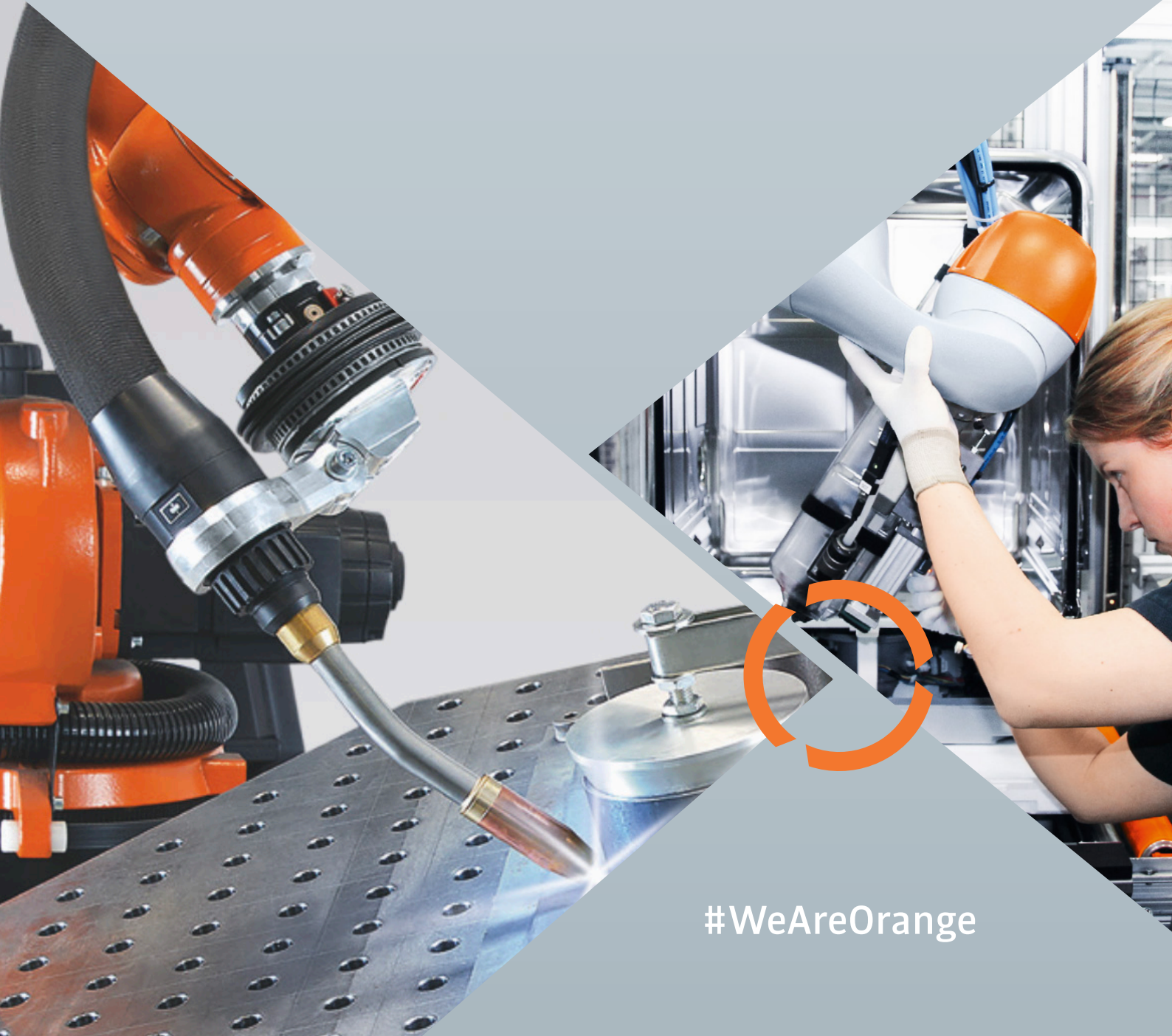


KUKA

Stronger, faster, more
productive_automation
for the new normal



#WeAreOrange



Robot sales, global and UK and Ireland, 2017-2019

Installation figures (robot units)	2017	2018	2019
Global:	399,640	422,271	373,240
UK:	2,380	2,415	2,021
Ireland:	155	151	201

Source: IFR

Note: The main reason for the declining numbers of new installations is the low demand from the biggest customer industries, in automotive and electronics. Car production declined in 2018 and 2019 (OICA production statistics) and electronics was presumably affected by the trade conflict between China and the US. Both affected by Covid. (Comment from IFR, International Federation of Robotics)

It's time for robots to solve industry's biggest challenges

At KUKA, we understand technology. We understand manufacturing and the business case for investing in automation. We understand the reasons for the reluctance to deploy automation solutions: time, cost, skills and short-term contracts with customers.

What we offer are real solutions to some new and critical challenges in our fast-changing world. Growing pressures from Brexit (labour), Covid-19 (operator safety), competition (Asia and reshoring), and food supply and prices are now driving much keener analysis of robots and automation.

We believe the time has arrived for robots to prove they can solve these challenges.

Covid-19 is forcing industrial operations to safely distance employees. In many cases, robots can replace every second or third human operator to maintain this distance whilst increasing productivity – an ideal solution for food sorting and packing operations, for example. Also consider the risk to industry of a new virus pandemic: fully automated operations can run 24/7/365 remotely, with no breaks. KUKA believes, largely for this reason, the food and beverage sector will be among the biggest growth markets for robots in 2021 – see the future of British and Irish manufacturing on page 4.

Brexit and stronger economies in Eastern Europe are removing our access to low-cost labour; for many businesses, this is a serious problem. Robots can help future-proof an operation from the vagaries of labour supply. It is often said that robot investment is a net job creator, rather than destroyer, as more high-skilled jobs are created. The proof is not always there but this report has hard evidence; for a clear example, read our customer story on ZND UK – page 36.

There is compelling, apolitical argument that the UK and Ireland need to increase productivity to compete globally and increase wages.



The International Federation of Robotics reports in September that there are 2.7 million robots in factories globally, an increase of 12% on 2018. UK robot sales dipped in 2019 while they rose elsewhere, including Ireland (see box). KUKA is committed to improving this, by showing industry how robots can help.

Consultancy McKinsey says that “automation could raise productivity growth globally by 0.8 to 1.4 percent annually” – read more on page 6. Our report has some real examples of this – from pages 24 to 37.

Our system partner model is KUKA's greatest strength. These specialist integrators 'deep dive' into customers unique technical needs and work with KUKA, delivering the very best solution – read more on page 12.

Robots are proliferating in novel areas, even where they had not been considered viable, until recently. As an example, several KUKA system partners and customers use our robots to make props, structures and statues for theatre and film. They need flexible, fast, accurate and bespoke solutions.

“We work in a very fast-paced industry,” says Mark Maher at Odyssey Studios in Limerick. “Often we have pieces that might take months to make by hand and with multiple changes to get right, they spurred us to go with automation.” (see page 26).

We believe it's time for robots to fulfil their potential for British and Irish industry. We hope you get a lot of useful information and value from this industry report.

The future of British and Irish manufacturing

Will Britain and Ireland's industrial estates be swarming with robots and automated machines in the near future, replacing thousands of assembly jobs? That is unlikely, but real change in automation is coming from macro- socioeconomic drivers.

The UK and Ireland rank low in the robot density global league table (robots per 100,000 workers), outside the world's top 15. That's partly down to cultural resistance to automation but also because these nations don't have the mass electronics and car-making industries of, e.g., South Korea, Singapore, Japan and Germany. The UK's manufacturing base is widely dispersed and SME-heavy; small companies traditionally have not bought robots, to the extent of industrial giants like Samsung and BMW.

Covid has had a devastating effect on manufacturing in Britain and Ireland. In Ireland, even with a strong post-Covid recovery, a best prediction for unemployment by the year-end is about 10%, more than double the rate pre-March.

But globally, the number of robots operating in factories in full-year 2019 hit 2.7 million, 12% up on 2018. Ireland is buying more robots but from a low base. While in the UK sales have dipped, the stars are aligning in 2020 that should see a big rise in robots in Britain and Ireland in the coming years, and KUKA is working hard to support this. Covid-19 has forced "safer distancing" at work. Companies are adjusting to this new normal; workplaces with high worker density, like meat packing and low-cost assembly, will look to robots to replace some workers and maintain safe distances between others.

KUKA believes the food and beverage sector will be the biggest growth market for robots in 2021. The future of manufacturing is also about being flexible and agile. KUKA has observed that those companies with robots were able to react better and faster to the crisis by being able to scale production up or down as a reaction to market demands.

Automation: changing the game

E-commerce is the standout success of the Covid crisis. Amazon UK sales surged 26% to £13.73bn in 2019; revenues that would place a UK-listed company comfortably in the top half of the FTSE-100. E-commerce means more robots. More of the cube-like order picking type for grocery orders, but also industrial robots and cobots for other packing and loading operations; all are in hot demand, simply to shift the greater volumes that are now being seen.

Logistics companies have also benefitted. According to McKinsey, in the US, logistics firms or in-house logistics units were estimated to collect \$12 to \$20 of every \$100 in e-commerce sales in 2019; a massive increase from the \$3 to \$5 from a typical "bricks-and-mortar" retail operation. Logistics firms are using some of this cash to automate, with more AGVs (automated guided vehicles) and more robotic warehouse stacking. Drones will also play a part; Tesco is about to trial a drone delivery service.

While the attraction of cheap labour in China, Vietnam and elsewhere will remain, manufacturing industries are seeking to shorten supply chains – which means more local production. Consider a large UK Midlands-based OEM needing approved parts that it currently buys from Asian suppliers.





An engineering firm in e.g. Wolverhampton doesn't need an automated, repeatable and zero-defect robotic process to win that business but, if it has one, its unit price will be much more competitive; plus, it is only a few miles down the road. But labour costs in the UK and Ireland mean that automation is essential in reshoring manufacturing at scale.

A more radical change in the make-up of supply chains in Europe and the UK is a very real prospect with three forces working in concert: Brexit, Covid-19 and environmental pressures. At present the factories of several big companies are heavily embedded in the UK; Vauxhall's Luton plant, BMW's MINI and engine factories, Airbus's wings in Broughton and more. Could these companies – and other multinationals – pull out of the UK, to avoid WTO tariffs if there were a No Deal Brexit and to shorten their own supply lines to sites in Munich, Toulouse and Galicia, as the environmental footprint of their supply chain is reassessed? Each one, and other automotive and aerospace companies, have specific reasons to be here, such as the work share agreement Airbus has with its four European countries, but these reasons are being put to the test by Covid-19 and possibility of a hard Brexit.

Medium- to long term, automotive manufacturing in Britain and Ireland (for components) will change forever as we transition from mainly internal combustion engines (ICE) to hybrid and electric vehicles, where the Nissan LEAF is the only electric car to be manufactured at scale in the UK.

The London Electric Vehicle Company and Arrival are about to manufacture electric vans in volume, and buses in Arrival's case (see page 34), but it's too early to say whether electric vehicles will replace the jobs and GVA of ICE vehicles.

