

**Increasing
manufacturing
efficiency and
driving down costs.**

**We'll help you
achieve growth.**







Networks, experts and knowhow

We share your ambition to make the most of new opportunities in manufacturing and engineering. In an increasingly competitive global market, you can gain a significant advantage over competitors using our specialist services and leading edge equipment. We have a highly successful track record and we are always looking for new challenges.

Partner with a university that has a reputation for being responsive to business, built on decades of successful commercial partnerships. We combine our knowledge of fundamental science and engineering with your industrial experience to deliver measureable commercial benefits. From small manufacturers to large multinationals, we work with a wide range of organisations and tailor our approach to each situation.

Innovation is essential to our success, so we invest in the most up-to-date analytical and processing research equipment. In addition to our expertise and facilities, we also have thousands of students and graduates in disciplines relevant to the sector that are eager to apply their knowledge and fresh thinking.

Experts in commercial application

You can call on our teams of specialists in areas as diverse as materials engineering, robotics, energy management and food manufacturing.

These are experts with a proven track record in applying cutting-edge research to products and processes that can improve your bottom line. You can also access our wider network of expertise in areas including management and leadership, employee wellbeing, facilities management, IT and events.

When working on particular projects, we can build multidisciplinary teams to suit your specific needs. These individuals and groups work with you to deliver solutions according to your time and budget constraints. Expect creative thinking backed by scientific rigour to help you generate significant and measurable impact.

Our approach is to work with you to understand your challenges and find a route that works in reality, not just in theory. Our clients often become long-standing partners as a result of this pragmatic approach.

Professor Papken Hovsepian is head of our Thin Films Research Centre and Nanotechnology Centre for PVD Research. Papken has more than 30 years experience in PVD development and has carried out pioneering work on the development of Cathodic Arc PVD technologies and systems leading to industrial implementation of the process.









One manufacturing partner countless benefits

By taking advantage of our networks, experts and knowledge, you can

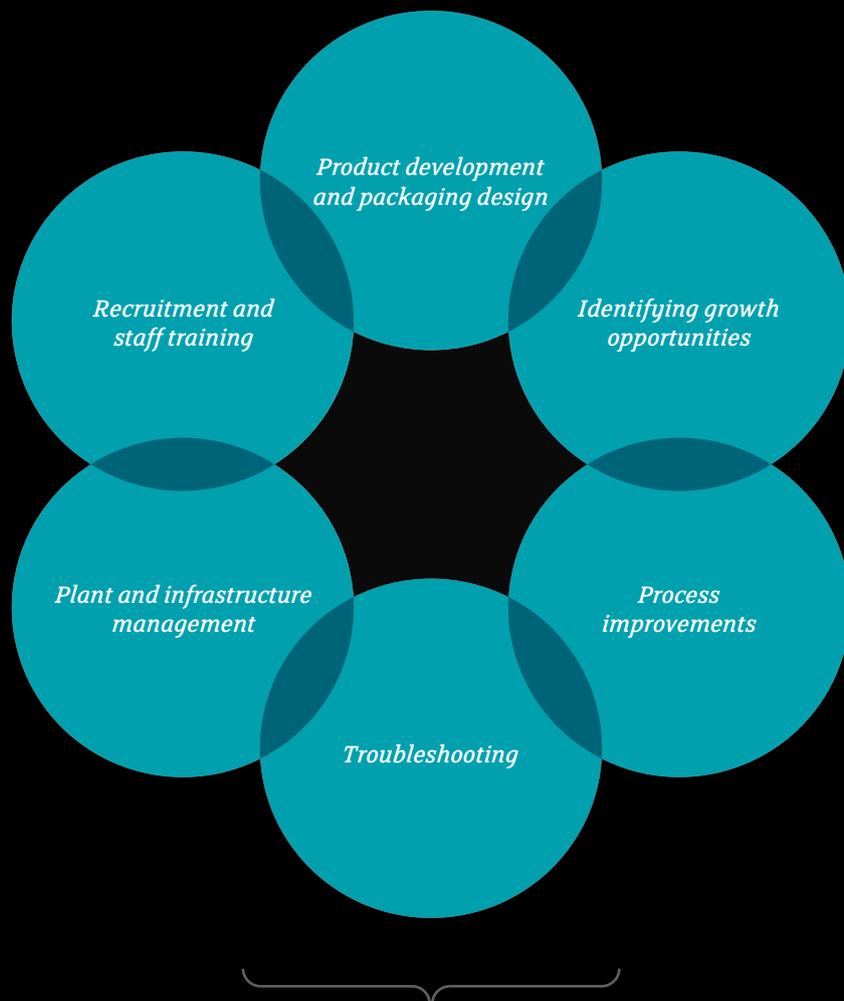
- make cost savings
- improve quality
- reduce waste
- develop strategies for growth
- apply the latest scientific techniques
- develop effective supply chains
- take advantage of market demands
- design, test and introduce new manufacturing processes
- save energy and minimise environmental problems
- develop innovative new products
- solve complex problems that involve multiple aspects of your business

