

How do you take new initiatives from idea to implementation?

We extensively profile the energy usage of our equipment so that we have a deep understanding of machine tool energy demand. This enables us to focus attention on areas with high energy consumption in order to have the biggest impact.

When looking at the feasibility of any energy-saving project, the first step is to calculate the theoretical improvements of the new technology or initiative before moving onto the trial phase of small-scale application to verify the results. Once confirmed, the project plan is put in place for the procurement and installation of the new technology.

What advice would you give a machine shop looking to introduce new technologies?

Fully understanding your current processes is crucial. For example, a machine tool is never consuming a consistent amount of energy; there are different processes turning off and on all the time, so it can be difficult to quantify energy consumption and calculate savings. Testing and verifying current systems, as well as taking the time to test new technologies before implementation, helps you to make the most impactful changes. It's a good idea to work closely with your operators, as their real-world knowledge of your processes could provide valuable insight.

Has it been possible to automate any of Renishaw's energy-saving initiatives?

Simply keeping a machine tool on requires a large amount of energy, so we use energy-saving modifications to enable 'hibernation' when not in use. The modification shuts down unnecessary functions while remaining on for efficient start-up times. Renishaw's Automated Milling Turning and Inspection Centre (RAMTIC), is a flexible manufacturing system that enables machines to run unsupervised for long periods of time. We have programmed the machines so that once a batch has finished, they automatically enter energy-saving mode, which maximises energy saving over weekends and removes unnecessary tasks from the operators.

How does Renishaw motivate production teams to embrace changes on the shop floor?

To successfully implement effective change, it's important to involve everyone in the process. Seeking user feedback for the application enables you to make any necessary changes before implementation. It's also important to communicate the outcome of the project with the teams involved to help quantify success and provide recognition.

What's next for Renishaw's energy-saving initiatives?

Compressed air systems are currently a significant cost to a manufacturing process, so we are currently reviewing these to better understand inefficiencies. These systems have high run hours, so by implementing advanced technologies we are hoping to improve operational efficiency.

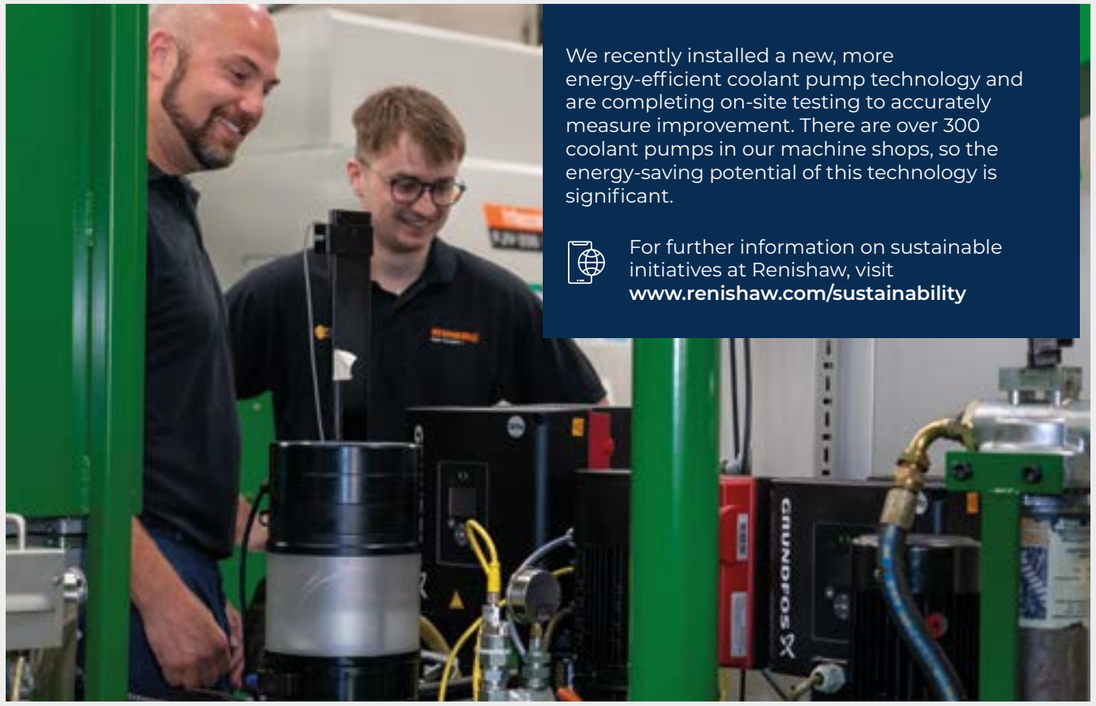
We've recently seen emerging advancements in transformers, enabling us to more efficiently change

FROM OUR SHOP FLOOR

between designed and destination voltage. This particularly applies to machines made in Asia, where local standards for power supply differ from that in the UK. Equipment manufacturers are beginning to offer this technology upon purchase, and we believe replacing the legacy systems here at Renishaw will bring significant benefits.