Try before you buy

The High Value Manufacturing Catapult and other technology innovation centres are helping more companies to prove robot applications before industry adopts them. In parallel, more UK and Irish universities are using robots and cobots in research at the lower Technology Readiness Levels. Both are helping accelerate robot adoption. KUKA has the biggest collaboration footprint in low and high level research of the major robot suppliers, with c.35% market share in the last five years. More on the work of these technology centres is on pages 8 to 11.

Ireland is in a similar place to Britain. It is the second biggest exporter, after Germany, of medical technology in Europe and the second for med-tech jobs. The food industry is also very important. Covid is having a big effect and investment has weakened. Low-cost labour from Eastern Europe has helped keep Irish manufacturing competitive but Brexit and stronger Eastern Europe economies bring unavoidable change. Smart robot technology and advances in robotic end effectors and grippers, means that complex medical parts, for example, that were once only made by humans, can now be automated.

Manufacturing is being tested by big and very complex macro-economic issues but we expect robots to become more prevalent in industry, academia and society – especially with a new younger generation that readily embrace the technology.

Why robots and automation matter

Since the First Industrial Revolution, automation has boosted output, productivity, employment and national wealth. Robots and advanced automation, including artificial intelligence, have never been more accessible than they are now. Arguably, they have never been more vital, either.

It is a message that bears repeating: automation boosts productivity.

According to a 2015 London School of Economics report¹, which studied the impact of robotics on productivity across 14 industries in 17 countries between 1993 and 2007, robots raised those countries' average GDP growth rates by about 0.37 percentage points and productivity growth by about 0.36 percentage points respectively. Small numbers – but they add up. Over the 14-year period, additional growth amounted to 12% of total GDP growth and 18% of labour productivity growth in the countries studied.

McKinsey is even more positive. It believes that “automation could raise productivity growth globally by 0.8 to 1.4 percent annually”². If that is the impact across the whole economy, the transformation that could be achieved by individual businesses should be similar, and in many cases greater.

The proof is already here

There are ample examples of companies, especially SMEs, transforming their competitiveness, quality, productivity and profitability by investing in appropriate automation. This publication highlights several businesses for whom automation has been

transformational, including cider brewers Thatchers, who cut forklift truck movements by 50% while improving consistency and output in its palletisation/depalletisation cell, and Odyssey Studios in Limerick and Dublin, Ireland, which automated the production of scaled and full-size models for film, theatre and TV, enabling it to win bigger contracts across the world.



On a larger scale, UK automotive has invested the most of all industrial sectors in automating production lines but headcount, in most cases, has increased³ – showing that robots do not always mean job losses. ZND in Rotherham, manufacturers of temporary fencing, installed robots, increased capacity and sales and hired more people in sales and engineering (see more on page 36).

Automation: an opportunity for SMEs to grasp

In 2018, NatWest-sponsored research by Cebr⁴ said that SMEs could add up to £57bn a year to the UK's economy if they were as productive as similar-sized enterprises in Germany.

The research shows UK SME employees generate £147k worth of output per year on average – less than half that of their German counterparts' £335k/worker/year.

Automation can help transform even the very smallest companies. A UK business with 10 employees could increase annual turnover by £1.9m if they worked at the same productivity level as a German business; the figure rises to £4.7m for businesses with 25 employees⁵.

Small is beautiful – and productive

Automation need not involve large pieces of machinery or large investment. KUKA's KR3 Agilus robots have payloads of just 3kg and operate in cells just 600 x 600mm. It is ideal for businesses assembling small components that are tight on available space. Even more simply, a palletisation cell can free up staff from repetitive manual labour to conduct more productive tasks, while a robot palletises perfectly, time after time, 24/7 and year-round. It never gets bored or takes time off sick.

Technological advance under the heading of “Industry 4.0” has been a topic of discussion since 2011 when Germany's federal government launched the term. It is high time it moved off the lower reaches of the agenda and onto the shopfloor. Although automation and Industry 4.0 are not the same thing, an automated connected process is a big part of it.

Archie McPherson, CEO of High Value Manufacturing Catapult at Warwick Manufacturing Group, asks the simple question: “if you don't automate, where will you be in five years' time?”

¹ Graetz & Michaels, CEP Discussion Paper No 1335, March 2015: “Robots at Work”. London School of Economics/Economic & Social Research Council

² McKinsey Global Institute, 2017

³ <https://www.statista.com/statistics/387104/jaguar-land-rover-global-workforce>

⁴ Productivity in focus: Germany vs. the UK. NatWest Bank, 2018

⁵ *ibid*



Change is unavoidable: seize the time

If that question had been posed five years ago, it is doubtful that anyone would have forecast what has happened this year: Covid-19 has dominated 2020. The pandemic has shown the vulnerability of globe-spanning supply chains and has stimulated discussion of reshoring or “nearshoring” – bringing manufacturing back from low-cost countries and closer to the marketplaces. Controlling labour costs and maintaining competitiveness requires automation. Covid-19 has accelerated what was a rising trend; Richard Wilding OBE, Professor of Supply Chain Strategy, Cranfield University, said that discussions were already under way.

“We were starting to see increases in nearshoring; the current crisis has created the ultimate “burning platform” and we have been seeing, in some organisations, the equivalent of five years of implementation within a three-month period,” he says⁶.

Breakthrough technologies like 3D printing and automation of customised production are in their infancy. This provides British and Irish businesses with a golden opportunity to leapfrog a couple of generations of automation and catch up with Germany and other competitors – but it must be done the right way. Wasting money on confusing and expensive “tool proliferation” and what McKinsey describes as the “IT fallacy” – the idea that sustainable automation can be driven by IT alone – must be avoided.

With a range of products that extends from benchtop models like the KR3 Agilus to the 1300kg payload KR1000 Titan and its system partner program, KUKA is ideally placed to provide the right tools and advice to automation newcomers and improvers alike.

⁶ Quoted in eureka! 36 CatLiftTrucks Europe, 2020. Interviewed by R McCallion

Our commitment to British and Irish manufacturing

KUKA is a strategic partner of the Catapult centres (UK), Irish research centres and many British and Irish universities. This helps to get more working, system-proven automation solutions into the hands of nearly every manufacturing industry.

The iconic image of the industrial robot is welding body-in-white panels on a noisy car production line, sparks flying.

See beyond the car plant though, and robots are everywhere; packing product into bags, loading pallets, removing defective food from a conveyor, drilling holes in aircraft wings, blending sauces and soups, guiding parts to shopfloor assembly points. Look further and more exotic applications abound: medical robots assist surgeons with complex surgery, cube robots pick customer orders in fulfilment centres, service robots help the infirm, milling robots carve statues, and so on. More niche and enigmatic uses are constantly being devised, as researchers also experiment with affordable collaborative robots.



Image: Example of KUKA robots used in blood sample handling

How robots are applied by industry often begins in universities, at the lower Technology Readiness Levels, then in the higher TRL technology innovation centres – Catapult centres and others – where the new process is proven-out for commercial use. Britain and Ireland are especially good at both.

Every engineering-centric British and Irish university and the high value manufacturing research centres use robots in research. KUKA provides fully supported robots, integrated automation and consultancy to many of these institutions.

KUKA robots are installed in 19 of the 30 universities making up the UK-RAS Network, a connected group of robot and autonomous system research funded by the engineering council, EPSRC. Examples include the Edinburgh Centre for Robotics, a joint venture between the University of Edinburgh and Heriot-Watt University, and Cranfield University, which has a focus on human factors, ethics and safety in Human-Robot Interaction. The work of UK-RAS spans applications from space and aerospace to bioengineering, collaborative robots, autonomous systems and more, underlining that robots in Britain and Ireland today have moved far beyond the car factory gates.

In Ireland, University College Dublin, National University of Ireland in Galway, Technical University Dublin and the other big engineering schools are doing similar work – see page 11 for an example at the University of Limerick.

Proving for industry, derisking investment

Industry often needs to trial a new process before it incurs the cost and risk of installing it in a factory, where it might not run optimally, or even fail.

The High Value Manufacturing (HVM) Catapult centres help both big and small companies experiment with new technology before they scale-up for production.





Image: High Value Manufacturing Catapult
KUKA robots in use at the National Composites Centre in Bristol

Robots and experienced engineers are available to trial processes over-and-over, like an advanced technology playground, offline to industrial operations.

KUKA robots are working in projects at six of the seven HVM Catapult centres. All four of the Advanced Manufacturing Technology Centre (AMRC)'s franchises, in South Yorkshire, North Wales, Preston and Broughton, have KUKA robots involved in research, as have Irish Manufacturing Research, CONFIRM and QUB in Ireland. Much of the research is for aerospace and non-automotive industry R&D, further proving that robots today have a much broader remit than automotive.

Speeding up aerospace manufacture

The VIEWS project at the Advanced Forming Research Centre (AFRC) in Strathclyde has helped Spirit AeroSystems increase the rate of cost-effective, non-destructive evaluation and testing of the geometries and material properties of composite components in aircraft winglets. This accelerated their manufacture and helped Spirit select the Glasgow-based facility as its European R&D base.

Working with an aerospace company, the team at Factory 2050 has commissioned an automated cleaning and sealing system, using a KUKA KR60 on top of a KMP1500 AGV. This project will eventually demonstrate the flexibility of robots when mounted to an autonomous platform that is able to navigate using Simultaneous Location and Mapping, aka SLAM, technologies.

Nuclear finds that robots can't be beat

At the Nuclear Advanced Manufacturing Research Centre in Rotherham, robots are used in bulk additive manufacturing (BAM) research. The centre is developing techniques for leveraging robotic technologies for large-scale additive manufacturing applications.

AMOS, SafeG and NUCOBAM Horizon2020 are three projects that have or will be implemented using the centre's BAM capabilities.



The Safety of the Gas-cooled fast reactor (SafeG) project, funded under the European Horizon 2020 Euratom Work Programme, will support the development of nuclear CO₂-free electricity and industrial process heat generation technology, by developing innovative materials, technologies and processes, including additive manufacturing. Robots are used in these environments for repeatability, productivity and (especially) safety, as nuclear engineering can be a hazardous environment.

Machining and much more at AMRC

Factory 2050, part of the AMRC in Rotherham, is involved in virtually all aspects of robotics, including collaborative robotics, autonomous guided vehicles (agvs), cognitive robotics (AI applications in robotics), robot machining and drilling, fixturing and assembly, and applied in most manufacturing sectors.

One of the stand out installations at Factory 2050 is the KUKA Titan Accurate Robotic Milling System – ARMS – a collaboration between the AMRC, KUKA, Siemens and Electroimpact to create an accurate robotic machining platform capable of positional accuracies of less than 0.1mm. Its large working volume and flexibility opens up opportunities for new machining processes.

Food and beverage: The next automotive?

Automation professionals think that food and drink could be about to enter a golden era for robotic automation, due to Covid-19 measures and a shortage of low-cost labour.

At the National Centre for Food Manufacturing in Holbeach, Lincolnshire, a giant orange robot lifts and mixes huge vats of ingredients quickly and precisely, far faster than a team of people. The Titan is part of an ongoing research project by KUKA partner OAL to develop automated, accurate blending processes for high-volume liquid foods, like soups and sauces. The system is now commercially available and in use by food companies.

