ROBOTICS

Engineering an Automation Nation

Examples of UK and Irish applications of robotic automation for manufacturing



Welcome

The Industrial Revolution of the eighteenth and nineteenth centuries saw the United Kingdom become a global manufacturing powerhouse. Using the latest innovations, British industrialists were able to produce products faster, more cheaply and at a higher level of quality than had ever been seen before.

Fast forward to today and the United Kingdom is on the brink of a second industrial revolution, one where robotic automation is set to play a major role in re-establishing the country's manufacturing fortunes.

The latest statistics from the International Federation of Robotics (IFR) show the UK still lagging behind in the global league of robot-using countries. Despite the massive role played by robots in the successful turnaround of the UK's automotive sector, take-up of robotic technology has been slow to catch on in other sectors.

We believe that it is time to reverse this trend. Today's robots offer the highest levels of accuracy, precision and flexibility, enabling them to be used for everything from mass production through to low volume and bespoke processes. Developments in operator technology mean they are also far easier to set up and program than ever before, enabling them to be quickly switched over to handle a variety of different duties as and when required.

In short, we believe it is time to harness the potential of robotic automation to deliver enhanced competitiveness and productivity. We believe this offers the best way of realising the Government's ambition to turn the UK into an advanced automation economy, boosting GDP and creating new opportunities for employment and growth.

We like to call it Engineering an Automation Nation.



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Nigel Platt
LBU Manager UK and Ireland – Robotics

"We believe it is time to harness the potential of robots to deliver enhanced competiveness and productivity."

Table of contents

04	**Engineering an Automation Nation**
05	**Coupling technology and collaboration**
06–07	**Machine tending for metal castings**
08–09	**Plastic novelties production**
10	**Plastics moulding**
11	**Confectionery palletising**
12–13	**Pancake packing**
14–15	**Milk bottle trolley packing**
16–17	**Confectionery cutting**
18–19	**Automotive - steel bale stacking**
20–21	**Composites production**
22	**Automotive accessories**
23–25	**Agricultural machinery production**
26–27	**Ladder and platform production**
28	**Vehicle towbar manufacture**
29	**Aggregates handling**
30–31	**Aggregates handling and distribution**
32–33	**Bespoke machine production**
34–35	**Metalforming and sculpting**
36–39	**Hand-crafted ceramics production**
40–43	**Shoe manufacture**

Engineering an Automation Nation

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ABB offers the advice, support and training needed to help you get the most from an investment in robotic automation

Our own research shows that the UK's low adoption of robotic automation stems from a belief that robots are costly, complex and difficult to operate. For smaller companies in particular, there is a perception that robots cannot economically be applied to low volume or one-off processes. Added to this is the fact that many companies simply lack the in-house expertise to install, operate or maintain a robot.

Our Engineering an Automation Nation campaign is an attempt to address these concerns in the UK and Ireland. Our aim is twofold. Firstly, we will show how the greater affordability, simplicity and flexibility of today's robots enable them to add value to manufacturing processes of all sizes. Our ability to offer complete solutions, such as standardised systems featuring everything needed for specific applications, is just one example of how we're helping to simplify the process of specifying, installing and using robots.

Second, we are putting in place the educational framework needed to ensure that both today's and tomorrow's engineers have the skills and experience they need to get the most out of robots. Like any tool, a robot will work best when in the hands of a skilled operator who knows how to get the best from it.

Our Milton Keynes Training School offers a broad range of courses for industrial operators, whilst our Educational Package for schools, colleges and universities provides an ideal entry point for students to get their first experience of robotic technology.

Most importantly, Engineering an Automation Nation is about more than selling robots. It is about giving end users – whether businesses, systems integrators or educational establishments – the products, support and ongoing collaboration they need to maximise their investment in robotic automation.

In this way, we believe that we can make a valuable contribution to helping businesses of all sizes to enhance their international competitiveness.



Coupling technology and collaboration
Unleashing the power of robotic automation

01 YuMi will be used by Sony UK Technology to pick and place circuit board parts

02 Robotic solutions for welding applications enable organisations to manufacture more parts in less time

Safer collaboration between people and robots

Developments in robotic safety technology are providing new opportunities to utilise robots and workers together, co-operating to gain the best of both worlds.