Top five new technologies or environmental initiatives introduced in Renishaw machine shops

1. Energy saving (hibernation mode)
2. Neat oil reclamation
3. Compressed air leak surveys and corrections
4. Coolant pump upgrades
5. Legacy compressor replacement



We recently installed a new, more energy-efficient coolant pump technology and are completing on-site testing to accurately measure improvement. There are over 300 coolant pumps in our machine shops, so the energy-saving potential of this technology is significant.

For further information on sustainable initiatives at Renishaw, visit **www.renishaw.com/sustainability**

SUSTAINABILITY

Our journey to Net Zero

> **“Our vision is to deliver a credible Net Zero plan and play our part in protecting the environment and the communities in which we operate.”**

At Renishaw, we’re committed to conducting our business responsibly. Part of our business strategy for achieving this includes our ongoing efforts to operate sustainably and protect our planet from issues such as climate change. To minimise the impact of our own operations, we’ve worked to reduce the emissions from our manufacturing facilities. But more than that, we can also support our customers as they transition to more sustainable manufacturing, providing solutions that help them to produce more with less.

The Global Goals

The United Nations (UN) has called for an urgent acceleration in the global response to climate change. Its Sustainable Development Goals (SDGs), also known as the Global Goals, provide a shared blueprint for achieving peace and prosperity for people and the planet by 2030.

Action is now required from all levels of society including governments, academic institutions, individuals and of course, manufacturing industries.

We’ve installed solar panels at many of our sites, including these at Stonehouse in England.

Emissions scopes

Our carbon footprint relates to the greenhouse gas (GHG) emissions that are emitted as a result of our company’s activities. These emissions are measured in categories split into three scopes, as defined by the GHG Protocol for international reporting standards.

We have been measuring our operational GHG emissions (see Scopes 1 and 2) fully since 2015. This has allowed us to track our emissions over time and implement initiatives that have allowed us to drastically reduce our emissions.

Our Net Zero goals

In November 2021, we committed to a Net Zero 2050 target, which will be validated and monitored by the SBTi (Science Based Targets initiative), an international body that defines best practice in emissions reductions and Net Zero targets in line with climate science.

We have committed to the following sustainability targets:

- **Net Zero for Scopes 1 and 2 emissions by 2028**
- **Quantification of Scope 3 emissions by March 2023 (to enable us to set a more ambitious overall Net Zero target date than the current 2050)**

Scope 1 emissions

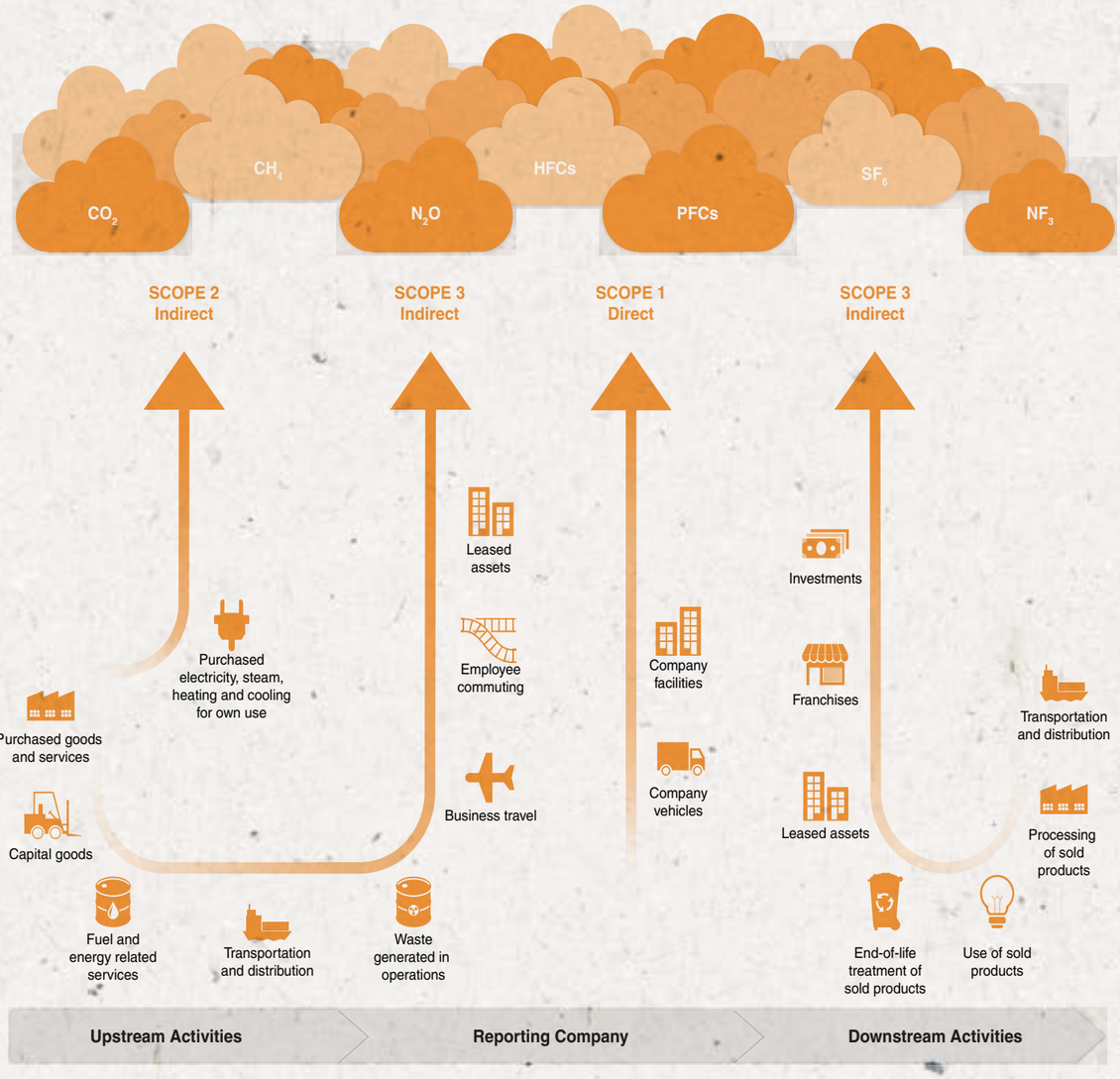
All direct emissions that an organisation emits directly from owned or controlled sources, such as the fuels burned by heating systems and company vehicles.