One high-volume food operation that has always foxed automation is sandwich making. KUKA partner Active8 has got one step closer to preparing sandwiches automatically, perfecting a skilleting line using two KR Agilus HM robots – taking and packing halved sandwiches in triangular packs. Tens of thousands of sarnies a day are prepared by some companies; the ability to package them automatically will be transformative.

Composites need speed = automation

For composites to reach their full potential, automation is crucial. In the automated preforming cell at the National Composites Centre (NCC), in Bristol, two KUKA robots work together using digital manufacturing principles to rapidly pick, form and place composite parts onto complex geometries. The plethora of end effectors and manipulators that are available to the robots enables the engineers to do everything from manipulate and stack the materials, trim to net shape, inspect, surface treat, monitor and form.

The NCC's Ultra High Rate Deposition Cell is a prime example of where advances in robotics and cell automation are enabling manufacturing throughput of composite wing structures that satisfy rate, performance and cost criteria for future build programmes.



Irish Manufacturing Research, CONFIRM and University of Limerick: Ireland's bedrock for smart factories

Ireland's manufacturing base is smaller than the UK's but companies are typically high tech. The country hosts a high number of medical technology engineering firms, for example. Irish Manufacturing Research based in Rathcoole and Mullingar and CONFIRM, a Science Foundation Ireland-funded research centre for smart manufacturing, based at the University of Limerick, are Ireland's equivalent to a Catapult centre. Both have several robot projects, including one that is evaluating human-machine interfaces for remote robotic arm operation.

KUKA has delivered two robotic systems to the Bernal Institute at University of Limerick, both for use in researching advanced materials joining. The first cell uses a KR210 with a KP1 single-axis positioner to perform Automated Tape Placement (ATP) of composite fibres. Attached to this robot is a sophisticated tape dispenser, which uses a high-powered laser to cure the thermoplastic prepreg material. The twin robotic system offers big advantages in manufacturing composite components, such as superior accuracy with high volume capability and the ability to produce more complex geometries.

In 2019, KUKA Ireland teamed up with KUKA Systems in Bordeaux to deliver a composite and plastics robotic joining suite. KUKA's Quantec KR210 R2100 Ultra is fitted with an ALEMA multifunctional end effector, used in the aerospace industry to perform drillings, riveting and sealing operation on fuselages.

Much research at the University of Limerick revolves around the drilling and fastening of composite alloy materials, along with ultrasonically welded composite, alloy and hybrid joints.

The university recently acquired a "PrePro 3D" system from CONBILITY GmbH that will help the team's capabilities in composite tape laydown and allow it to accomplish IR-assisted thermoset prepreg placement, including unwinding of the tapes' backing paper and dry fibre placement.

KUKA's technologies and knowledge are helping the University of Limerick take a lead in the research of joining composite materials.

Pharma and electric vehicles complete a full house

Pharmaceutical manufacturing is already very heavily automated; tablet production is designed for almost zero human intervention.

But even here, KUKA is helping industry find efficiency gains. AstraZeneca's work with the CoLAB (collaborative laboratory) High Throughput Screening system, supplied by HighRes Biosolutions, incorporates a KUKA LWR iiwa medical robot.

It is used for scientific research at the start of AstraZeneca's drug discovery process. The robot tests millions of compounds against the diseases the company is addressing and ultimately identifies and selects the best potential drugs as starting points for future medicine development in its R&D laboratories.

KUKA believes that industry must change to lower carbon emissions. One clear route is the electrification of transportation. "Unicorn" (£1bn-plus valued) automotive company Arrival is about to start building electric vans and buses and plans to develop a whole intelligent transport system. KUKA is delighted to announce it has secured the first robot contract for Arrival's first production facility. Read more about Arrival and KUKA on page 34.

Knowledge is king

KUKA and system partners

Rather than compete for business with integrators and systems providers, KUKA develops strategic partnerships that bring in-depth knowledge of applications and specialist skills to the benefit of customers across all manufacturing sectors.

When KUKA originally entered the field of robotics and automation in manufacturing it was primarily focused on the automotive sector. Automotive is still its main market but, in 2011, KUKA made a strategic shift in its overall approach. It publicly announced that it would not compete with systems integrators in market sectors outside its original core area of large auto manufacturers.

The strategy has paid off, for both KUKA and systems integrator companies.

A vital sales channel

“Today, 80 per cent of our robot sales are through system partners,” says Bernard Bagley, Head of Robot Sales, General Industry. “There are so many different systems, requirements and specialities; we cannot be masters of everything. Our partners have those skills – this knowledge is their core business. We work with them, we do not compete with them. That would be a recipe for disaster.”

KUKA system partners range from small, niche operators to quite large enterprises, operating in markets as diverse as entertainment and film, food and drink and the aerospace supply chain.

What they bring to the table is specialist skills and knowledge in their sector, for customers that need equipment integration and programming but also key knowledge of bespoke materials and geometries of products like medical prosthetic knee joints, for example. The development of bespoke software to drive special tools for small markets may not be worthwhile for a large, multinational company but such adaptability is bread and butter for specialist systems integrators.

Strength in breadth and depth

The system partner program enables KUKA to strengthen the breadth and depth of expertise available to its customers. Its sales force can talk about particular needs and introduce the specialist that have the skills to deliver the appropriate requirements and provide the best service and support.

“The robot element of an automated system represents about 25%; integration, tooling and task-related software represent the other 75% and that’s the integrators’ area,” Bernard explains.

“If you think of a palletisation robot, for example, it picks things up, swings around and puts them down – it’s quite simple, really. It becomes complex when you add upstream and downstream functions, from conveyors to sorters and other pieces of equipment. KUKA is a product-based business and our robots are virtually 100% reliable. The wider system can be very diverse and it’s our system partners who are best placed to deliver in the application area.”





The success of the system is borne out by the experience in Ireland, where MD Brian Cooney has led KUKA from a marginal presence to being one of the largest suppliers of automation, through the system partner initiative.

A two-way street

Sales leads are generated by both sides but the majority tend to come from KUKA, due to its size and reach. The system partners are independent and are not required to specify KUKA robots in every case but, naturally, the company expects that most robotic automation deployed will be Orange.

KUKA has a structured program; at the entry level, it builds a relationship. That can include giving a new connection a KUKA robot cell to explore and learn about – often to the delight of the integrator, who may not previously have had such support from other companies. KUKA also holds regular training days and conferences for its partners.

“It is a tiered structure,” says Bernard. “We encourage and support our system partners up to the Platinum level, which is based on the number of robots they sell.”

As time goes on, the relationship becomes closer. KUKA does not merely introduce a system partner, wait for the orders and then deliver a new batch of robots at the customer’s door for the integrator to get on with integrating; it encourages an open and symbiotic relationship.

Constructive engagement

“We try to ensure that our sales team is also involved through to the conclusion of the deal with the end customer,” Bernard says. “Leads are the currency of the relationship. The KUKA name generates a lot of trust and we look at the applications and decide who among our system partners is best suited to the task. Ensuring that our sales team remains engaged throughout the process means that we can help to identify potential issues and devise solutions, before they become problems.”

Working with KUKA often helps the system partner to “punch above its weight”; having the support of a large company can enable them to acquire business they would not otherwise have won – and customers can have confidence that even a small, specialist company will be able to deliver, including novel ideas and solutions.

“Our system partners often come to us with enquiries. That’s the strength of the relationship: it’s win-win-win, for ourselves, our system partners and the customers,” he concludes.

From Agilus to Titan

KUKA has a solution for all

KUKA's robot range extends from bench-tops and cobots to the heavy-duty KR 1000 TITAN, which can lift loads of up to 1300kg.

They are used in industries from food and beverage to space satellite construction and advanced engineering. They are integral to Industrial Internet of Things and are instrumental to the progress of Industry 4.0. Key to KUKA's success is how it delivers its broad range of solutions, either directly or through its System Partner program.

KUKA has been at the heart of robotics and automation in manufacturing since it launched FAMULUS, the world's first six-axis industrial robot, in 1973.

Since then, it has innovated with the first offset wrist robot (IR 6/60, 1976) and, the KUKA LBR 3 in 2004, the world's first collaborative robot – a robot that could operate alongside human workers without cages or protective equipment. KUKA broke further new ground with its **TITAN** robot, which gained an entry in the Guinness Book of Records as the largest and strongest six-axis industrial robot in the world. Recent additions include the **KR QUANTEC** robot family and the **KR AGILUS** small robot series.

Innovation, experience and collaboration

KUKA has also innovated in the way it sells its products to the market. While it maintains its direct connection with automotive OEMs, including running an entire Jeep assembly plant in Toledo in Ohio, USA, all other segments are served by the System Partner program, in which KUKA actively collaborates and does not compete with systems integrator segment specialists. Its Platinum Partners in the UK and Ireland include CNC Robotics, DesignPro, Loop Technology, SCM Handling, Tricon Automation,

Pilz Automation Ireland and WestRock Automation – many of whom have projects featured on pages 24 to 33 – and another 22 firms, making 26 partners altogether. They all have a depth of expertise of their core markets that, combined with the knowledge of the world's leading innovative robot manufacturer, gives the customer the best solution possible.

A range beyond the familiar

Industrial robotic assembly lines, typically with a series of cells performing welding, joining and other repetitive tasks, are now a familiar sight via movies and the internet. But automation has reached far beyond dirty, difficult, dangerous, routine and repetitive tasks. They have now been joined by bespoke manufacturing, detailed finishing (as with model making for movies), advanced composite construction, packaging automation and more.

It is becoming as common to see a small, bench-mounted cobot working alongside a human, without a protective cage, as it is to see production lines made up of fully-enclosed, heavy-duty welding, filling and packing cells. The availability, suitability and falling costs of robots and automation systems means that they are realistic considerations for all sizes of business, from SMEs to global OEMs.

From small, fast cycle to large, heavy duty

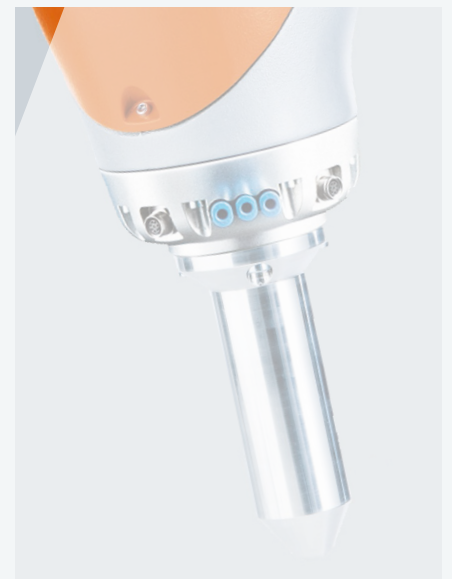
KUKA's **KR3 AGILUS** range is an ideal solution for the manufacture of small components and products in restricted spaces. Its footprint is just 600x600mm and it shares a common mounting base hole pattern across the whole AGILUS family – a feature that makes it easy for users to relocate their existing robot equipment and to renew and upgrade, as their needs evolve.

These robots have a very low moving mass, which allows for high-speed operation that means shorter cycle times. It is a versatile machine that is suitable for applying parts, painting and gluing; assembly of small components; palletising and packing; handling of small components and measuring/inspection.