Our expertise in design spans back to 1843 when we first opened the Sheffield School of Design. Since then we have expanded a great deal, but design has always been a core element of the University. We work closely with businesses in this area and have particular expertise in product and packaging design.

A close-up, slightly blurred photograph of a person's hand interacting with a control panel of a High Power Impulse Magnetron Sputtering (HIPIMS) machine. The hand is positioned on the right side of the frame, with fingers resting on a series of buttons and a small screen. The machine itself is a complex piece of industrial equipment with various pipes, cables, and metallic components. A prominent blue cable runs diagonally across the upper right portion of the image. The background is a plain, light-colored wall, and the overall lighting is bright and even.

Our High Power Impulse Magnetron Sputtering (HIPIMS) facilities and expertise are world-leading. This novel technique for surface pre-treatment and coating deposition is breaking new ground. It has been used in many different types of business worldwide, from the automotive industry to surgical tools and high-temperature applications such as turbine blades.





Improving your products and processes often requires more than one type of facility or expertise. By providing a network of highly specialised units we can offer you all the help you need to meet the challenges of your business.

We have over 30 years of experience working in partnership with commercial organisations such as Evenort, Joseph Rhodes, Al Materials, Wolstenholme Machine Knives, Swedish Posten, Road Tankers Northern, Aquaculture, Billerud and the Ministry of Defence.

Our cutting-edge services your competitive advantage

From research and consultancy to hiring our state-of-the-art facilities, a partnership with us can help you to overcome challenges and take advantage of new commercial opportunities.

Identifying growth opportunities

- market analysis
- the national Knowledge Transfer Partnerships (KTP) scheme*
- commercialisation and intellectual property (IP) opportunities
- student projects
- accessing grants for innovation

Product development and packaging design

- product design
- advanced coatings
- materials innovation
- mechanical and flow modelling
- metals, polymers, ceramics and glass development
- brand development and packaging design

Process improvements

- automation and robotics
- lean and Six Sigma
- systems modelling and simulation
- control systems development
- machine vision

Plant and infrastructure management

- construction and maintenance management
- energy management
- reclaiming waste energy
- factory layout optimisation
- corrosion and structural integrity

Troubleshooting

- materials analysis
- welding and structural integrity analysis
- tracing contamination
- quality assurance of materials supplied
- expert witness services

Recruitment and staff training

- student projects
- placement students
- graduate recruitment
- short courses, e.g. electron microscope training or Six Sigma
- part-time courses, e.g. MBA, higher degrees and part-time PhDs
- bespoke course development

*The government-backed Knowledge Transfer Partnership (KTP) scheme enables you to employ a graduate to help you tackle a business challenge. A KTP is a three way partnership between your company, the graduate and their supervising academic at the University. KTPs offer additional knowledge, technology and skills, and you'll also have access to our vast range of equipment and facilities.





Equipped to meet your challenges

Use our high-specification facilities and focus your budget on expertise to increase your success in innovation. We can offer you a wide range of specialist equipment and laboratories.