Scope 2 emissions

Indirect emissions from electricity (including steam, heat and cooling) purchased and used by an organisation. These emissions are created during the production of the energy that is used by an organisation. We’re moving to fully renewable electricity across our sites and, where possible, we’re increasing our self-generation of power, which will include solar, wind and small-scale hydro.

Scope 3 emissions

All other indirect emissions from an organisation’s activities, occurring from sources that they do not own or control. These are usually the greatest share of the carbon footprint, covering emissions associated with business travel, procurement, waste and water and products in use.



SUSTAINABILITY

Our journey to Net Zero

Meet our Sustainability team

In 2022, Renishaw assembled a dedicated Sustainability team to manage the environmental, social and governance factors that affect our business.

Name: Ben Goodare

Job title: Head of Sustainability

Recently named one of The Manufacturer's Top 100 manufacturing role models, Ben has been involved with Renishaw's sustainability efforts since 2013. He implemented a carbon management system across the Renishaw estate to calculate our greenhouse gas emissions and in the past five years, Renishaw has successfully reduced its carbon footprint by 39 percent.

Name: Dr Uchenna Kesieme

Job title: Sustainability Manager – Life Cycle Assessment

Uchenna's role focuses on the quantification and management of whole life carbon emissions within Renishaw's value chain. His projects include quantifying the embodied carbon of our product range and infrastructure programs across the Group.

Name: Emma Brown

Job title: Senior Net Zero Project Manager

Emma supports the business in its goals to achieve Net Zero by 2050. She is the lead project manager on all Group sustainability activities, and ensures a standardised best practice approach to project management.

Name: Natalie Price

Job title: Sustainability Data Analyst

An Associate member of the Institute of Environmental Management and Assessment, Natalie is responsible for maintaining Renishaw's carbon and waste reporting system, including data auditing, researching new sources of data, and supporting the team with project and reporting data requirements.

Name: Sam McConnochie

Job title: Sustainability Reporting Manager

Sam's experience in corporate sustainability reporting and strategy development enables him to deliver sustainability reports that benchmark performance against science-based targets and sector-specific data.

Name: Roz Woodman

Job title: Sustainability Manager – Value Chain

Roz works with our supply and customer management teams to engage stakeholders on sustainability. As a specialist in risk management, she also informs the business on market trends and appropriate sourcing strategies to minimise risk. She works with suppliers, design colleagues and senior leadership teams to conduct business responsibly.

SUSTAINABILITY

Our journey to Net Zero

Applying sustainability principles to everything we do

We're applying our Net Zero principles to the design and planning of all upcoming site expansions, new builds and refurbishments. We're investing over £50 million at our Miskin site in South Wales (UK) to increase manufacturing capacity and to help meet our Net Zero emissions targets. This expansion will see 400,000 ft² (37,000 m²) of additional low-carbon buildings created at the 193-acre site to the west of Cardiff, consisting of two new production halls and an employee welfare facility. The existing production halls will be refurbished with more energy-efficient cladding to reduce their greenhouse gas (GHG) emissions. The new facilities will be built with the latest technologies and materials to ensure that they will be Net Zero in operation, and the build will also aim to minimise the amount of embodied carbon within the building materials used in construction.

5 ways we're reducing our environmental impact

1. 80 percent of our total electricity use now comes from renewable sources; this includes the installation of solar arrays
2. Just nine percent of our global waste went to landfill in the 2021 financial year
3. Conducting lifecycle assessments on all Renishaw products to reduce our carbon footprint
4. Integrating a carbon-management system to calculate our greenhouse gas emissions
5. Switching to low-impact lighting and installing additional insulation

Energy-efficient lighting also supports the health, comfort, safety and productivity of staff.