For many companies, palletisation is one of the first processes to be automated. AGILUS robots are suitable for small and light packaging tasks but larger and heavier operations require something more, such as the **KR 700** series.

As its name indicates, it has a 700kg capacity and the reach is 3200mm. A separate story in this report describes how the acquisition and installation of a dual-function palletising/depalletising cell at the Thatchers Cider plant in Somerset helped to cut forklift truck movements by 50% and improved productivity and quality, compared with the previous manual operations. The cell is composed of two KUKA robots: a KR 700, which lifts up to six cider kegs at a time, either full or empty. The second robot, a **KR QUANTEC 120**, lifts or places intermediate layer boards, positioning them precisely, time after time. As with a convoy, the speed of operation is determined by the slowest element; the KR 700 is capable of 17 work cycles per minute.

The **KR QUANTEC** series is not just an assistant. With a payload range of 120kg-300kg and a reach of up to 3901mm in the KR QUANTEC Ultra, it is quite capable of being used in cells and to perform tasks in its own right.



Fit for the flexible future

Manufacturing does not fit into neat, compartmentalised boxes. Operations and functions overlap. As the UK has seen during the Covid-19 crisis, a Formula One Grand Prix racing team can be called upon to design and deliver urgent medical equipment and a garment manufacturer can turn their hand to the production of personal protection equipment.

Production lines aren't static; they have to be agile and adapt to the manufacture of different SKUs or finished products. Batches-of-one are becoming more normal.

Similarly, KUKA robots often overlap, in size, payload and function. The KR AGILUS range at the smaller reach/payload end of the spectrum is complemented by the **LBR iiwa** for small spaces. It is a human-robot collaboration (HRC) unit, or cobot, designed for lightweight and highly sensitive tasks, performed in close proximity to human workers. It is the world's first series-produced robot of its type. It is available in two versions, with payload capacity of 7kg to 14kg and 800mm-820mm reach.

The **KR CYBERTECH** range is a multi-role workhorse for low to medium applications. With a payload of 8kg to 22kg and reach of 1612 to 2013mm, it has a compact footprint but is capable of handling large components. It can also be equipped for machining, assembly, palletising and arc welding. These robots can be mounted on the floor, ceiling, wall or installed at an angle.



The smaller **KR CYBERTECH nano** has a lighter payload (up to 10kg) and reach (1420-1840mm) and has the same spectrum of application as its larger sibling, but its compact dimensions – with the smallest in-line wrists in its class – means that it can function within tighter operational envelopes.

The **KR CYBERTECH ARC** product family is specifically designed for continuous-path applications, such as arc welding or the application of sealants or adhesives. It can be set to a fully-horizontal reach of 2101mm.

The next level up is the **KR IONTECH** family, designed for medium payloads of 30kg-70kg, with 2100-3100mm reach. It has a small footprint for optimising space and the Foundry option is specially protected for operating temperatures of up to 55°C.

Beyond the QUANTEC range, in payload and reach, is the **KR FORTEC** cluster of six-axis robots, which are particularly suited for heavy-duty assemblies. The name is a combination of force, or strength in operation, and technology. It is already a familiar sight in automotive assembly plants, having been selected by a number of carmakers because of its suitability for intelligent system concepts.

The latest KUKA addition is the new range of SCARA (Selective Compliance Assembly Robot Arm) horizontal jointed-arm robots. With a reach of 500-700mm, they are ultra-compact and have an extremely short cycle time: 0.36 to 0.38 seconds. They are designed especially for automation in cost-sensitive markets, like pick-and-place applications.

Equipped for connected factories

Technology and connectability are key features for manufacturing now and even more in the future, as artificial intelligence gains ground and fully-connected Industry 4.0 factories become reality.

Every KUKA robot is delivered with controllers and a software package for basic operations. But they come with something else, which doesn't have a price tag but is invaluable: expertise.



“Before we deliver a robot to first-time users, especially, we undertake an audit,” says Alan Oakley, Head of Business Development – Education and Research with KUKA. The objective is to ensure that the customer is getting the right equipment for their needs. KUKA wants to sell robots but it also wants to build long-term relationships with customers – and that means making sure that the product is 100% right for its purpose, will do what the customer needs, and at the right price.

In all manufacturing sectors except for automotive, the next step will be to introduce a system partner – third-party businesses that have been vetted and trained by KUKA – who will specialise in systems integration, including the appropriate software, tools and support.

These partners are an essential part of the KUKA offer (see from page 24).

“Eighty per cent of our sales are through system partners,” says Alan. “We work as a team, as a family. It's not all about competition, even between KUKA system partners, who may indeed compete for business from time to time. It is about shared resources and sharing problems.”

Working together for comprehensive support

Competition improves the breed but working together can help solve challenges, as well. The KUKA range is nothing without expert, integrated support. KUKA makes sure that its system partners are fully immersed and informed about all aspects of its equipment.

“We provide comprehensive training to our system partners and also to organisations like the High Value Manufacturing Catapults in the UK, and their equivalent in Ireland, and encourage systems integrators we work with to engage with the Catapults and encourage SMEs to do so as well,” Alan says. “We also provide robot training for customers, and the systems integrators undertake the cell training on the total solution, including PLCs, conveyors and ancillary systems.”

In summary, whatever robot a customer begins with, the relationship with KUKA is not sales-centric. With a very comprehensive range and support infrastructure, owners and operators can be confident that there is a solution and system that will be right for them, whatever their circumstances.

Why choose orange?

Trust, partners, people

Industrial robots must not fail. A stalled production line can cost tens of thousands in lost revenue every minute. The technology embedded in industrial robots today is so good that all the main robot manufacturers offer capable, high quality products. So why choose orange?

KUKA's offer is based on three key factors:

1. Trust and the best advice, even when counterintuitive
2. A network of expert system partners
3. Excellent people

1. Trust, ahead of sales

Robot installations can be complex and costly; high success rates are expected. Companies new to automation may believe that a robot or robot line will solve a problem and improve their KPIs overnight, as if by magic.

But not all problems are suitable for a robot solution. Alternative automation including combinations of linear actuator drives and pneumatic actuators, may be more appropriate – or indeed, a different project within the plant may prove to be better suited to robotic automation and yield a better ROI (return on investment) than the initially-identified challenge.

“Automation solutions are not about selling a product in a box – anyone can do that,” says Brian Cooney, Managing Director, KUKA Ireland.

“Until you walk the site and make a full technical assessment of what the customer is trying to do, you can't help them, and sending any kind of estimate can be disingenuous.”

Walking the shopfloor to fully assess the application means that companies can be given informed and appropriate advice on what can be done with robotic solutions or even if an alternative solution would be better.

This thorough and honest approach to commissioning automation gains trust.

“Sometimes, we have to decline and admit that a project is not for us because it won't work as a robotic automation solution,” says Bernard Bagley, Head of Robot Sales, General Industry. “We may not sell a robot on that occasion, but customers absorb our advice and frequently return with a more viable application. Our approach builds trust and long-term partnerships.”

KUKA regards customer service as vitally important; its expertise goes beyond the reach, payload and price of a robot. KUKA and our system partners advise on return on investment, financial models, floor space requirements; whether the installed machines are compatible with proposed automation equipment; software; commissioning time; and more.

This is the information the customer needs to make a balanced, value-based decision. When a new customer invests, a customer service engineer is assigned to provide daily consultation.





A conversation about buying a new robot is just the beginning. Bernard says: “The essence of #WeAreOrange is that our salesperson is just the start of a journey. Our customer service people, applications engineers, system partners and their teams are there to help you make your business successful. It’s not always easy but success is our goal.”

2. Our system partner model works

Only 20% of KUKA’s sales are direct, primarily to automotive OEMs. The majority are made through system partners: companies that are experts in engineering specific industrial applications and are an integral part of the KUKA offer.

The variations and complexities in automated solutions are almost innumerable. No two projects are identical, which makes automation a challenging, but very interesting, branch of engineering.

A provider has to give customers precisely what they need. The solution may involve very specific picking / moving / loading / packing and combined criteria, with reliability and accuracy as close as possible to 100%, zero defects, and 24/7 support.

KUKA delivers all of the above, in no small part because of deep partnerships with expert system integrators. CEO Jeff Nowill thinks of the system as a true family; KUKA, system partners and customers solving problems together, each bringing their own expertise to bear.

“We win work from KUKA because we have deep experience in the medical device market, and they win business from us because they have expertise in robot engineering—it’s a symbiotic relationship,” says Redmond McDonnell, CEO of DesignPro, an automation designer and provider in Ireland.

3. People make the difference

KUKA makes sure that sales and customer service work closely together. Others may keep them separate; customer feedback has steered KUKA to operate them side-by-side. The team will weave itself into the fabric of customer companies during projects that can have six-, 12-month or even longer lead time.

But perhaps the key differentiator is the people. KUKA’s training is exemplary, with regular product communication videos and in-person training. Its team has strength in depth, with high degrees of technical knowledge blended with personality, customer empathy, and a commitment to hard work. KUKA has developed a its own method for hiring employees with the right blend of technical and personal skills.

“We need excellent technical skills but people also have to fit smoothly into customer projects, which can be very demanding. KUKA has worked hard at developing the right mix in its personnel,” Brian Cooney concludes.

Choice means finance is no barrier to automation

Cost can put companies off from seriously considering investing in automation – but frequently the understanding of costs and affordability can be unfounded and the range of finance choices available is wide and flexible.

KUKA goes a long way to help customers acquire the right robots and automation equipment for their business, from audits that assess the need, advising on the correct payload and reach for the job, through to introducing system partner integrators to make everything work in harmony.

But KUKA is not a bank. However, KUKA produces robots that hold their value, which makes them an attractive proposition for financing.

“We are not offering a servitisation business model in the general industry segment and nor are we in the finance business,” says Bernard Bagley, Head of Robot Sales, General Industry. Only the largest companies are likely to consider the outright purchase of brand new robots. For most companies, especially smaller ones, the availability of finance to spread the cost will be a crucial consideration. It may even make the difference between automating and not.

Incentives available

The UK government has offered a string of incentives, including the Annual Investment Allowance, which allows the purchase of plant and equipment including robotics and automation to be offset against corporation tax.

The annual limit was up to £200,000 per year, but since 2017 that has been increased to £1m until January 1st 2022 and – perhaps more importantly – businesses are currently allowed to offset the entire purchase price of qualifying assets to be written down in a single year.

Cars are specifically excluded but, in the case of automation equipment, a million pounds could buy a lot of robotic cells.



However, most companies are not in a position to buy capital equipment outright so financing is often used. Many financing options are available and, with fintech growing, there are even more. In 2019, members of the UK Finance and Leasing Association (FLA) loaned a total of £36bn in asset finance to businesses, 20% of which was to SMEs.

The £36bn total represented 37.6% of all UK investment in machinery, equipment and software. By sector, manufacturing, construction and “other production” amounted to 21.4% of the total; by non-vehicle asset category, plant and machinery led the way, with 21.4%; IT represented 8.3%; and business equipment amounted to 7.2% – adding up to about 40% of funding of all business assets, or about £13bn.