Our equipment includes

Advanced coatings

- differential scanning calorimetry (DSC)
- thermal analysis (TG, MS, TGA and GCMS)
- SIMS and Mossbauer spectroscopy
- SEM, optical imaging and analysis systems
- HIPIMS and PVD coatings facilities

Corrosion and structural integrity facilities

- accelerated environmental tests (including humidity testing and salt spray testing)
- corrosion testing facilities (including SVET, SDC, SEM)
- fatigue test machines
- scanning kelvin probe and scanning droplet cell
- microscopy
- infrastructure testing facility
- cements and mortar test facilities

Materials engineering and analysis facilities

- diffuse reflectance infrared fourier transform spectroscopy (DRIFTS)
- raman spectroscopy
- atomic force microscope (AFM)
- hardness testing
- infinite focus microscope (IFM)
- MALDI imaging
- scanning electron microscopy (SEM)
- x-ray fluorescence spectrometry (XRF)
- x-ray diffraction (XRD)
- rapid prototyping

Materials modelling and complex flows facilities

- UNIX workstations housed in a purpose-built, dedicated computing laboratory
- a beowulf cluster, currently comprising in excess of 150 CPUs







Tinsley Bridge Ltd wanted to develop high strength materials based on steel grades not typically used in suspension components, for heavy vehicle torsion bar applications to be used by the British Army. They worked with our materials and engineering specialists to develop new materials in response to urgent requests from their client.

Tinsley Bridge approached us after receiving urgent requests to improve vehicles used by the British Army in Afghanistan – such as the Warrior Infantry fighting vehicle. Previous improvements to the protection of the vehicles had significantly increased their weight, resulting in much higher loads being transmitted onto the vehicle suspension. This impacted on the height and mobility of the vehicles, putting lives in danger.

After successfully winning a SMART grant, the company worked with our materials researchers to develop innovative steel materials with world-leading strength. Developed using new heat treatment technology these new materials could allow suspension parts to operate at higher loads, without shattering. This will improve mobility and lift the vehicles higher off the ground, giving greater protection against mines.

The technology, developed in collaboration with the University, has found further applications in the marketplace, enhancing the company's advantage in this sector. In particular, truck manufacturers are increasingly seeking to invest in the research of weight-saving manufacturing materials to make vehicle improvements in response to rising prices in fuel and recent new emissions regulations.

Tinsley Bridge, in partnership with the University, is in a leading position to provide these new materials. As a result, they have gone on to secure a Knowledge Transfer Partnership lasting until 2015 to expand their development further.

'We have a very powerful collaboration with the University. We're connecting academic knowledge and the specialist facilities of a world class research institution with an innovative manufacturing company to create the competitive advantage necessary in global markets.

'Sheffield Hallam has a great external focus. As such they are able and willing to help industry engage in cutting edge R&D that would otherwise be impossible for an SME engineering company.

'We've worked with them to develop a steel which is stronger, more durable and can be used in high performance markets such as automotive, rail and defence. The new material could allow suspension parts to be 30 per cent lighter. It depends on the project and what flexibility you need, but it could be the equivalent of taking out 10 kilos in weight.'

Martin Filleul
Managing director
Tinsley Bridge

Case study – Tinsley Bridge

Rapid nanotechnology research into steel production delivers stronger and lighter suspension for British Army vehicles



Case study – Joseph Rhodes

**Our advanced computer
aided engineering
techniques helped to
secure £14 million
worth of orders**

An innovative new approach to Super Plastic Forming and Diffusion Bonding processes (SPF/DB), developed through a Knowledge Transfer Partnership (KTP) played a fundamental role in securing orders worth £14million from BAE for Joseph Rhodes Ltd.

The new processes also led to a prestigious Queen's Award for Enterprise for the company, which is one of Europe's leading manufacturers of metal forming, environmental, aerospace and clay working machinery, as well as of sub-sea structures for deep sea oil and gas exploration.

With the support and guidance of our academic experts, KTP Associate Karthik Ramakrishnan worked with Joseph Rhodes to help them introduce advanced Computer Aided Engineering (CAE) techniques of 3D modelling, animation, simulation and finite element analysis (FEA) with the overall goal of improving design innovation to reduce lead time and costs for new product development.