A vital consideration for this construction program is the achievement of our Net Zero Scopes 1 and 2 GHG emissions targets.

The additional low-carbon buildings created at Miskin will include two new production halls and an employee welfare facility.

"This significant investment by our Board to increase the Group's production capabilities demonstrates a huge vote of confidence in our manufacturing operations and people, at an exciting time for the business."

Gareth Hankins,
Head of Global Manufacturing

The 400,000 ft² (37,000 m²) expansion at Miskin will allow us to increase our machining operations and the assembly of products, such as our world-leading metal additive manufacturing (3D printing) machines.

SUSTAINABILITY

Our journey to Net Zero

Making engineering sustainable

As the average global temperature continues to increase and droughts become more frequent, finding more sustainable manufacturing methods is key to reducing the environmental impact of industries across the globe. Here, Ben Goodare, our Head of Sustainability, discusses how we are becoming more sustainable and why it is so important that the wider engineering industry and its stakeholders continue this trend.

What is sustainability?

Sustainability encompasses much wider issues than most people think — as well as environmental sustainability issues, such as greenhouse gas emissions, it covers social sustainability, like slavery, gender pay gap and human rights. Renishaw's sustainability goals consider both aspects; this involves improving our stakeholders' quality of living while reducing our environmental impact as much as possible across our whole value chain.

Environmental impact is easier to quantify because it is more visible, such as measuring carbon emissions from energy usage or testing the insulation levels of an office building. Social justice is harder to measure, understand and change, so it is commonly overlooked in sustainability plans. Positively impacting both aspects, while remaining competitive, is the key to creating a fully sustainable business.

> *"Engineering businesses can make immediate changes to improve social issues by paying the living wage and investigating the working conditions across their supply chain."*

At Renishaw, the journey to sustainability began with setting clear goals internally, including achieving Net Zero for Scopes 1 and 2 by 2028, and Net Zero for all Scopes by 2050 at the latest. We have aligned our sustainability delivery plan with the United Nations Sustainable Development Goals, such as responsible consumption and production. We started our sustainability journey many years ago, but to increase our efforts we now have an enlarged dedicated Sustainability team to support the business to drive the necessary internal changes and across our value chain. As part of our commitment to a science-based target through the SBTi, we will report on the impact of employee activity, such as business travel, commuting and home working. This will help us to identify areas of improvement and make changes across our business.

Take the first step

For businesses just starting out on their sustainability journeys, taking one step is better than doing nothing. Some things are easier to change, such as swapping to a renewable energy source, changing to low-energy light bulbs or setting up some diversity and inclusion support groups. Choosing some initial steps that are important to the business and its stakeholders will encourage managers, colleagues and wider stakeholders to support the sustainable changes and encourage the move to a larger sustainable cultural shift. We've seen a positive reaction to the changes we've made and future plans and have a very strong commitment from the Renishaw Board, who understand the benefit of investing now to become more sustainable in the longer term. Employees are also encouraged to suggest their own sustainable ideas, so everyone in the company can have an impact on the global business.

Becoming a sustainable organisation is a journey, and it does take time. You won't be able to solve everything right away, but action needs to start now. Businesses will normally have ideas from employees who can bring their sustainable practices from their home lives to work. Some banks can also provide advice and help to support businesses in reducing their costs. Contacting someone who is an expert in sustainability, through a friend or person in the value chain, will also provide businesses with sustainable suggestions and support. The sustainability journey is different for all businesses, so finding the most effective way that allows your business to move towards a culture that has sustainability embedded is essential.

Creating a sustainable supply chain

According to Deloitte, Scope 3 emissions account for over 70 percent of companies' carbon footprints, so communicating with stakeholders and helping them start their sustainability journeys is key to reducing a manufacturer's overall environmental impact.

We're expanding our environmental goals by setting out a longer-term Scope 3 process. We're assessing the impact of indirect emissions from stakeholder activities and will work with those stakeholders to set out key performance indicators to encourage them to become more sustainable. Small-to-medium sized suppliers may not have the capacity to invest in a dedicated sustainability team or research. Larger engineering businesses like Renishaw, however, can help reduce a supplier's impact by offering suggestions and support. Making sustainable changes is not only important to support the planet, but also business across the value chain. To remain competitive in an increasingly sustainable market, businesses must adapt or risk being left behind.

Future sustainability

Engineering is an industry full of problem solvers, so achieving a more sustainable industry and supply chain is definitely possible. Social justice and climate issues can be significantly impacted by the engineering and manufacturing industries creating more sustainable technologies, processes and reusing products. Renishaw's products are well-placed to help manufacturers use fewer raw materials and less energy. The consequences of the engineering industry becoming sustainable are far reaching, so setting clear targets and pathways to achieve this is key.

Let's keep the conversation going...

Collaborative sustainability

To speak to our sustainability experts for advice about how your business can become more sustainable, or to get support during your first environmental management steps, visit www.renishaw.com/collaborativesustainability

SUSTAINABILITY

Our journey to Net Zero

Renishaw technologies for productive and sustainable manufacturing

Our portfolio of manufacturing solutions helps our customers around the world to minimise unproductive machining time, eliminate scrap components and reduce total energy consumption. Find out how to achieve more productive and sustainable manufacturing with Renishaw's industrial metrology solutions.