The cost and space challenges of robot safety
Protecting manual workers against heavy and fast-moving robots has been a major consideration that has meant additional time, cost and space in traditional robot installations.

The answer is safe collaboration technology
Advances in robotic safety technology are enabling true collaboration between manual and robot workers, allowing them to work safely together in the same area.

Safe collaboration is at the heart of ABB's new YuMi® robot, a human-friendly dual arm robot designed for a new era of automation where people and robots work side by side.

YuMi has been developed to meet the flexible and agile production needs of the consumer electronics industry, but will increasingly be rolled out to cover other market sectors. YuMi is a collaborative, dual arm assembly solution offering high accuracy assisted by vision technology. The robot's soft, padded dual arms, combined with innovative force-sensing technology ensure the safety of YuMi's human co-workers. Safety is built into the functionality of the robot itself so that it can work cage-free.



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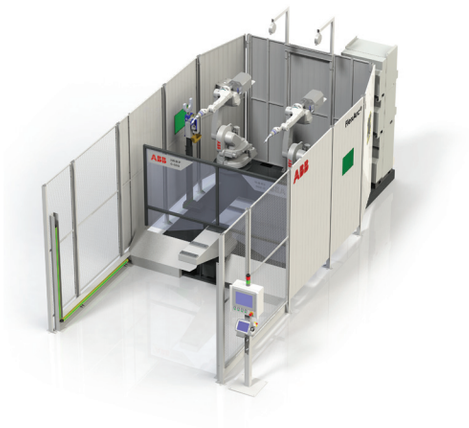
Easier integration with standard solutions

The increased availability of application-specific standard solutions promises to make it much easier for companies looking to take their first steps into robotic automation.

The perceived challenges of robot complexity and inflexibility
Complexity and lack of flexibility are two of the biggest concerns that have deterred companies from making a switch to robotic automation. Robot cells can represent a major investment, involving the time and cost of specifying, installing and maintaining multiple pieces of integrated equipment.

The answer is ABB's standardised solutions
ABB standardised solutions offer everything needed for automating many applications in various industries. Provided by ABB, the standardised solutions come with all the necessary equipment fully pre-configured.

With all of the equipment fully-matched and designed for the installation, standardised solutions offer the benefits of simple set-up, fast delivery and proven reliability and can offer significant cost and space savings, opening up new opportunities for how and where they can be used.



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Machine tending for metal castings

Robot cells help metal castings manufacturer to transform productivity

ABB's Feedline machine tending robot cells have helped a manufacturer of cast metal products to dramatically improve its productivity. Working 24 hours a day assisting in the loading and unloading of grinding machines used in the manufacture of iron and iron castings for the automotive industry, the cells have enabled Castings PLC to increase its output by 50% with a 50% reduction in cycle times.

As a Tier 1 supplier to the heavy truck sector, Castings PLC specialises in the production of ductile iron and ductile iron alloy components for vehicle chassis and engines. The company typically produces medium sized batches, ranging from 2,000 up to 50,000 parts per batch, as well as machining of parts from 1kg up to 30kg in weight.

The decision to use robotic automation was prompted by a drive to find ways to better utilise the company's workforce. Previously, the company's CNC grinding machines were loaded and unloaded manually, with one operator assigned to handle two machines. To insert and remove components manually was incurring long periods of dead time, limiting the productivity of both the operator and the machines. There was also the ever present risk of operator injury caused by lifting and carrying heavy components into and out of the machines.

The company also wanted to find ways to increase the output of the machines themselves, with the aim of being able to use them to produce a target of 2,500 different components.

Proving robots could work

To help evaluate whether robots could achieve these aims and help win board approval, Castings PLC first installed a pilot cell in 2015. Utilising an ABB robot, imaging system and conveyor belt, the cell proved it could deliver the flexibility that Castings PLC was looking for.

"Having used robotic automation in previous roles for other companies, I was already well aware of their ability to help improve production both in terms of output and quality," says Adam Vicary, Managing Director for Castings PLC. "On seeing the Feedline system, I knew it could provide the answer to Castings PLC's search for a production solution able to deliver greater productivity and flexibility."

To help demonstrate the Feedline's capabilities, a labour equivalent case was put together based on one person operating four machines instead of two and showing the potential cycle time improvements that could result from automating the loading and unloading of the machines.