Joseph Rhodes was not new to the KTP approach, Karthik's programme was the company's second successful KTP experience and, once again, it has shown clear benefits for all three parties. The impact on Joseph Rhodes performance has been dramatic. Karthik now has a permanent role with the company as their finite element design engineer, and we

have become a regular source of advice and expertise for the company, from stress analysis to the use of consultancy facilities for activities such as testing rubber products and ceramic blocks.

Some of the specific achievements as a result of this innovative KTP programme, which was judged outstanding at national level and was shortlisted for the best KTP Award 2011, include

- £10million increase in annual sales turnover during the project period
- £14million of new orders with BAE
- the development of a new autoclave business and the chance for the company to work in partnership on a £750 million waste management project

Managing director Mark Ridgway is a firm supporter of the KTP programme, and the company has now completed four successful partnerships.

'The success of our initial collaboration with Sheffield Hallam is leading to additional programs of work and research. We now plan to build on the results of our pilot study by developing a protocol for a larger study to try and investigate the potential impact of a larger organisation intervention.'

Mark Ridgway
Managing director, Joseph Rhodes



Recent increases in the cost of fuel have led to greater market demand for aerodynamic tankers. Road Tankers Northern (RTN), the largest manufacturer of tankers in the UK, were delighted when research by our energy experts led to a significant reduction in fuel consumption for a major supermarket customer.

We used drag analysis more often associated with Formula One cars to examine the aerodynamic performance of RTN's iconic trailers - a short cab and a long cylindrical trailer. Using high-tech computational fluid dynamics, our researchers focused on the space between the two vehicles (cab and trailer) to improve aerodynamics.

Barnsley based RTN chose us on the recommendation of another regional business. They initially approached us with an open-ended brief: they needed a unique selling point that would distinguish them from strong competition abroad.

With tankers potentially on the road for 24 hours, any reduction in fuel usage would mean considerable cost savings for their customer base, and a lowering of carbon emissions.

Our business-facing team of energy specialists worked to understand RTN's specific requirements. Part of the challenge was to change the tankers' aerodynamic performance without changing the material, which was easy to weld, or compromise their iconic tractor-tanker design of a short cab and long cylindrical trailer.

'This project is a superb example of industry and academia working together to make a very saleable product. The company has been able to redesign its tankers with the proven knowledge that they are lighter and more aerodynamic which translates into greater fuel efficiency and carbon savings without loss of structural integrity.'

'Even the tiniest design changes can have a massive effect on the amount of fuel that is used by these tankers and we are planning to collaborate with the University on future projects to see if further savings can be identified.'