Our precision measurement and process control technologies enable you to predict, identify and correct process errors before they happen. This helps to eliminate scrap and, in turn, reduces the wasted energy, time and materials involved in producing those scrap components.

Factory automation drives operational efficiency by increasing machine uptime and overall output, without adding extra machines. Our probing solutions for the automation of CNC machining processes allow you to increase machine utilisation and operate 24/7. With process automation technologies in place, you can implement physical automation, which increases productivity and, in turn, can reduce waste and energy consumption.

Other products that can help to reduce energy consumption include our REVO multi-sensor measurement system. This allows a wide range of inspection tasks (contact, non-contact, surface and ultrasonic) to be carried out on a single co-ordinate measuring machine (CMM) eliminating the need for multiple dedicated machines. Fast yet accurate, multi-purpose CMM equipment releases valuable time and space in your factory for additional technologies or allows you to operate out of smaller sites, which can often require less energy to run.

Get improved battery life with QE series

Machine tool spindle probing technologies are key to process automation. Data relating to the condition of parts and tools, the performance of machines, process trends, interventions and the effects of temperature and humidity, all reflect what is happening at critical points in a manufacturing process. Data can be analysed and automatically adjusted for tool wear and drift, before a bad part is produced – all in the pursuit of the elimination of waste, re-work and manual intervention.

Our next-generation QE series radio transmission probing system provides reliable, automated on-machine tool setting, tool breakage detection, part set-up, and part verification capabilities. Our Probe Setup app delivers simplified set-up and remote diagnostics to all radio probes. Updates to the probes' electronics and radio transmission deliver an increase in battery life of up to 400 percent, which when used with the RMI-QE, offers an industry-leading battery life of up to five years based on typical usage.

www.renishaw.com/qeseries

"While we are immensely proud of the technological advancements this next-generation system delivers, we are equally proud of our ongoing efforts to reduce the environmental impact of our products. With the battery life improvements demonstrated here and with recent improvements to our OMP40 and OSP60 optical transmission probes, we are committed to minimising the environmental impact of our products."

James Hartley, Industrial Metrology Software Marketing Manager

SUSTAINABILITY

Our journey to Net Zero

Make better use of your shop floor with the REVO® system

Renishaw's REVO 5-axis measurement system features seven interchangeable sensor types on a single co-ordinate measuring machine (CMM) platform. The range of sensors includes tactile scanning, touch-trigger, surface finish, ultrasonic and vision measurement probes. Multi-sensor functionality allows you to do more with your CMM and remove redundant equipment from the shop floor, enabling you to make better use of the space in your factory. Using 5-axis CMMs in your production shop, instead of those equipped with three axes, also reduces the number of CMMs needed to achieve the same part throughput, due to the system's high rate of data capture.

RUP1 ultrasonic probe

Our RUP1 ultrasonic probe increases the multi-sensor capability of the REVO system, offering ultrasonic thickness inspection. Unlike many other ultrasonic systems, RUP1 does not require the use of water tanks or coupling gel to enable a good transmission of the signal. Instead, it uses an innovative elastomer tip ball to provide excellent coupling between the probe and the material. As a result, the RUP1 probe removes the need for skilled operators to interpret oscilloscope screens, and it releases shop floor real estate as immersion tanks and deep bore CMMs are not required.

www.renishaw.com/rup1

RVP vision probe

Our non-contact REVO Vision Probe (RVP) is also being used to help manufacturing plants throughout the automotive supply chain transform their production capabilities for a more sustainable, electric future.

The RVP is ideal for the inspection of electric vehicle motor stators.

www.renishaw.com/rvp

Reduce energy costs with FORTiS™ enclosed encoders

The FORTiS™ encoder series has been designed to improve machine tool performance, increase uptime and reliability, and improve the efficiency of assembly, maintenance and servicing, all of which can affect productivity and energy consumption.

Thanks to its advanced sealing system, the FORTiS encoder enclosure offers dramatically reduced air consumption and reduced air leakage from the air purge system, resulting in lower operating costs and greater system longevity. The FORTiS system offers a reduction of up to 70 percent in air purge requirements compared to other optical enclosed encoders, which can significantly reduce energy consumption over the life of the machine.