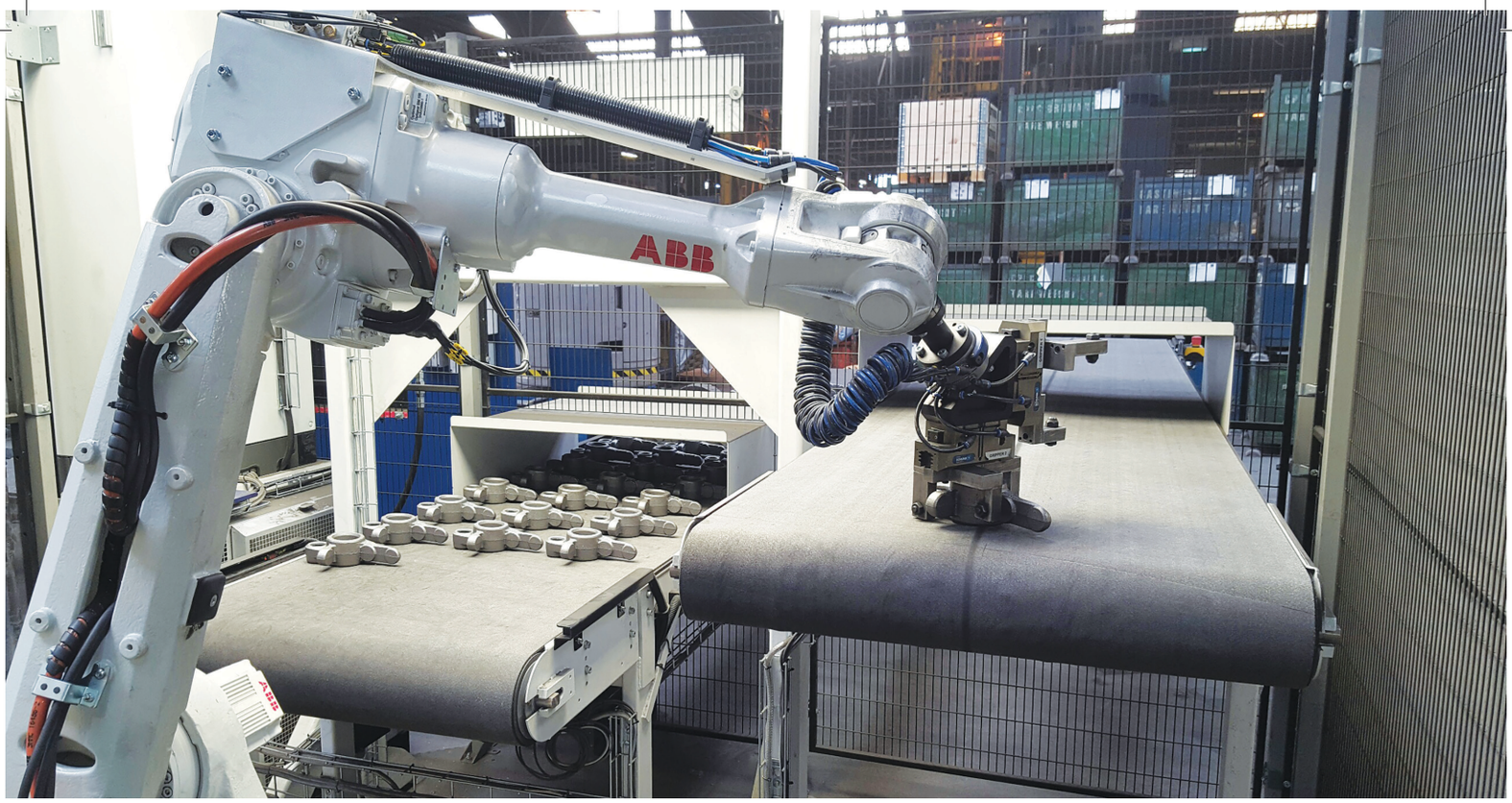
> "Provided you give the right thought to how robots can be used, there is very little they can't be used for."
>
> Adam Vicary, Managing Director, Castings PLC

Key to the Feedline's flexibility is the imaging system, which allows the cell to be programmed to recognise a variety of different components in both standard and non-standard positions.