Asset finance: no need to put the house on the line

Rather than simply talking of HP (hire purchase), lease purchase or loan finance, the preferred term today is asset finance. Like any loan, several financing options are available to suit the customer, offering varying deposit sizes, repayments, contract lengths, and final balloon payments. Among its advantages for an SME, especially, is the fact that the asset itself is usually the security and it is not necessary for controlling directors to accept a charge over their home.

In order to qualify, assets must satisfy what lender Lombard calls the “DIMS rule”: they must be Durable, Identifiable, Moveable and Saleable. Robots and their associated automation systems clearly qualify under the first three headings; they are not typically heavy plant and machinery, such as presses. Saleability is now a significant factor, too, as the demand for second-hand equipment has grown and continues to increase.

Increasing saleability means that residual values are higher, which leads to more affordable leasing payments and more flexible financing terms. If a company has won a contract for supply to a large customer that is only for three years, for example, the risk of being landed with expensive equipment with nothing to do, at the end of the term, is reduced by something called an operating lease (note that different providers may have different terms).



An agreement that will finance the necessary capital investment is structured to take into account the term of the contract and the likely sale value at the end of three years. If the contract is not then renewed, the equipment can be handed back.

Alternatively, if it's renewed for, say, another year, the lease may be extended at lower payment terms. The provider knows the contract is secure for three years, at the end of which the equipment will be worth, say, £50,000. The company can then make a balloon payment to keep it or hand it back with no further responsibility. If anything goes wrong, the asset is the security: the provider is covered, the company has the equipment it needs and is able to boost revenue and productivity.

Leases can even be structured to take seasonal variations into account and ancillary gains, such as energy savings, in assessing affordability.

And now fintech providers can offer asset finance quickly, where a pool of credit-rated investors rather than the bank's balance sheet, is the creditor. Fintech platforms offer fast decisions using an app that they claim is much faster than a normal loan application.

The range of options are now huge. Professional advice should always be taken, to ensure the best deal for individual circumstances.

Bounce-back sectors, factory safety and our versatility give KUKA a bright future

2020 was a brutal year for manufacturing. It caused companies to reconsider what they make and how they supply it. Robot sales suffered but Covid-19 has actually made many realise the essential role of robots in industry; improving safety as well as speed and productivity.

By Jeff Nowill, CEO, KUKA Robotics UK

Against expectations and despite all the positive messages about Industry 4.0, 2019 was a disappointing year for the global robot industry. Everyone was gearing for an upshift, which did not materialise. Sales were down on 2018 and, at KUKA, we adjusted our forecasts for Q1 2020. But no-one in our industry was prepared for Covid-19 and its devastating effect on business.

The big robot suppliers today are forecasting sales in a band of between -20% and -30% against their budgeted numbers for the year. Notwithstanding one or two anomalous orders in Q1 and Q2, everyone is in the same boat.

Many good projects at KUKA have been deferred but, thankfully, few cancelled outright. It is a very difficult time for colleagues in the manufacturing and logistics sectors and many people are concerned about their jobs. Employment will suffer but I am proud to say that at KUKA, in several high-level meetings in Germany, job losses were never foremost on the agenda. We need skilled people with the right attitude, both today and in preparation for the recovery.

We hope other companies share our optimism about the bounce-back to come. I would like to offer my positive but pragmatic views on why we can be excited about the future, both for manufacturing and the role of robotics.

“Necessity is the mother of invention” was a popular phrase with my mother. Today is a good example, as we adjust to operating in a world with the Covid-19 virus and, potentially, future pandemics. The wheels of industry must still turn and logistics must work even faster, as more people than ever use home delivery – Tesco in August created 16,000 jobs to help service booming demand for online groceries. The virus is making us more innovative, with business solutions like video meetings and home working, on-site temperature checking, and Test & Trace. Robots will play an increasing role in this world.

Operations in some food and beverage and electronics factories, where workers are packed shoulder-to-shoulder, create a manifest health risk. Linked to this is the fact that low-margin manufacturing industries have relied on low-cost labour, from Eastern Europe and beyond. This labour source is falling, due to Brexit, Covid-19, and improving pay in their home countries. The solution has to be robots: installed to maintain safe distance between workers while fulfilling key tasks with unmatched repeatability and accuracy.

Industrial robot manufacturers’ customers are typically automotive-heavy. Automotive has been hard hit, devastating sales early in lockdown, but we are looking ahead to a UK vehicle industry with a bigger mix of hybrid-electric and full electric vehicles.





Arrival, the new electric van and bus company, is a very exciting example – in 2020, it has received an order for 10,000 vans from US parcel service UPS.

KUKA is excited by the “bounce-back sectors”; those that had great potential for robots before and now after the covid crisis.

They are: 1) food and beverage 2) logistics and warehousing, deriving from the big trend in home shopping and fulfilment and 3) medical and pharmaceutical, which are particularly linked to reshoring. While reshoring of manufacturing to the UK and Ireland has had a few false dawns it is now actually happening, as international companies shorten supply chains and move production either home or closer to the customer – in the medical devices sector in Ireland, for example.

With partnerships, everyone wins

People should not look at KUKA merely as a “supplier of robots”. Anyone can sell something in a box. We must be a true strategic partner - and I really mean that with total conviction, not simply as lazy, marketing words.

We have created a model of **system partners**, graded to platinum, who are expert system integrators.

Westrock, for example, are masters at building bespoke packaging, loading and palletising solutions. CNC Robotics have perfected modifying KUKA robots for milling applications, for set design, special structures and more.

These firms have strong technical knowledge about our robots, but they also know the demands and nuances of the applications in their field, intimately. As a team we really can solve most projects we are challenged with; without these partners, our proposition is weakened. There is more detail about our superb partners from page 24.

Another powerful differentiator for KUKA is that we give the best advice possible, even if this means telling the customer the solution they need is not a robot. The solution they are seeking may be hard automation, or labour. We might find a better project to automate. We can only prosper in this industry with trusted relationships; you have to gain trust and this may mean losing a short-term sale.

Looking ahead, as well as the “bounce-back” sectors and the urgent need for automation to mitigate low cost labour shortages, we are excited by the rise of service robots and robots in novel applications, such as medical situations. Surgeons will soon supervise routine operations from a control room, using haptic controls to “manage” a suite of surgical robots. It’s a rapidly growing area for robots, along with others, that are discussed on page 9 of this report.

At KUKA you can be absolutely certain that – whatever the application – if an industrial project can be improved with robotics or automated, we can help. I look forward to helping you to automate, deliver your product quicker and win more business!

Thatchers Cider

Handling efficiency

Family-owned cider maker, Thatchers, delivers product all over the UK. The company turned to robots to improve consistency and efficiency, cutting forklift truck movements by over 50%.

Thatchers Cider Company Ltd, based in Somerset in south-west England, remains family-owned more than a century after it was founded. It farms 500 acres of its own orchards and also buys in apples from nearby growers.

Being family-owned does not mean that Thatchers is a prisoner of tradition. It has developed a novel way of growing apple trees including training along wires, in hedge-row style. These linear orchards offer improved growing and harvesting conditions, for which it developed a bespoke machine.



Thatchers presses up to 500 tonnes of apples a day. The cider can be matured in their own oak vats, before being packed into kegs for draught dispensing in pubs, bars and sports venues, or bottles and cans for retail outlets across the UK.

Keg handling: Improving efficiency and output

Empty kegs arriving at the production hall are stacked in 18-unit lots, with three layers of six kegs each. Gary Delafield, supply chain director, explains that the original keg loading and unloading was challenging as the forklift drivers had to split the 3 layers down and then place them accurately onto the production line to keep up with a 450 keg per hour line speed.

Gary believed that the solution to improving the efficiency of this process would be automation.

He approached SCM Handling, a company local to Thatchers, known for paper and similar materials handling solutions, and explained the current operation. From this discussion and subsequent site visits, the SCM team designed a bespoke solution that had a variety of automation, including two KUKA robots at its core to deal with the challenge.

Two robots for efficiency and accuracy

SCM Handling built the cell around two robots, which easily keep up with the line speeds, improved health and safety and had a higher repeatability. The two robots are: the KUKA KR 120, which picks up the layer boards that sit between each six-pack layer of kegs, and the 700kg payload KR 700 PA, which picks up and stacks the kegs. The KR 700 has a high reach of 3320mm, specified because of existing conveyor heights.

Gary explained that the forklift drivers now only deal with stacks of 18 kegs rather than having to split down and handle sixes.

This means Thatchers' loading/unloading process is now safer, more reliable and, most importantly: more efficient.

Empty stacks of 18 kegs are moved from lorries to the loading end of the cell. A centralising unit squares them up before the KUKA KR 120 removes the layer board, allowing the KR 700 to lift six kegs at a time and place them onto the conveyor, for inspection and cleaning before being refilled.

But there's more.

The cell is two-sided. Full kegs arrive on the opposite side, ready to be stacked back into 18s. The KR 700 swings through 180 degrees from the incoming conveyor to the outbound side and stacks the kegs, whether 30 or 50 litres, and the KR 120 precisely positions the layer board in between layers. Once stacked, the kegs are ready to be taken by forklift truck and loaded onto the waiting lorry.



The automated cell has been a great success since it was installed, in 2014. The sensors and programming of the robots ensure that each layer of six kegs – and the intervening layer boards are precisely positioned, which eliminates the risk of toppling that can happen when stacking with forklifts.

Service and support

“SCM has worked with us closely throughout, designing and installing the handling tools and moving the robots and cell location on multiple occasions, as we have expanded our production capacity,” says Gary. “They have provided great service; they can dial in remotely to assess and solve any problems, quickly.”

The cell has been so successful that Thatchers purchased a further three KUKA robots when they installed their new canning facility.

Gary explains how the robots can be modified as the job develops.

“This really is the beauty of robotics,” he adds. “SCM sold us one machine but we have already moved and reprogrammed it multiple times to suit different line layouts. The stacking head is quite a specialised tool and, with kegs being returnable, they can have a hard time but, as far as machines go, it’s a great improvement.”

CNC Robotics

Automating artistry

Odyssey Studios has transformed itself from a traditional props maker to a global reaching, digitised company thanks to an automated robotic system from CNC Robotics and KUKA.

Robots are typically tasked with performing heavy-duty jobs, on a big scale, delivering the same thing, repetitively, over long periods. This is pretty much the opposite of what Odyssey Studios does.

With headquarters in Limerick, Ireland, and newly-opened premises in Dublin, it specialises in making ‘props’ – models and scenery – for films, TV series, theatre, and public art, such as sculptures and installations in open spaces. Many of the props are bespoke, large scale, and specialised rather than repetitive. For Odyssey, a run of 10 statues is big.

“Sometimes we do some large, one-off pieces and it could take artists sculpting them quite a long time,” says Mark Maher, founder, and CEO of Odyssey Studios.

He has been in the business for over 20 years and has made props for movies such as The Hobbit series, Alice in Wonderland, and for TV series including the first incarnation of Penny Dreadful, which used Dublin as a stand-in for Victorian London.

Mark has always been aware of the potential of automation and after investing in the robotic system has seen how transformative this is in the prop building industry.

A statue that had originally been created as a one-off but which the director liked and then ordered a dozen more of; or to speedily scale up a maquette (scale model) to something three meters tall, using 3D scanning.