> *"Five years of accelerated life testing, under the harshest conditions has enabled Renishaw to develop and refine the new advanced DuraSeal™ lip seals. These offer excellent resistance to wear and machine tool lubricants, superior sealing and ingress protection up to IP64 when combined with air purge."*
>
> Ian Eldred, Principal Mechanical Engineer

www.renishaw.com/fortis

CASE STUDY

SUSTAINABILITY

Our journey to Net Zero

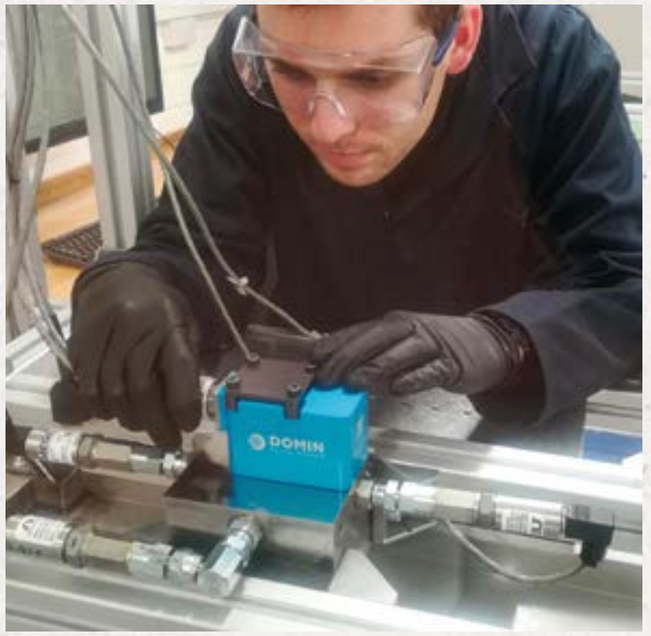
Helping our partners to manufacture more sustainable products at a lower price point

With a little help from our metal additive manufacturing (AM) technology, UK-based Domin Fluid Power Ltd. (Domin) has disrupted the hydraulics industry by redesigning servo valves from first principles to achieve a better performing, more sustainable product at a lower price point.

"We believed that metal AM was the final puzzle piece and we're confident we could generate true industry change and make a positive impact," explained Marcus Pont, Chief Executive Officer of Domin. ***"By combining AM with other innovations like high-speed motor control, modern electronics, big data and connected technology, there is real potential for disruption.***

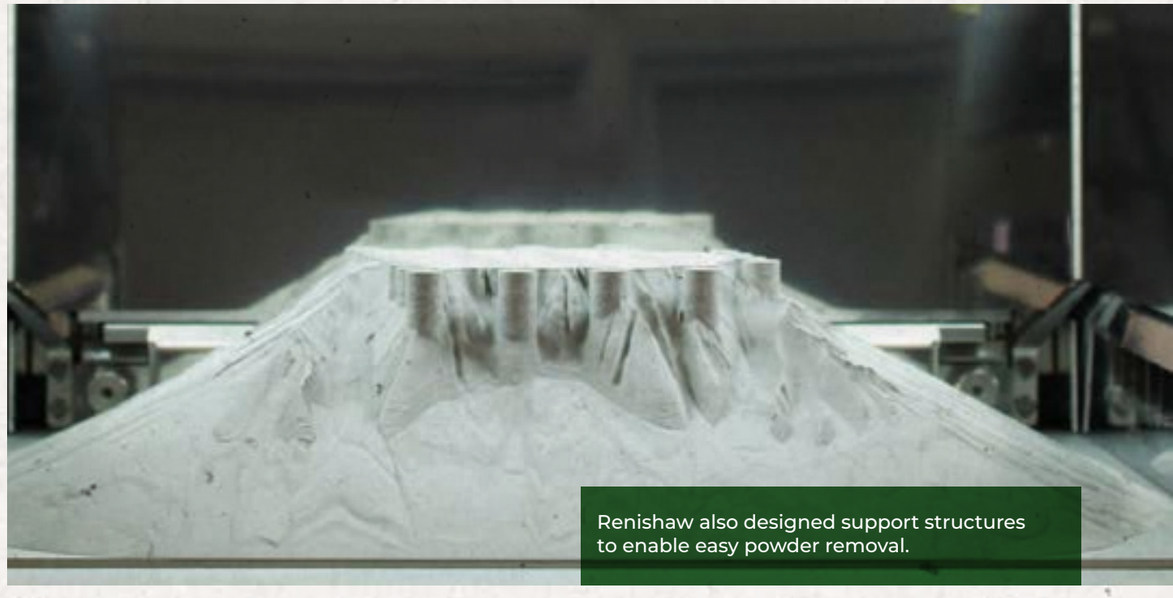
"There is a compelling reason disruption is needed — sustainability. In the US, the fluid power sector alone wastes about 300 million tonnes of CO_2 per year through system inefficiencies," added Pont. **"More efficient technology could make a real difference to global emissions."**

Metal AM involves building a solid metal component layer-by-layer from metal powder. Due to its inherent design freedom, additive manufacturing enables Domin to build complex parts, free of tooling and with minimal operations and assembly. For example, metal AM provides the ability to design complex geometries with internal features like lattices and cooling channels. It produces parts with good strength-to-weight ratio and requires less material than conventional machining, as it only builds structure where required.



To read the full case study, visit **www.renishaw.com/domin**

> ***"Every valve we sell saves over a tonne of CO_2 per year compared with alternative products. The next step for us is to improve the efficiency of hydraulic systems by 400 percent, which could make a real difference to global emissions."***
>
> Marcus Pont, Chief Executive Officer of Domin



Renishaw also designed support structures to enable easy powder removal.