"The integration between the robot and the imaging system is the really clever bit," says Vicary. "The components can be moved in approximate positions rather than being fixed in certain positions and orientations. By programming these into the cell's control system, the robot can immediately recognise how to handle the component, enabling it to pick it up from the belt and load it into the machines."

More robots, more flexibility

The success of the trial cell led to a further 12 machine tending cells being installed by May 2017, all commissioned with the help of ABB. A further 10 cells are due to be commissioned by the end of the year, including eight at Castings' sister site, William Lee of Dronfield. The cells are used to handle a range of components up to 5kg, with each currently programmed to handle 90 different part types, which can be processed on any machine.



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Robots are helping Castings PLC to realise its aim of producing 2,500 different components

"We were in a position to have enough parts programmed to allow full-scale production to be achieved from the outset, which meant we could hit the ground running," says Vicary. "We're now at the stage where we're ramping up the capabilities of the robots in order to work towards our target of producing 2,500 different components, including infrequent parts such as truck spares."

"We are programming a minimum of one part per day and are expecting to have 300 parts complete this year, which will cover a significant amount of our regular batch jobs. Part of this entails ensuring that our workers are being taught the skills needed to program and operate the cells."

Enhanced efficiency

A key benefit of the cells is their ease of operation. Programming can be mastered within a few days, enabling operators to quickly change over the cells to handle different component types. For Castings PLC, changeover can typically be performed within 10 minutes, minimising disruptions to production.

Thanks to the improvements brought by the cells, worker effectiveness at Castings PLC has been transformed. The cells can be programmed to handle jobs ranging from one hour up to five hours, reducing the need for operator supervision. This has meant that one operator can now handle up to four machines, effectively halving the amount of labour required. The automated cells also mean that production can now also be run around the clock, which has seen the company significantly increase its production output.

"Although our grinding machines are now running for longer, we're using them more efficiently," says Vicary. "We can now run them around the clock with none of the dead-time previously associated with having to manually load and unload them. Furthermore, the improved output that the cells have given us also means we now effectively have the benefit of a one hour buffer."

In addition to machine tending, Castings PLC is also using a robot to handle grinding of certain components in order to help further safeguard against injury risks to workers.

"Prolonged operation of fettling and deburring equipment can increase the risk of physical injuries such as Hand-arm Vibration Syndrome, which can affect blood vessels, nerves and joints," explains Vicary. "By automating these processes we can help to avoid this, protecting our workers against unnecessary harm and reducing production time lost to sickness."

The benefits that the robot cells have brought have led Castings PLC to purchase additional units for a second phase involving automating the handling of the company's medium-sized castings, including turbocharger manifolds weighing up to 15kg.

"Given what we've achieved so far, we believe there is plenty more scope for using robotic automation to further improve our manufacturing capabilities and performance," concludes Vicary. "Our experience shows that robots are not just for high volume processes – provided you give the right thought and consideration to how robots can be used, there is very little that they can't be used for."

Plastic novelties production

Robot delivers 18 month return on investment for CHX Products



Taking the plunge into robotic automation has transformed CHX Products in Cornwall from struggling to keep up with the competition to a leading maker of plastic promotional merchandise in the UK and international markets.

Previously, the company's manual-intensive production process had meant it was struggling to match its competitors' prices and turnaround times, leading to business being lost, particularly to overseas rivals. The processes of moving the products around, applying heat transfers and cutting and boxing were all handled manually, incurring time and cost.

The challenge was clear. CHX needed to drastically cut its costs and lead times in order to boost competitiveness and improve delivery times.

CHX duly contacted Geku an ABB Robotics systems integrator, which proposed installing a Geku SR250 beam robot to de-mould the parts and an ABB IRB140 to print and remove the moulds from the runner into a container, with the waste being dropped into a granulator for recycling.

Initial scepticism resolved

Andy Knight, Director of CHX Products, admits he had his reservations. Like many UK manufacturers, he wasn't familiar with the capabilities of industrial robots. "I remember thinking at the time that it all seemed too easy," he explains. "I asked myself, if it seems easy is it going to work? That's just a lack of experience, not knowing how clever these bits of kit are."

The fully-automated process took just three months to complete from the original order through to the installation. This included Geku's design work, machine building, fitting the system and subsequent testing and troubleshooting.