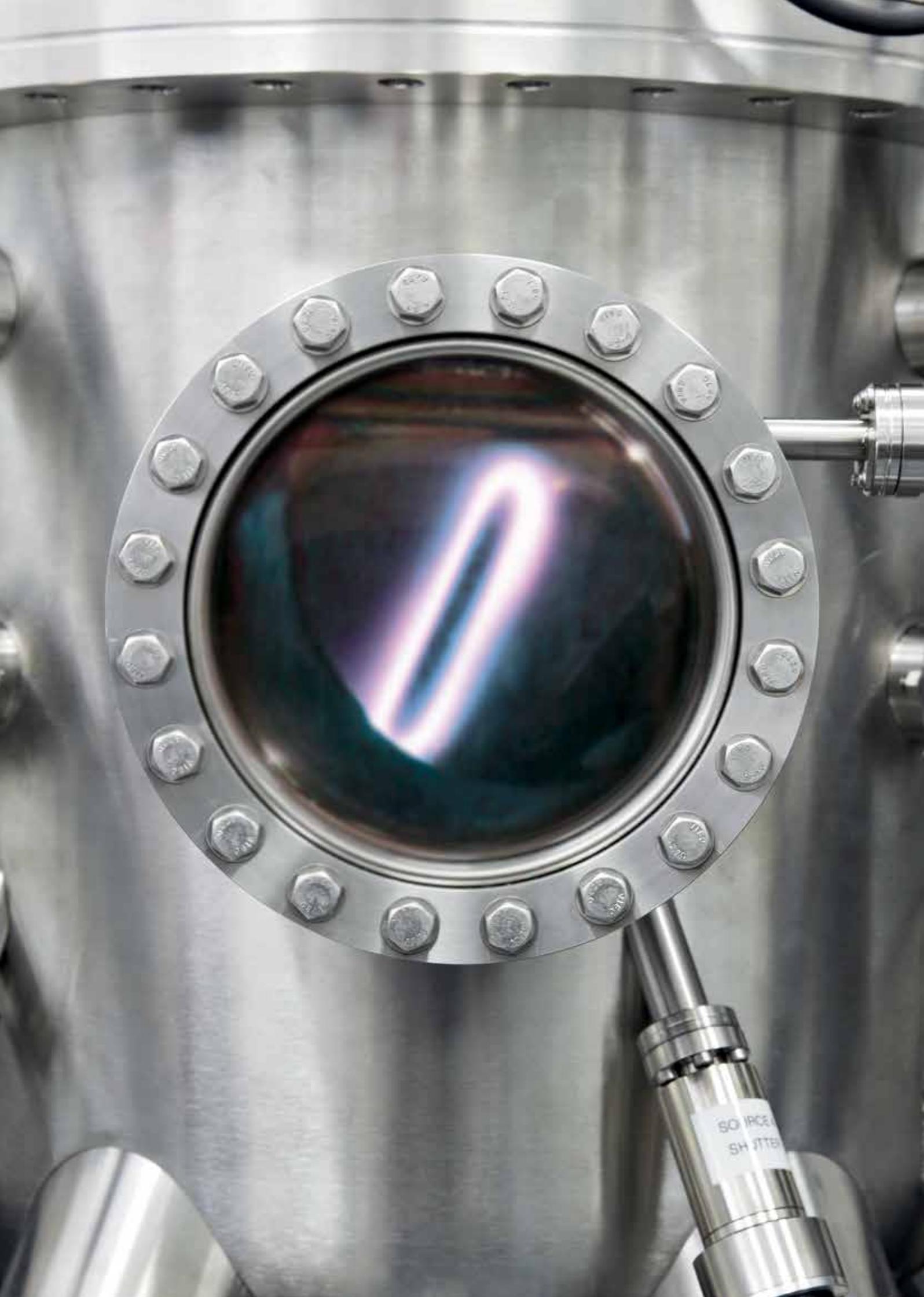
Don McKelvie
Operations director
Road Tankers Northern



Case study – Road Tankers Northern

Using motorsport-style drag analysis on tankers to significantly reduce fuel consumption





50 IRCE
SH JTB

Revolutionary new coating for satellite cryocoolers that allows us to see beyond the known solar system

The Space Science Technology Department of Rutherford Appleton Laboratory (RAL) went into partnership with us when we discovered component coatings better at maintaining the optimum temperature of satellite systems on Space missions.

Our experts developed a new coating for the cryocoolers – the specialist devices that regulate their temperature and enable them to function in space. They are now set to be used in a space observatory to help characterise the physics and chemistry of planetary atmospheres beyond the known solar system.

It means that we can help support the £9.1bn space industry, currently experiencing an annual growth rate of 7.5 per cent.

This innovation was made possible through a unique new coating technology called High Power Impulse Magnetron Sputtering (HIPIMS) pioneered by coatings specialists at the University. It allows for the deposition of very dense and highly adherent metal and ceramic materials.

We are a world leader in HIPIMS technology and have developed new applications for space, manufacturing, automotive, semiconductor and photovoltaic sectors.

‘For some years we have been aware of the potential for rare-earth coatings to enhance the performance of our coolers but despite numerous attempts were not able to implement a flight-worthy solution. Now Sheffield Hallam has developed an excellent coating suitable for a flight qualification programme.’

‘Directly through that work, our Stirling cycle cryocooler has demonstrated a clear advantage over other technologies at this temperature, and is the first choice for scientists currently entering instrument proposals for forthcoming missions such as EChO, a space-based observatory to characterise the physics and chemistry of exoplanet atmospheres.’