The robotic system has enabled Odyssey to replicate designs and machine props more efficiently and with shorter lead times.

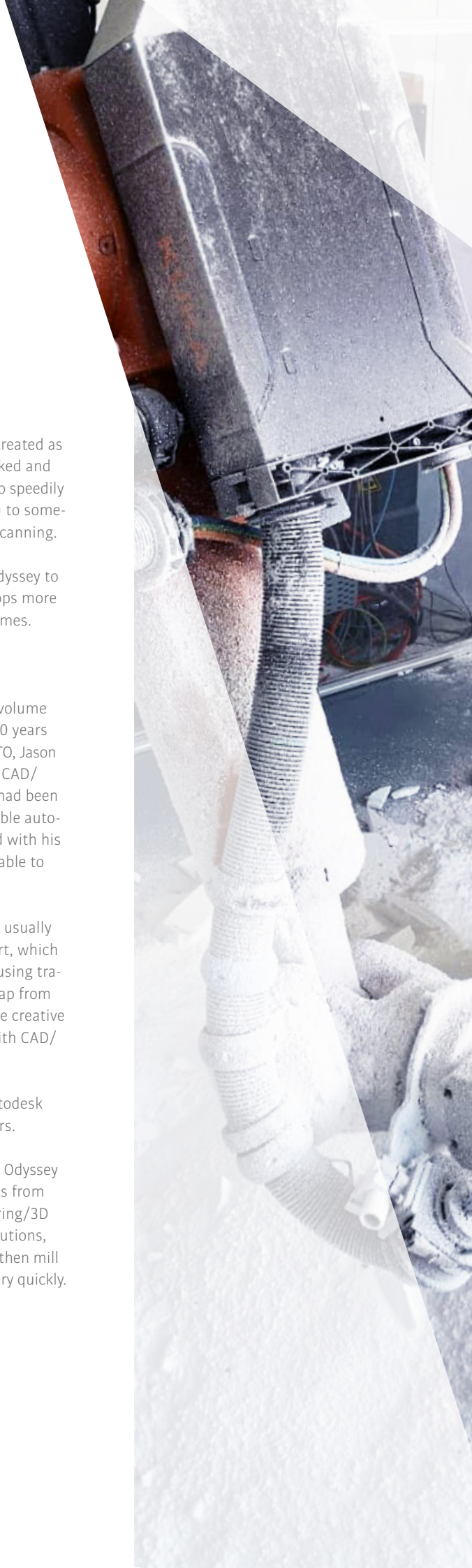
Automating artistry

The technology to machine small-volume one-off parts was developed just 10 years ago by CNC Robotics founder and CTO, Jason Barker. The breakthrough came as CAD/CAM capabilities advanced. Jason had been searching for ways to bring affordable automation into creative industries and with his background in this sector, he was able to see the potential.

“When you're making one-offs, it's usually a very complex, highly detailed part, which would often take weeks to sculpt using traditional tools and methods. The leap from the industrial environment into the creative world came from driving robots with CAD/CAM software.”

CNC Robotics has worked with Autodesk PowerMill software for several years.

Jason says that manufacturers like Odyssey Studios have seen positive benefits from incorporating additive manufacturing/3D printing and developing hybrid solutions, enabling it to initially 3D print and then mill back from near-net to net shape, very quickly.





Acceptable accuracy

The key to adopting these solutions was the realisation that creative industries did not need the same levels of accuracy as engineering. If it did, the 5-axis machines typical of engineering applications would still be prohibitively expensive.

“For companies like Odyssey, the visual aspect and the creativeness that they add by using a KUKA robot instead of a human being is that they can get repeatable parts, multiples of the same thing, but they also get that one-off capability where they can drive something dynamically and investigate how to extrapolate from the digital world into the real world. The robot is the best vehicle to do that,” Jason says.

Ease of use

The simplicity of operation is the key to Odyssey Studios. Its KUKA KR 210 R2700 robot has made its work easier, faster, more accurate, and more productive.

“Since we got the robot, we haven’t stopped using it, except for Covid-19 interruptions,” says Mark Maher. “We can scan in a model approved by the director and immediately scale up to the size needed and then form the piece, in polystyrene or, in the case of public space art, produce a plaster mould that will be used to make a sculpture. In the studio, what we are making could be the interior of a Gothic palace or the interior of a spaceship.”

Making such things manually is time-consuming; producing a digital maquette, getting it signed off, and then producing the full-sized article – or articles – with a robot is more efficient and effective use of time.

The robot has also helped to win new business.

“We work in a very fast-paced industry,” says Mark. “Often we have pieces that might take months to do by hand and with multiple changes to get right. It was those needs that spurred us to go with automation. We are the only studio with it in Ireland. There are not many anywhere in the world,” he adds.



And business is good; Odyssey Studios is working on one of the biggest tickets in entertainment at the moment, Mark confirms.

“We’re doing work right now for an Apple TV show coming out next year called Foundation, from the Isaac Asimov books. It’s a massive undertaking.”

DesignPro Automation

Providing solutions

Each year sees millions of medical devices, knee joints and orthopaedic prostheses manufactured for use in surgical procedures. Automation shortens manufacturing cycle times and maintains consistency and quality, while meeting fast-rising demand.

Ireland is a large manufacturing base for medical devices; second only to Germany in Europe for medical device exports. The manufacture of orthopaedic components such as joints is not simple to automate and, historically, many suppliers have relied on manual work.

As global demand rises, medtech OEMs are taking advantage of better automation technology to increase throughput, turning to companies like Limerick-based KUKA platinum system partner, DesignPro Automation.

DesignPro are experts in automation, mechanical engineering design, PLC programming and robotic integration. It primarily serves medtech and automotive markets but can help any industrial application that requires medium-sized modular cells and small payload robots with tight tolerances.

DesignPro also builds solutions for other medical-oriented applications, such as large assembly lines for the manufacture of wound dressings. The company recently designed an automated line with highly innovative vacuuming techniques for production of an advanced medical trauma dressing. The integration of KUKA KR3 and KR6 Agilus robots with vision and sensor technology enabled the client's custom assembly line to produce the volumes required to boost market share and influence.

Connectivity and interactions among parts, machines and people made this particular system up to 100% faster and 20% more efficient. DesignPro has also integrated standard, off-the-shelf higher payload robots for robotic tending and welding.

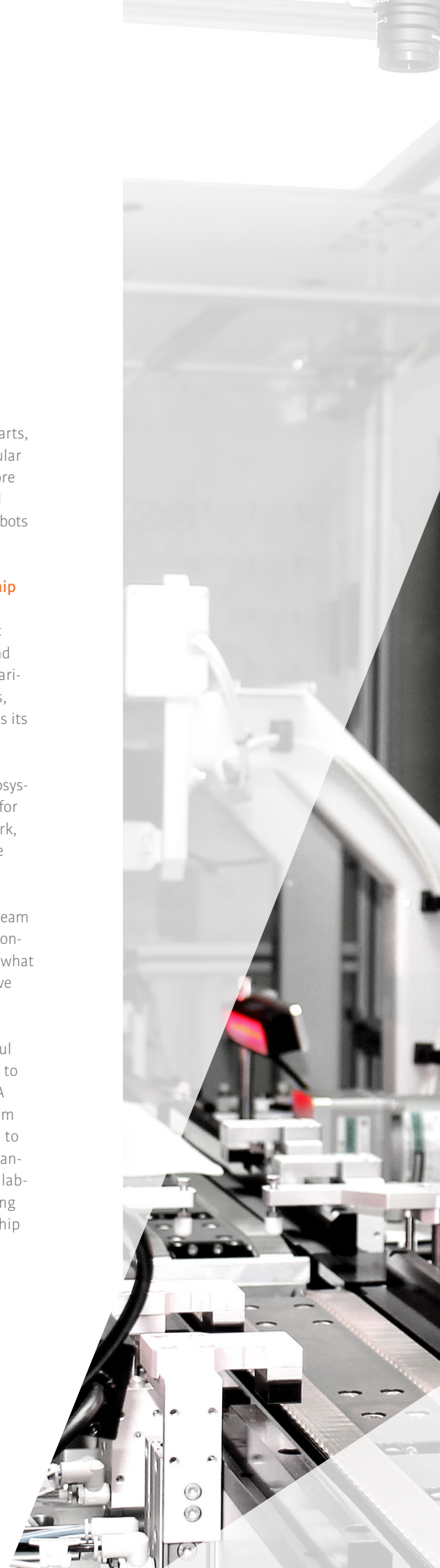
Why orange? It's a two-way relationship

Robotic welding is currently a hot topic in Ireland, says DesignPro CEO Redmond McDonnell. With its need for specific variations in tolerances, working envelopes, payloads and speeds, it selected KUKA as its robot partner.

"We got very familiar with the KUKA ecosystem and decided they were the best fit for what we do; the precise med-device work, industrial welding and bespoke machine build projects," he says.

"We give the requirement to the KUKA team and they help us specify the robot and configuration, based on their knowledge of what our customer needs – it is a collaborative effort, merging two knowledge sets."

The partnership with KUKA is successful on many levels, DesignPro brings work to KUKA and, in turn, Brian Cooney (KUKA Ireland Managing Director) and his team entrust DesignPro with projects suited to their skill sets, from across Ireland's manufacturing industry. The companies collaborate at trade shows and with marketing campaigns, and share thought leadership at annual training days.





R&D takes pole position

Both KUKA and DesignPro invest heavily in R&D, to service the varying demands of Irish industry.

“We are always testing the speed and accuracy of robots for any given application, and we’re always excited when KUKA brings out a new model, perhaps a niche robot that wasn’t available before, where we can see new uses,” says Redmond.

An example of this is KUKA’s new SCARA (Selective Compliance Assembly Robot Arm) pick and place robot, due for release in October. DesignPro recognised a growing demand for this type of robot, especially in lower cost applications. The company believes that delivering this type of customer feedback to the KUKA labs helps to influence future product releases.

DesignPro uses the distinctive KUKA LBR iiwa collaborative robot for R&D projects, such as for testing the potential for automation of endoscopy in throat inspections. This is a high-tech product, where tolerances and feedback are tight; operators need a fairly high level of automation education. Redmond’s team is looking forward to the launch of the LBR iisy in 2021; an easy to use cobot with drag-and-drop programming.

“A small payload cobot for use in industrial applications will be appropriate for several customers,” says Redmond. “The ability for customers to make coding changes themselves using drag-and-drop – that’s the golden goose for cobots and KUKA is moving that way.”

Automation set to thrive in Ireland in Covid recovery

Covid-19 has definitely impacted the medical device business. DesignPro is running a project to automate the manufacture of materials for face masks but new capital in some of the elective medical sector is drying up, with several projects delayed for months.

An unanticipated benefit of the crisis is that more manufacturing companies understand that automation can help solve social distancing issues in the plant and ensure production continues if a second wave, or new pandemic, strikes again.

Ireland is experiencing labour shortages; automation enables consistency of production while allowing redeployment of valuable resources to higher value activities.

“While some capital-intensive projects are on hold, we see several smaller retrofit projects in the medical device industry here that are moving to a more automated environment,” Redmond says.