The end result was a faster, less labour-intensive manufacturing process. With the Geku S250 and ABB IRB140 in collaboration, the picking and placing, printing and cutting was performed at a much faster rate, shaving almost a whole week off lead times and enabling greatly improved turnaround of customer orders.

Lights out, production up

CHX took full advantage of the freedom brought by the cell and began operating on a lights-out basis. This added a lot more capacity and what Andy calls, "Free product, essentially. All we had to do was supply the materials. It's a bit like the elves and the shoemaker – we arrive in the morning and the work has been done."

The cell helped CHX Products achieve its original goals of reducing its production costs and minimising lead times. A third objective to reduce waste was also met, with all scrap plastic being dropped onto a runner to be granulated and re-used by the machine within seconds.

> "The plan is to grow over three times our current size over the next five years. Robots will definitely play a part in that."
>
> Andy Knight, Director, CHX Products

Andy was also surprised at the fast return on investment, which he estimates to have taken just 18 months. Looking back, he believes that there were other benefits that could have been taken into account. "I firmly believe the payback could have been much quicker but we didn't have the forethought or experience to take other factors into consideration at the time."

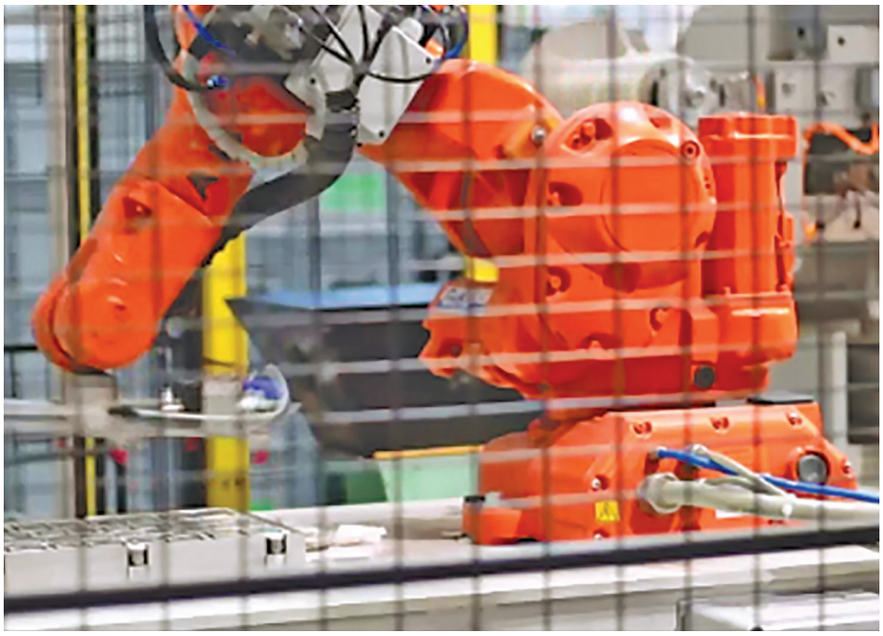
Further upgrades

In 2013, CHX decided to upgrade its process to incorporate a vision system. The intention had always been there, however the original robot had not been compatible. When an ex-demo robot cell became available at Geku, CHX quickly took the opportunity to retrofit. With the ability to



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01 Since installing a robot cell 10 years ago, CHX Products has transformed itself into a leading manufacturer of promotional plastic

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02 The IRB140 prints and removes the plastic moulds from the runner

precisely position the prints according to their design, this system has helped to achieve added improvements in the production process. Previously, lining up the plastic with the various transfers had to be done on a trial and error basis, which incurred lost time through interruptions to the process as well as added wastage.

When Andy Knight was asked how robot automation has helped to shape his Cornwall business, his response was, "Looking back, we feel the robots have made a big difference. Over the last five years we've been in a hideous recession, but now we're on to another growth spurt. We're fully wedded to the idea of integrating more automation to help new products get online quickly and cheaply."

Future plans

CHX has also started planning how it can further develop its services to keep up with the demands of tomorrow. The company is now looking at incorporating an ABB FlexPicker to put pins on the back of the badges, a process which is currently done by hand.