INNOVATION IN ACTION

We proudly supported Sir Ben Ainslie and INEOS TEAM UK as they raced in the PRADA America's Cup World Series in December 2020. As the team's official precision measurement and additive manufacturing (AM) partner, we contributed our engineering expertise to help build and control their technologically advanced boat. To watch the video, please visit **www.renishaw.com/ineos**

Main image copyright: C Gregory.
Inset images credit: Harry KH/INEOS Team UK

SERVICE

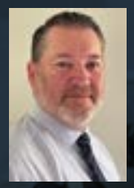
Local support on a global scale

Renishaw was established in the United Kingdom in 1973. Since then, we've grown considerably and now operate in 36 countries with 95 percent of sales coming from outside the UK. We focus on providing dedicated global customer support from initial sale and throughout the product lifecycle.

The range of after-sales support we offer, includes repairs, replacements, servicing and calibrations. In this feature, we're showcasing the support capabilities of three of our global hubs based in the Americas, Europe and Asia. These sites offer local servicing, repairs, calibration and support for all our customers, regardless of their size, value or location.

"What we provide in terms of customer experience goes far beyond innovative products and world-class manufacturing. Our partners trust us to deliver high levels of local support whenever they need it. The knowledge of our engineers, our service infrastructure and product range are hard to match and this, we're told, is what gives Renishaw customers their advantage."

Will Lee, Chief Executive Officer



"We believe that the differentiator between good businesses and world-class organisations is how well they support customers post-sale and throughout the product lifespan."

Martin Carr, Global Service Manager

Spotlight on our applications engineers

Apply innovation with the support of our global network of experienced applications engineers

Renishaw's user-friendly range of machine tool programming software makes it easy for anyone to develop programs for part set-up, tool measurement and automated tool offset updates. However, for challenging and complex applications, our global applications engineering team provides the complete solution with dedicated support, even after installation.

Our engineers have honed their experience in solving customer challenges over many years. In the following pages, allow us to introduce you to a few members of our global applications engineering family.

SERVICE

Renishaw GmbH, Germany

Offering enhanced support capabilities for mainland Europe

Over 25 years ago in Germany, we set up a support hub equipped with recalibration capabilities. To further enhance our support for customers in mainland Europe, we're currently investing heavily in our people and equipment. This will enable us to meet increasing demand and provide more proactive after-sales support.

Training for the growing team is provided by the existing group of skilled technicians at Renishaw GmbH, some of whom have over 20 years' experience with Renishaw.

"In the EMEA region we're investing significantly in service capability and innovating new services to ensure that customers can get the most out of our products," explains Rainer Lotz, President of our EMEA region. ***"We aim to give peace of mind that when service is required, it's delivered cost effectively, on time and with a simple, transparent process."***

"Providing excellence in service is a major part of the Renishaw commitment to our customers," continues Lotz. ***"Being able to support the product from the point of sale throughout its life and ensuring that, through regular calibration, it remains as effective as the day it was purchased is something we strongly believe in."***

Like the rest of Renishaw, our German hub is also constantly exploring possible initiatives that could support our business on its journey to becoming more sustainable. Minimising the shipment of products back to the UK for servicing is just one example of our commitment to keeping our greenhouse gas emissions down.

Repair By Exchange

One of the most popular support services we offer is Repair By Exchange (RBE). This means that if you need equipment replaced urgently to avoid costly downtime, a substitute unit could be with you the next day. This pioneering scheme allows us to quickly respond to your needs. When avoiding downtime is critical, RBE is often the preferred option.

With repair by exchange, our support teams can get a customer's machines up and running quickly, reducing downtime and avoiding the large costs caused by machines being idle for a long period of time.

Spotlight on our applications engineers

Andy Sage

Job title: Principal Applications Engineer

Length of service: 36 Years

Location: UK, EMEA

Andy supports the EMEA region on a technical basis, including training, visits and remote support.

"My first major success was working on the machining of aerospace engine cases on three large new vertical lathes for a major aerospace engine supplier. The success of using probing to control features using the 'test, cut and measure' approach allowed the customer to consistently hit the fuel consumption figures set by the airlines.

"Another key project involved me and some other colleagues visiting a major Japanese OEM to demonstrate using probing to set up axis pivot positions. This planted a seed in the customer's mind about how probes could be used to set up 5-axis machines."

SERVICE

Renishaw Inc, USA

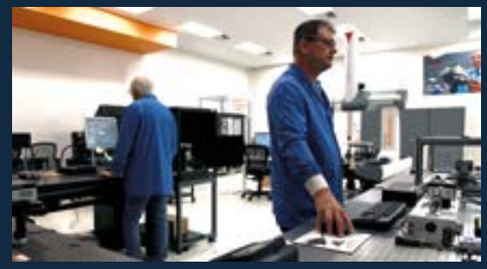
Experienced calibration specialists proud to service our North American customer base

Renishaw Inc's support hub can be found at the heart of our state-of-the-art North American facility, which opened in 2017 near Chicago. Our fully equipped Service Centre is run by 11 highly trained technicians dedicated to supporting our local customers as efficiently as possible.