DesignPro is also seeing new activity in the badly-hit automotive sector. It supplies automation solutions for the manufacture of vision systems to car OEMs, using robotics for applying glue on lenses, placing cameras in their housings and actively aligning sensors for the cameras, which are widely used on current car ranges and on prototype future models. Autonomous, self driving cars with 360° vision require a multiplicity of cameras; suppliers must be ready for higher volumes.

National Composites Centre Boosting productivity

The National Composites Centre (NCC), located near Bristol, is possibly the world's leading authority on composite materials. Its Automated Preforming Cell has increased the consistency and reduced the cycle time of the process, as well as reducing waste, since the installation of KUKA robots.

Part of the UK's High Value Manufacturing Catapult network, the NCC's technology innovation centres enable hundreds of specialists to work with advanced digital manufacturing technology to help design and develop new composite products. It is an integral part of the Future Composites Hub, an EPSRC-funded manufacturing cluster involving the University of Bristol and six other universities, along with industrial partners including Airbus, BAE Systems, GE Aviation, GKN, Rolls-Royce, and others.

In delivering its mission to accelerate the adoption of high value, sustainable engineering solutions in composites, the NCC researches and develops industrial solutions from the laboratory to large-scale production. It provides advice, access to specialist equipment and training and works with organisations of all sorts and sizes, from micro SMEs to large OEMs and Tier One suppliers.

Composite materials – such as fibre reinforced plastic – help to make products lighter, stronger and, in some cases, more durable than those made from metal alloys. Their range of applications are being expanded at a rapid rate. The NCC and other organisations have helped to drive down cycle times from weeks to hours, in some cases, making these materials progressively more useful in industrial and manufacturing settings.

KUKA platinum partner Loop Technology, based in Poundbury, Dorset, was founded 22 years ago. It specialises in industrial automation installation and integration and offers a range of services and solutions, from bespoke robotic cells to full, turnkey installations, including metrology, software, robot tooling and electronics. It supplied the NCC with automation solutions for several years and across multiple applications. The company recently added a second KUKA robot to NCC's **automated preforming cell (APC)**, which uses digital manufacturing and Industry 4.0 principles to rapidly pick, form and place composite parts onto complex geometries.



Automating complex shapes

The combination of complex, multi-radii geometry and the nature of raw carbon fibre sheets presents particular challenges in measurement, placement and metrology.

“The APC takes raw carbon fibre sheets and lays them up, ready for the mould,” says Adam White, Internal Sales Engineer, Loop Technology. “Carbon fibre in its raw state is not a very consistent material; it is floppy, like cloth. Until the cell was automated a couple of years ago, laying up was done by hand.”

The floppiness of the material made it difficult for the machinery to consistently define and find the sheets' edges. Loop Technology integrated an advanced imaging system and upgraded software that can identify edges within three millimetres; currently more than enough accuracy on a five-metre long piece of carbon fibre, multiple ply material.

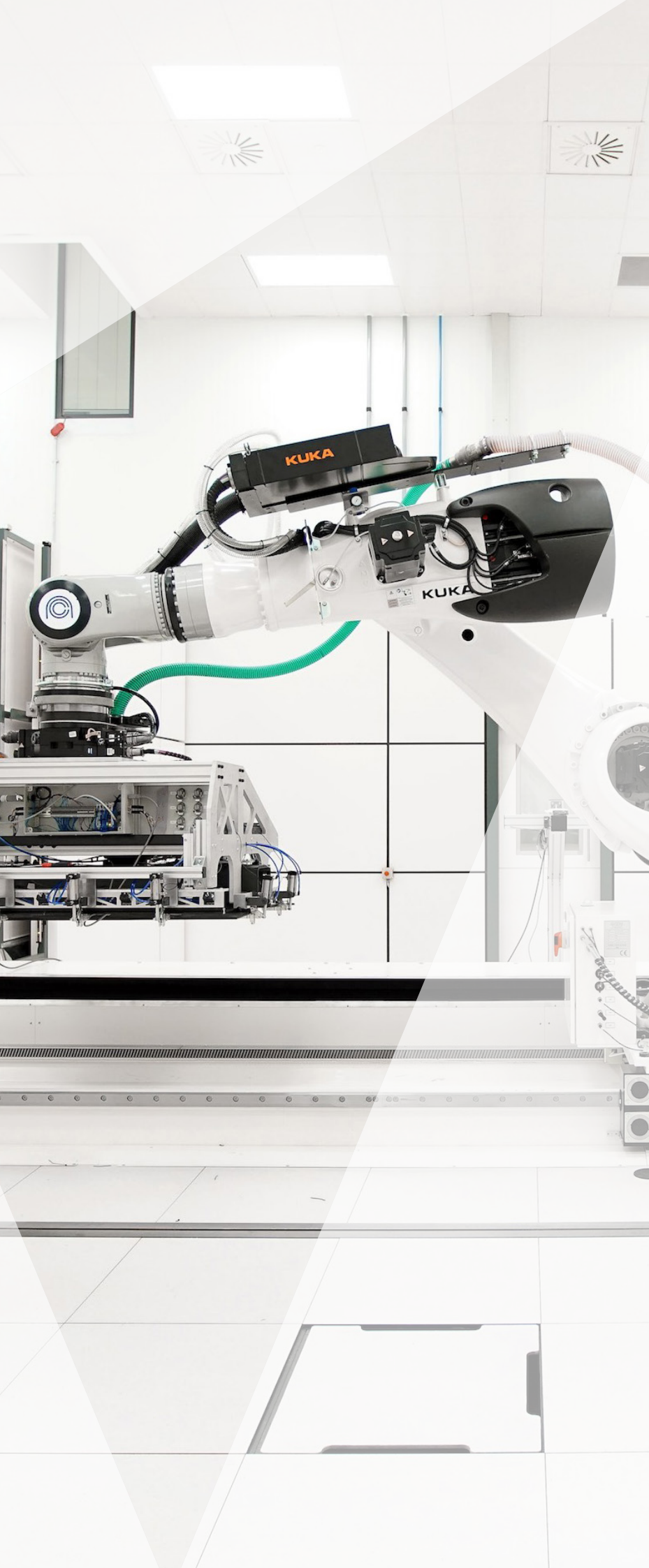
Boosting productivity and consistency

“The APC is equipped with a KUKA KR510 R3080 robotic arm and a smaller KUKA KR300 R2500, both mounted on a single, 18-metre linear track,” says Jack Cheasley, NCC's Engineering Capability Lead for Automation.

“We had the bigger robot for about three years, and it worked well. We realised we needed extra capability and the second was installed earlier in 2020.” The two machines can work collaboratively or individually.

The APC is a developmental cell, but it is very much part of the drive towards Industry 4.0, a system where machines can see and execute manufacturing processes themselves. As well as being enabled for live operation from anywhere within the NCC, the cell is equipped with sensors for continual adaptive processes, for optimised manufacture, process control, analysis and waste minimisation.

The wide range of end effectors and manipulators available for the KUKA robots enable NCC to manipulate and stack the materials, trim to net shape, inspect, surface treat, monitor and form them. Automation has virtually eliminated human error and variation, which arises no matter how skilled and experienced the operators.



“We can make sure the robots are doing exactly the right thing, 24 hours a day and seven days a week, every single time,” Jack concludes.

Growing markets: automation is key

Before the Covid-19 crisis, the global market for composites was predicted to be worth \$105.8bn (£82.8bn) in 2020. The UK market alone is expected to reach £12.5bn by 2030, as manufacturers seek to make products lighter and stronger.

Composites are well established in aerospace applications, in wings and fuselages including much of the Airbus range, for example, the Airbus A350 XWB wings are all-carbon fibre composite material. They are lighter even than aluminium or alloys like Inconel. Lighter weight saves fuel, which makes flying more sustainable. It also reduces the stress on other components, which helps to prolong their working lives.

The next generation of aircraft will be significantly lighter still. Research and development at the NCC will help to bring electric aircraft into the realm of the practical. The NCC’s CEO, Richard Oldfield, says that the global aircraft market will need between 60 and 100 pairs of wings a month for next-generation flight; current, labour-intensive, processes are not capable of that output.

The problem with using composites is the speed of manufacture; the lay-up process, compared with injection moulding say, is slow. Automation is essential to improving performance, boosting productivity and ensuring consistency.

WestRock

Challenge solver

Platinum system partner WestRock engineers large and complex packaging, palletising and loading solutions in demanding applications. Its robot supplier cannot be a weak link.

Consider the engineering challenge

Automation must handle thousands of engineering permutations as it addresses many product sizes, quantities, case dimensions and packaging materials, even in just one single operation. As an example, one international beverage company packs and ships tens of thousands of cans and bottles across hundreds of SKUs from its UK distribution centres daily. These SKUs are then arranged on trays or cases, depending on product size, then palletised in different multiples, like trays, multipacks and four-packs.

Recently, due to new innovations, some plastic collars are now being replaced with paperboard collars. The complexity becomes exponential.

Imagine the range of specifications and options that a company like WestRock provides as it works with customers in industries ranging from food and beverage (F&B) to e-commerce to pharmaceutical and home-care applications.

With more than \$18bn in annual sales and tens of thousands of employees around the world, WestRock partners with customers to provide differentiated solutions that encompass both consumer and corrugated packaging products to help them win in a complex and dynamic marketplace. With packaging equipment manufacturing operations, they build a wide range of automation solutions including right-sizing machines that reduce

the volume of cartons to best suit the contents. WestRock is a market-leading supplier in Ireland and the UK, where they export their solutions globally.

KUKA has made WestRock Automated Packaging Systems a KUKA platinum system partner, and works hand in hand with them to provide unparalleled innovation and service to customers across many different industries.

A solution for every season

The only thing constant is change. “Labour challenges and the need to negate rising labour costs mean that automation will remain a top priority in this region,” commented Tom Whatling, Technical Sales Manager at WestRock’s Great Yarmouth facility. If recent events have provided any lessons, it surely would be that companies must act to future proof their operations. A combination of automation and robotics provides flexibility and minimises risks around social distancing, supply chain bottle necks, and dark factory operations.

Future-proofing an operation can seem daunting, but working with a group of highly aligned market leaders can help. WestRock and KUKA collaborate to ensure that customer experience streamlined value.

A typical customer might build a new distribution warehouse with racking, warehouse management (WMS) and conveyor systems, which needs to dispatch product from the WMS. The integrator partner – for example KUKA’s sister company, SwissLog – would be contracted to construct part of it, including sourcing machinery, the case erector, BoxSizer®, palletiser, and so on, all of which WestRock supplies.





Robots are used in three main applications, to reduce manual handling and increase throughput:

- i. Case erecting for multiple sizes
- ii. Product loading machines to collate and pack jars, cartons, packets and more into trays or cases
- iii. Palletising

WestRock primarily uses two robot loaders. The Agilus-2 R900 fitted with a 10kg loader and KRC5 compact controller, for collating and loading lined products the new KUKA IONTEC 70kg 6-axis robot may be equipped with a CLR60 for cases, or TLR60 for trays.

“The company pre-collates products in various ways; the robot picks multiple products and loads them. This system runs faster for high-volume, medium-speed work,” says Tom Whatling.