The idea of personalised badges has also been mentioned, proving that Andy Knight has a keen awareness of the growing relevance of 'Industry 4.0'. 'Industry 4.0' and its 'five characteristics of a smart factory' includes a hypothesis that the demand for one-off goods will grow tenfold in the near future, just as the demand for 24-hour delivery has recently become the norm.

Whatever direction CHX decides to take, it is certain to be a success. Andy Knight summarises, "The plan is to grow over three times our current size over the next five years. Robots will definitely play a part in that."

Plastics moulding

Plastics specialist cuts costs with ABB robots

— Through using robots, Mergon is able to cut total cycle time

To meet cost targets and maintain quality standards across its three sites in Ireland, Czech Republic and South Carolina, USA, plastic parts supplier Mergon International relies on 37 industrial robots from ABB.

The robots, installed over the last two years, are used for cutting, drilling and assembling the moulded parts, offering accurate, repeatable performance. But these are not the first; the company has been operating ABB robots for the past 15 years.

"We selected ABB based on the quality of the hardware and because the company offers local support as well as global availability," says Aisling Nolan, general manager of Mergon International.

Remoulding the process

The equipment at the Irish plant, where 23 of the robots are installed, was supplied and integrated by Robotics and Drives of Ireland, ABB Robotics' official Authorized Value Provider (AVP).

Mergon International manufactures technical plastic moulding products for the automotive and healthcare sectors.

"Using robots allows us to be competitive. Without automating our processes we simply could not compete in the marketplace. We almost always seek to automate processes if it makes commercial sense and ABB is a great partner in this respect," says Nolan.

When installing robots, the company looks for payback within one year, something that generally is achieved.

The robots enable high plant utilisation with the maximum possible processing in an unbroken chain. Mouldings are received from the machines, excess material removed and moulding flash ground off, before the parts are placed on a pallet in a set pattern designed to facilitate the next operation. With the use of robots, the manufacturing steps are linked together, cutting total cycle time and reducing the amount of capital tied up.

Model for model

Mergon operates three ranges of ABB robots. These are selected depending on the application, the payload and the reach required.

The company uses 18 ABB robots from the 6000 series, the most accurate and rigid robot in its class. This features a well-proven design that, together with a minimum of maintenance, ensures high production up-time. Advanced motion control and collision detection reduce the risk of tool and work piece damage. The control system ensures the robot always optimises acceleration and retardation to actual load, path accuracy and position repeatability, resulting in the shortest cycle time possible.

The company also uses 17 ABB robots from the 4000 series, which features compact robots with exceptional all-round capabilities and stiffness, making them perfectly matched for a variety of applications where accuracy, speed, rigidity and flexibility are important. The robot features fast acceleration and top speed, which gives short cycle times. It is also very accurate, which helps ensure consistent parts quality.

In addition, the company uses two ABB IRB 140, small, powerful and fast 6-axes robots, in cleanroom applications.



Confectionery palletising

Cadbury’s improve palletising recipe with ABB robots

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The robot system at Cadbury’s handles up to 22 cases per minute

Cadbury’s Sheffield factory is benefiting from faster, more accurate palletising following the introduction of a £1.2 million palletising system implemented by CKF Systems Ltd, one of ABB’s strategic industrial partners. The system sees the introduction of three ABB IRB 660 robots, all controlled by ABB’s dedicated palletising programme, PickMaster 5.

The new system incorporates three independent robot-palletising cells, each comprised of an ABB IRB660 robot complete with vacuum gripper. The new system handles up to 22 cases per minute and incorporates a pallet handling system including pallet dispensers and high speed stretch wrappers. Each robot station offers multiple line feeds which collect products from 3 separate conveyors. The robots also have the ability to handle three separate pallet sizes.

Flexible palletising
The three ABB 660 robots are capable of handling up to 250 kilograms each resulting in a multiple box pick up to reduce cycle times and to maximise throughput. The four-axis design comes with a reach of 3.15 meters and is ideal for palletising bags, boxes, crates, bottles and more.

ABB’s PickMaster 5 palletising software also contains all the features necessary to create a robust palletising application that offers flexibility for the shop floor. The software enables the complete project to be configured offline using a graphical user interface without the need for extensive programming and enables easy changes in production.