Dr Martin Crook
Rutherford Appleton Laboratory

Design innovation in laser welding reduces cycle time by 50%

When Knowledge Transfer Partnership (KTP) Associate Michael Bennett was testing equipment at Wolstenholme Machine Knives to find out the best way for welding different thicknesses of stainless steel, he began reprogramming the laser cutter and that led to his achieving an advancement that was previously thought to be impossible.

As the academic partner for the KTP, one of our researchers worked closely with Michael to provide technical advice. The result was a completely new process for welding the knives used in food processing and packaging and Michael's astonishing discovery led to an early Intellectual Property (IP) application by this long established Sheffield-based company.

Further developments of this new approach led to significant improvements in the production of bimetal scrapers, including a remarkable reduction of 50% in manufacturing costs.

The company manufactures and sells high grade straight, circular and formed knives for a wide range of industries. Under the guidance of University experts, Michael helped them to implement and embed Computer Numerical Control (CNC) bending and laser welding into tray knife and scraper blade production cells integrated with automated handling systems.

After his initial discovery, Michael went on to train the machine operators and to produce operator manuals, working closely with a range of company employees, including the production engineer and engineering director, to increase production efficiency.

Overall, the introduction of lean principles into the company's production processes resulted in a 50% reduction in cycle times and a remarkable 100% increase in equipment utilisation leading to a significant improvement in performance.

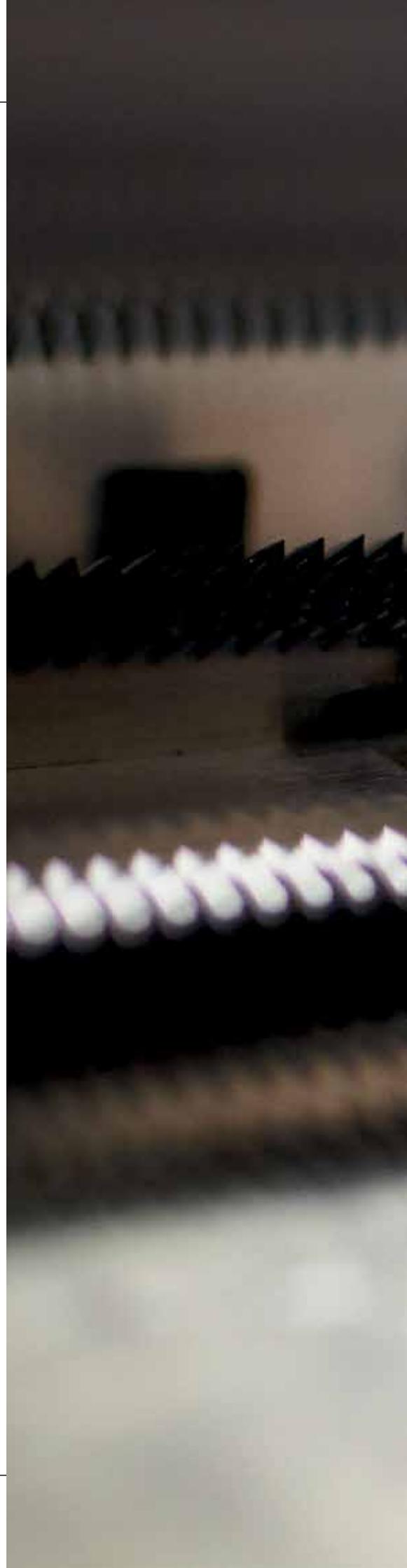
In addition, Michael went on to develop new laser etching techniques which could be applied to curved surfaces, resulting in considerable print cost savings.