A range of standard palletisers use 5-axis KUKA QUANTEC robots, ranging from 120kg to 240kg payload. They may be semi-automatic, where the operator changes pallets manually; a two pallet station Hot-Swap version, where the robot continues loading one pallet while the operator changes the other; or fully automatic, using de-nester and conveyor system where the cell never stops and the pallet is collected off the end.

Market trends and bounce back

In a labour-intensive packaging line, most workers will be erecting and closing cases or trays. This process can be heavily automated and payback is often quick. “The robotic part is often the more expensive part of the line and is often left by customers, who tend to automate the making and closing of boxes but still load them by hand,” says Tom.

“We build flexibility into the machines to make them more attractive to replace the labour for loading.”

Palletisers can be expensive and more difficult to justify, but excessive manual handling is causing a shift to automated palletising, which saves labour, time and repetitive strain.

As customers’ needs change, WestRock and KUKA have the capabilities to change with them, providing them solutions that allow them to meet their goals. WestRock’s unique strategy to bring their customers a wide range of paper-based solutions and packaging automation has positioned the company well to meet changing customer needs today and for the coming “new normal.”

The advantage: KUKA system partner

What is the KUKA partner advantage for WestRock? It is easier to work with one project manager, a single voice, than many people from different suppliers and integrators, who will relieve the customer of the responsibility of making component parts work seamlessly together, and ensure that the right machine is selected for each role.

“KUKA is competitive on price and has a good, versatile range that covers most of our applications,” says Tom. “We created our own solution for the high-speed pick and place delta robot, ensuring that there are no gaps in supply.”

Arrival

Special delivery

The announcement of an order for 10,000 electric vans for global logistics company UPS brought the name of Arrival to global public attention.

The company is a pioneer not just in manufacturing electric vehicles but in methods of manufacture, advocating ‘microfactories’ as a means to make the vehicles close to the market. Its manufacturing process may attract attention, as well; starting with a blank sheet of paper, Arrival has reimagined the production process using in-house technology and vertical integration.

Arrival is a young company, brimful of novel ideas about sustainable transportation and how vehicles such as vans, buses and delivery robots should be built. Its Integrated Transport Ecosystem vision embraces transport solutions for cities and the people who live in them.

The vision sounds elevated but the plan for delivery is very much down to earth. Arrival’s first two vehicles – an electric van and bus – are designed to offer “human-centered and intelligent design”, and at prices comparable to fossil fuel equivalents.

The concept caught the eye of parcels delivery company UPS, which in January ordered a fleet of 10,000 vans and also invested directly into the company.

The conventional way of fulfilling such huge orders would be to boost production at existing plants – maybe take on an extra shift, if the order was big enough. Arrival takes a different approach.



It intends to take a distributed manufacturing approach, deploying multiple microfactories around the world, close to the markets being served, utilising and developing local skills and resource and paying local taxes.

Intelligent solutions

Arrival microfactories will be built inside a standard 200,000 sq ft (20,000 sq meter) warehouse or factory unit, which is around 24 times smaller than most mainstream automotive manufacturing plants. They will be highly automated, which is to be expected of a modern factory, but the real difference will be in layout – and how that layout will evolve. The machinery will be connected and the whole factory utilises AI (artificial intelligence), in order to evolve and adapt itself to improve performance and productivity. Arrival's first microfactory in Oxfordshire will feature KUKA robots.

“The microfactory concept takes a fresh look at manufacturing and natively applies modern technologies to maximise their utility from the start, rather than trying to robotise traditional production lines,” says Doug Morton, Head of Technology Strategy at Arrival. “In this way, we can draw on alternative disciplines which offer the best value/approach, such as software design. It's widely accepted that the best way to solve complex software challenges is to give computers the ability to learn, without being explicitly programmed, rather than design each element manually. If you define the rules and the desired outcome, you train the machine to make use of data to optimise everything in between. We are using this same approach in the design of microfactories.”

A parallel to AI is the development of generative design, which has produced some very successful designs for automotive components, for example, that look nothing like conventional products. GM applied generative design to a seat bracket mounting point for seat belts. The software was instructed to consider additive manufacturing for production, which led to the design of a structure that looked as if it had been grown, rather than processed. It is 20% stronger than the original part but 40% lighter.

Designing for evolution

Arrival argues that generative design can also be applied to factory design – and that it will inevitably mean that factory floors and production lines evolve to look new and different to those of the past. At the moment, if anything in a traditional OEM factory is to be changed, the whole conscious process of design and testing has to be repeated, at great expense. Arrival is thinking differently – or rather it is encouraging AI to quickly adapt its processes.

“The thing that we really care about is that the output is efficient and robust,” Doug says. “If we liberate ourselves from the constraints of everything sub process and tiny activity needing to make sense to a human being, then we can unlock all of the potential that lies in the spaces between, in the gaps in time and in the natural variations.” He draws comparison with the natural world, with ecosystems that have evolved through the process of natural selection.

“Ecosystems and biological organisms, which themselves are terrifically optimised, have absolutely no responsibility to make sense to us. They make full and effective use of all the available resources in a way that human-designed structures and systems often do not.”



Doug says that factories are typically optimised for the human operator. The Arrival microfactory already looks different because production units are in squares, rather than along linear assembly lines. Rather than operating at specific speeds with stations in a specific order, the order of technology cells in a microfactory can be easily changed, or the same cell can be used multiple times on the same vehicle, enabling microfactories to build multiple different vehicle types.

“What we do with the microfactory is relinquish the desire to know explicitly in advance how each operation will be performed,” he explains. “If the location changes every time, it doesn't matter; what the machines are doing is planning to get the right parts, each time. While humans adapt to overcome limitations in existing production processes, we see a very compelling opportunity to overcome the inefficiencies of the traditional factory environment.”

ZND UK

Addictive automation

Fencing and barrier manufacturer ZND UK is a great example of how addictive automation can be. From mostly manual manufacture of these bulky products 10 years ago, the company now has two automated production lines and a range of robots, including 11 KUKA models. The outcome? Five-fold productivity increase and higher capacity.

Demand for temporary fencing and barriers is steady year-round but, during construction peaks and the summer events season (in normal years), demand shoots up. There is a strong business case to automate the manufacture of these big, cumbersome products in high volume, to reduce costs, increase capacity and reduce heavy manual handling.



ZND, which has plants in Holland, Germany, France, Poland and the US, manufactures temporary fencing, hoarding, pedestrian barriers and wire mesh for fencing. Its UK operation, in Rotherham, South Yorkshire, has invested heavily in robots and automation equipment, mainly specified by AMI in Italy, for the last 10 years and installed its first fully automated line in 2014.

Changes at ZND have been profound. Some products are now assembled, brazed, lifted and stacked completely automatically, with KUKA robots playing a prominent role.

Throughput is up massively, product defects are down and employees do not have to do as much body-straining lifting work now.

“A two-man team would make 50-100 barriers in a day before. With the automated line, a two-man team can now produce 500 per eight-hour shift,” says ZND UK managing director James McLean. “While other automatic machinery is integrated into that production line, KUKA is an integral part of it.” ZND’s automation story has been gradual, with one piece of equipment leading to another. The investment really began from 2009.

“In the last year the company has spent around £6 million on automation, mainly in the US but in the UK too,” James says. ZND is always looking for a new solution to automate. “This year we built a machine in Rotherham with an integrated robot, with another currently being built in Holland.”

How it works

Barrier panels are made from tubular material and infill tubes. The tubes for the outer frame are first cut, swagged, pierced and bent to form two U-shaped pieces. Four feet are then projection brazed in position. In the final assembly stage, cut-to-length infills are introduced and the two halves of the outer frame are closed to form the barrier.

A KUKA KR 210 robot removes the panel from the assembly machine and places it into a transfer system.

Further small items are fitted to the barrier and, at the end of the line, a second KUKA KR 210 robot collects it and places it into an automatic fixture that is mounted on a single-axis servo-controlled positioner, in a brazing cell with two floor mounted KR 16-two robots, each fitted with two brazing guns. A ceiling-mounted robot is fitted with a single brazing gun.

The floor mounted robot MIG gun brazes two infill tubes at a time, while the ceiling-mounted unit brazes the feet. At the end of the cycle the second KR 210 robot removes the finished panel from the fixture and places it in a horizontal stack. A forklift truck empties the unload station when it is full.

A second line, commissioned in 2016, works similarly to the first. Altogether, nine KUKA robots work on the two lines at ZND. System output is 1000 barriers per 8-hour shift; the two lines, working together, could produce 3000 barriers per 24-hours.

Manufacturing this number manually in a single eight-hour shift would have required 16 people.



Robots help retain and retrain staff

The company has continued to grow year-on-year, through disruption from Covid-19 and Brexit.

“Ten years ago, ZND had 120 people making these products mainly by hand,” says James. “Today we have 120 and sometimes more with agency staff and we are producing four to five times the volume of units, thanks to automation.” Staff have been redeployed to different jobs, usually more highly skilled and with less physical strain. “I don’t recall ever making someone redundant as a direct result of automation,” he adds.

Covid has been a tough period. From May to August it usually supplies to distributors for the big music festivals – these have gone. But ZND UK’s staple market is construction, which is more dependable.

The barriers and fencing are used everywhere. Currently temporary hospitals, test centres and a socially distancing queueing system, as well as fencing for public demonstrations, are topical uses of the products.

Report highlights

Here are 10 essential takeaways from KUKA's #WeAreOrange industry report. This page is designed to help you get a quick, accurate summary of the whole report.

- 1 Our system partner model is unique** to KUKA and is proven to work. We work in partnership with expert system integrators who have deep experience in certain applications.
- 2 Robots matter because automation** improves productivity. SMEs can benefit as well as larger businesses, as skilled staff are able to focus on added-value activities, rather than routine tasks.
- 3 KUKA robots are capable of** performing the widest possible range of manufacturing tasks, from end-of-line packing and palletising to more complex human-machine collaboration.
- 4 The UK and Ireland need to improve** national productivity to win global business. Both countries are low on the global automation league table.
- 5 Disruptive ideas, such as fully-**connected microfactories in use by electric vehicle manufacturer Arrival, make use of advanced equipment's capability for machine learning, or artificial intelligence (AI).
- 6 Food and beverage automation will** grow. Brexit and Covid are reducing the supply of low-cost foreign labour to the UK F&B industry. Due to the need for social distancing, the F&B sector will be the biggest growth market for robots in 2021.
- 7 Concerns about cost have put off** many companies from investing in automation. KUKA helps by undertaking audits to assess a customer's real needs. Incentives such as the Annual Investment Allowance – up to £200,000/year – and the best asset finance agreements help.
- 8 Robots can perform customised** as well as repetitive tasks. Odyssey Studios in Ireland finds its CAD/CAM software and KUKA KR 210 R2700 has made its work on short-run models and props for film and theatre production easier, faster and more accurate.
- 9 A flexible, dual-purpose palletising** area helped Thatchers Cider reduce forklift truck movements by 50% and boosted productivity through the improved consistency of packing and unpacking.
- 10 KUKA is with you on the whole** journey. The KUKA pledge is total and unbiased automation advice. KUKA will only recommend and implement the right solutions for what you need and never recommend a solution that is not required merely to secure a sale.



KUKA

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