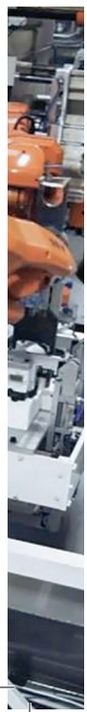
"The robots give Cadbury’s a versatile handling system that can be easily re-programmed to meet the needs of just about every palletising application" says Ian Schofield, Product Manager for ABB’s robotics business.

Productivity gains
Cadbury’s new system was commissioned and installed over a 12-week period with a loss of only 12 hours production time. Since being installed, the department has experienced a 22-week period of high levels of productivity and service levels above 99.5 percent.

The new robot system also helps reduce Cadbury’s carbon footprint by increasing the pallet stacking height to 1.7 metres, resulting in more products stacked on one pallet. Adding more products to a pallet means that a greater volume of stock can be delivered using fewer vehicles and warehouse space is better utilised.

"Without a doubt, this has changed the face of Sheffield’s packing hall" says Michelle Fitton, Manufacturing Manager for Cadbury’s Gums & Liquorice Division. "It has made us more cost effective, has further improved our high standards of safety, and is enabling the team to work more collaboratively than ever before. Not to forget playing our part in improving the environment by reducing the number of vehicles delivering our products
each year".

"The new robot palletising system offers Cadbury’s the ability to process more products" said Kevin Staines, Sales Director for CKF Systems. "The system provides Cadburys with a multi-platform conveyor and palletising system which has vastly improved productivity at the plant."







Pancake packing

Robotic picking line helps speed up Honeytop's pancake production

ABB's robotic technology has helped transform the production of pancakes at the Honeytop Speciality Food Ltd plant, by the installation of two lines each utilising four FlexPicker IRB 360 robots for the picking and stacking of pancakes. The solution, designed, built and installed by ABB's channel partner – RG Luma, ensures the company can meet its own stringent requirements for the hygienic handling of food, as well as introducing reduced labour costs and improved health and safety levels at the 120,000 square foot manufacturing plant in Dunstable, Bedfordshire.

Honeytop Speciality Foods Ltd, the UK's leading privately owned Naan bread producer and Europe's leading volume manufacturer of speciality flatbreads, produces more than 100,000 artisanal breads an hour. Recognising the need to improve productivity, the food specialist approached RG Luma – suppliers of industrial automation, special purpose machines and robotic integration – with the requirement for new automated production lines to help improve hygienic conditions at the plant and increase flexibility for the production of pancakes.

Specification stage

Speaking about the robots, William Eid, Director for Honeytop Speciality Foods Ltd, comments: "When we first began talks with RG Luma regarding this production line, we had some reservations about the robots and whether they could help introduce the flexibility and reliability we needed."

"We work in a industry with very tight turnaround times. We receive daily orders that are expected to be out to the depots within 12 hours of production. We needed to improve productivity, hygienic standards and increase the speed of the production line to meet these industry demands, all while reducing downtime."

By working closely with RG Luma, Honeytop Speciality Foods outlined the range of products required for production. The answer was to introduce flexibility; speed and quality with four FlexPicker robots, capable of handling 110 picks per minute to ensure all pancakes are picked and stacked quickly and precisely.

Clever conveyor

Forming part of a bigger solution for Honeytop Speciality Foods Ltd, the FlexPicker robots are connected via conveyor belts to a standalone automated hot plate production line that produces large quantities of batter-based products, including light and fluffy Amercian pancakes. The conveyor belt operates in a waterfall pattern, which helps to reduce the pancakes to room temperature following cooking, before preparing them for stacking and packing.

All pancakes are manually checked before entering the robot enclosure where the pancakes are picked and stacked in piles (of selectable height dependant on product) onto one central outfeed conveyor.

The enclosure is spilt into four areas of operation, enabling the robots to operate in alternative areas to the preceding robot on the line. The result is four ABB FlexPicker robots, evenly spaced out, each manning one section of the conveyor. This load-sharing system comes complete with a buffer system, designed by RG Luma, to enable the robots to keep pancakes on the buffer shelve until a short stack is identified. This buffer system also helps to reduce waste levels as the right stack of products is produced on the central outfeed conveyor.

"This is our first investment in robotic automated technology and despite some apprehension, we have not experienced one issue since the installation."