We offer a wide range of testing, repair and calibration services, including Repair By Exchange options, to help our customers minimise downtime and enhance their productivity.

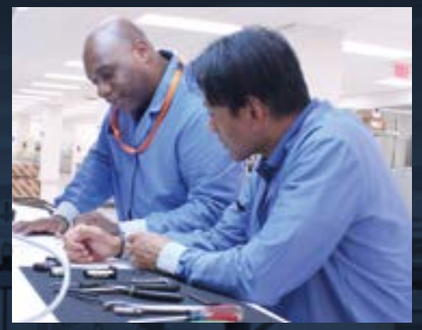
Calibration laboratories

Our calibration laboratory offers testing, repair and recalibration services to help our customers ensure that their Renishaw product is performing optimally throughout its lifecycle. Calibration services offered at our North American hub are certified to the highly recognised ISO 17025 standard by A2LA, and we offer expedited calibration services for fast turnaround. Our laboratory's environmental conditions are precisely controlled and stable over time to ensure accurate calibrations.



Skilled technicians at your service

The expertise of our American service technicians involves an in-depth knowledge of our product portfolio – something that we work hard to pass on to new technicians when they join the team.



Spotlight on our applications engineers

Mike Blaise

Job title: Senior Applications Engineer

Length of service: 26 Years

Location: USA, Americas

Mike's role at Renishaw involves machine tool product support, probe installations, customer training and applications.

"Something that I've learned over the years is to be patient and really listen when trying to understand a customer's problem. While our products can provide general solutions to a great many challenges, it takes a good applications team to fill in the gaps and serve up a complete solution – and that includes providing high-quality support after installation.

"In terms of products that are essential to my job, I rate Inspection Plus as the core of our machine tool software family. It's easy to learn, easy for customers to use and can be modified based on their individual requirements."

SERVICE

Renishaw KK, Japan

Celebrating 40 years of supporting our Japanese customer base

We firmly understood the importance of providing local assistance to our Japanese customers, which led to the opening of our Renishaw KK office in Tokyo in 1982. In 2022, this support hub celebrated its 40th anniversary; a feat that very few Western-based manufacturing companies have achieved.

Our long-standing business relationships mean that we have earned our customers' trust, assuring them that we will support them with immediate part replacements, where possible, and throughout the lifespan of their products.

Our presence in both Tokyo and Nagoya represents a level of customer support that is highly valued by our large machine tool customer base in Japan.

In 2019, we acquired a building in Nagoya to further enhance our logistic capabilities and support for customer solution development. In 2020, we opened a calibration laboratory, where over 1,000 recalibrations have already been carried out.

We're currently renovating parts of the building to accommodate stocks of our encoder and Equator gauge products from Tokyo and to further enhance our customer training and application development areas.

To learn more about the sales support available in your local area, visit **www.renishaw.com/support**

Renishaw KK offers local support, with sites in Tokyo and Nagoya. Here, you can see the main offices and staff areas in the new building in Nagoya.

We believe that success comes from patented and innovative products and processes, high-quality manufacturing and the ability to provide local customer support.

Spotlight on our applications engineers

Martin Summers

Job title:
Industrial Metrology Technical Manager

Length of service: 15 Years

Location: Hong Kong, APAC

Martin runs a team of applications engineers who support the Asia-Pacific region.

"For me, the most interesting applications engineering projects involve adaptive machining, using standard touch-trigger programming, which I've done in the 3C (computers, communications, and consumer electronics) industry, aerospace and even alloy wheels. My favourite project was with an aerospace MRO customer in Singapore. We grew the process together and ended up with an automated program where I created the adaptive cutting program, measured the part, updated the tool offsets, and re-cut if required before final inspection.

"Having a dialogue with the customer, producing an imaginative solution and then having the experience to deliver is highly rewarding."

RENISHAW
apply innovation™

Process control for your production line

Re-programmable gauging

Equator™ gauging systems

For applications where different parts are produced every few weeks, the Equator system's ability to switch quickly from one part to another has proven indispensable.

Its innovative technology is based on the traditional comparison of production parts to a reference master part. The re-mastering is as swift as measuring a production part and immediately compensates for any thermal effects on the shop floor.

www.renishaw.com/equator

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Click to download our software showcase magazine

RENISHAW
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Software showcase

Renishaw's role in the life of a machine tool

Ensure precise alignment at every stage of the CNC machine tool build.

Intuitive interfaces and a simple, convenient format make your job easier.

Find out how we support our machine tool builder and end-user customers.

RENISHAW
apply innovation™

DESIGN | BUILD | MACHINE | INSPECT

The total AM process chain

Can your partner for additive manufacturing (AM) provide end-to-end expertise and support?

Only one company in the 3D printing industry offers the technologies and expertise that provide both highly productive metal 3D printing AND control of all finishing and downstream processes.

For end-to-end process control of AM parts, speak to Renishaw now.

www.renishaw.com/amprocesschain

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