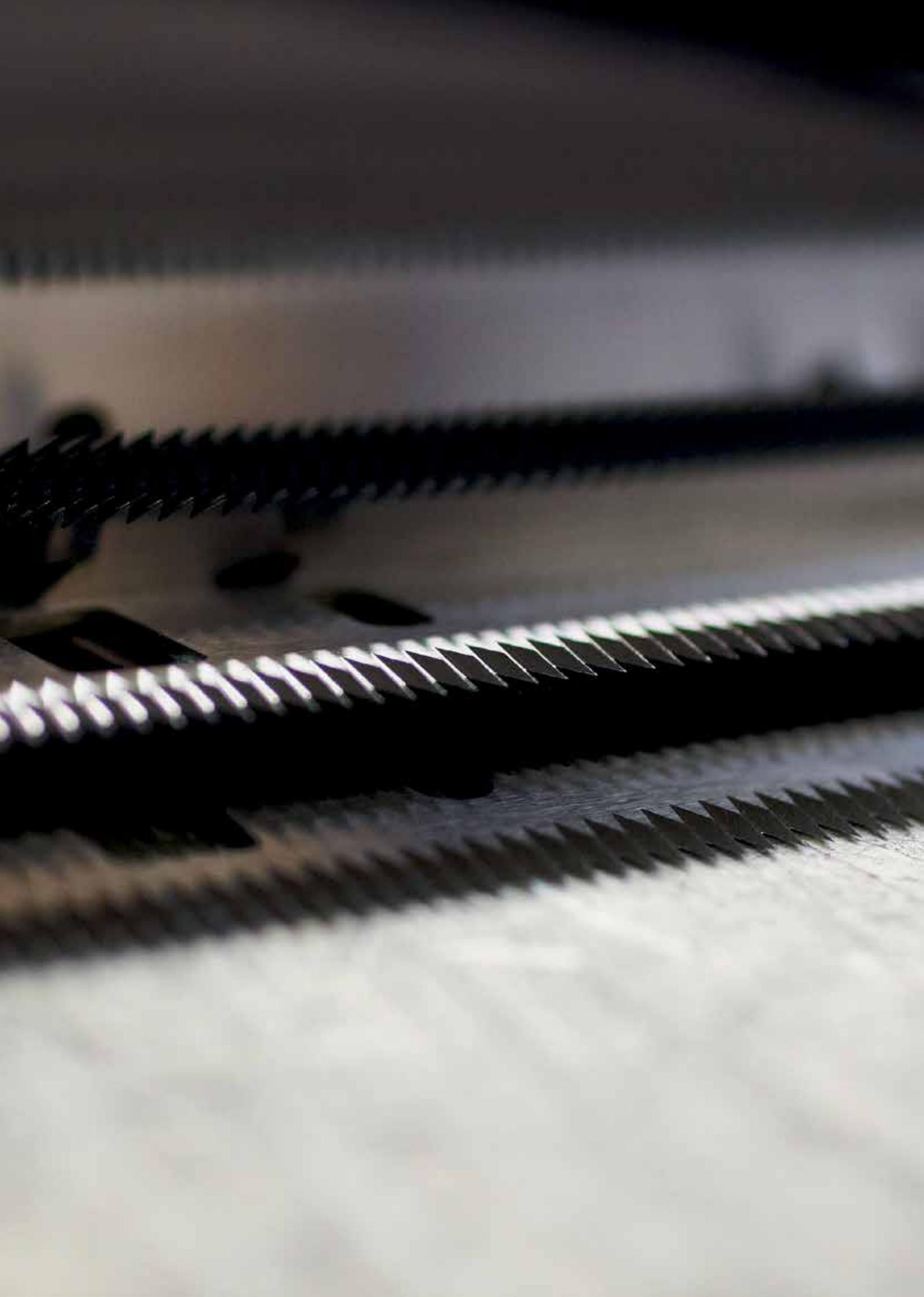
The KTP with us helped the business achieve a number of important objectives, including

- higher quality and consistency, through laser welding technology
- a 22 per cent increase in market share in its tray knife orders
- gross margin is three times as high in the scraper knife product range
- improved efficiency has led to annual savings of £70,000 in materials costs

'We are now producing better quality products in greater volume more efficiently – with no increase in labour costs. Lead times have also been reduced and we have seen a significant decrease in material costs.'

David Clowes
Engineering director
Wolstenholme Machine Knives





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