William Eid, Director, Honeytop Speciality Foods Limited



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01 Cameras mounted on the robots allow them to accurately track the position of each pancake
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02 The FlexPicker IRB 360 is capable of handling 110 picks per minute

Complementing the FlexPickers is ABB's proven PickMaster 3.2 software and its IRC5 controller. ABB's PickMaster 3.2 software offers greatly simplified programming, enabling users to model for applications and optimise multiple robot installations. For Honeytop, the use of the PickMaster 3.2 helps monitor progress on the line, including the total number of picks and can be used to quickly change production from one product to another. RG Luma has also created a secondary control system to work alongside ABB PickMaster 3.2 to vary the outfeed conveyor speed to prevent short stacks or overflows.

Vision technology
Integrated with the PickMaster 3.2 software are four-gigabit Ethernet cameras. These are mounted in front of each robot and used to locate each pancake's position on the conveyor. The robots then track the pancake position and accurately pick it and place it onto the central conveyor. RG Luma configured the vision software to recognise overlapping product and, for the first time ever, FlexPickers are able to pick a product overlapped on top of another one.

The final step of the production line requires the products to be checked again by manual operators before entering Honeytop's automated packing and labelling machine, provided by Fuji Machinery Ltd.

Speaking about the final solution, William Eid, comments, "This is our first investment in robotic automated technology and despite some apprehension, we have not experienced one issue since installation. Turnaround time has been dramatically reduced between products and as a result we can meet our customer's tight deadlines without delay. The robots have already enabled us to absorb a number of overheads, thanks to low labour costs and improved productivity."

Worries resolved
Andrew Jones, Sales Director, RG Luma, adds, "The Directors at Honeytop did express some apprehension about introducing robotics. Having integrated over 25 ABB robots in the past 12 months, we were confident in continuing to use such proven products and I think both William and his team could see how radical improvements would be possible with this change."

Each of Honeytop's final production lines feature four IRB360 robots, ABB's PickMaster 3.2 software and four IRC5 controllers. The built-in versatility of the production line has dramatically cut the changeover time between products, making it easier for Honeytop to meet its deadlines with high quality, products everytime.

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"Turnaround time has been dramatically reduced. As a result we can meet tight deadlines without delay"

William Eid, Director, Honeytop Speciality Foods Limited



Milk bottle trolley packing

UK dairy dazzled by robot automation as productivity soars by 50 percent

An ABB robot has helped Welsh dairy goods manufacturer Tomlinson's improve its productivity as part of a trolley packing solution designed by automation systems integrator Mechelec Automation. Working up to 18 hours a day loading bottles of milk into trolleys, the robot-based system has doubled the number of four-pint bottles packed from 120 to 240 per minute.

Based in Wrexham, Tomlinson's supplies over 25 million litres of fresh milk a year to over 300 outlets across Wales, the Midlands and the Northwest of England.

Previously, Tomlinson's manually loaded its trolleys at the end of the filling line, but the company often experienced a bottleneck, with trolleys becoming jammed when they were moved to load the bottles of milk. In addition, there was a constant risk of repetitive strain (RSI) or lifting injuries through repeatedly lifting and loading the products.

Time for transformation

When Tomlinson's decided to speed up production by upgrading other stages of its production line, the company realised that it needed to automate the loading system as well to boost productivity.

With previous experience in the dairy industry, John Salisbury, Mechanical Engineer at Mechelec Automation, was familiar with the handling problems presented at the end of dairy filling lines. Aware of the many dairy companies using trolleys, Mechelec Automation had already begun devising an automated solution to tackle the problems typically associated with transporting milk bottles from the end of the line into supermarkets.

Called the TP1002 trolley packer, this solution incorporates an ABB palletising robot with a bespoke end effector tool, compressed air operated components, servo drives and a variety of mechanical parts. Designed to perform at faster speeds than current systems, the TP1002 avoids jamming, improves productivity and is easy to maintain and clean.

Pneumatic automation of the trolley packer's collation system includes a configurable air supply unit suitable for a food production environment, ISO standard routine cylinders (DNSU), rotary cylinders (DSM) and compact valve terminals (VTUG). Supplied by Festo, these components are included to make the system as reliable, cost-effective and efficient as possible and were supplied ready-tested and assembled.

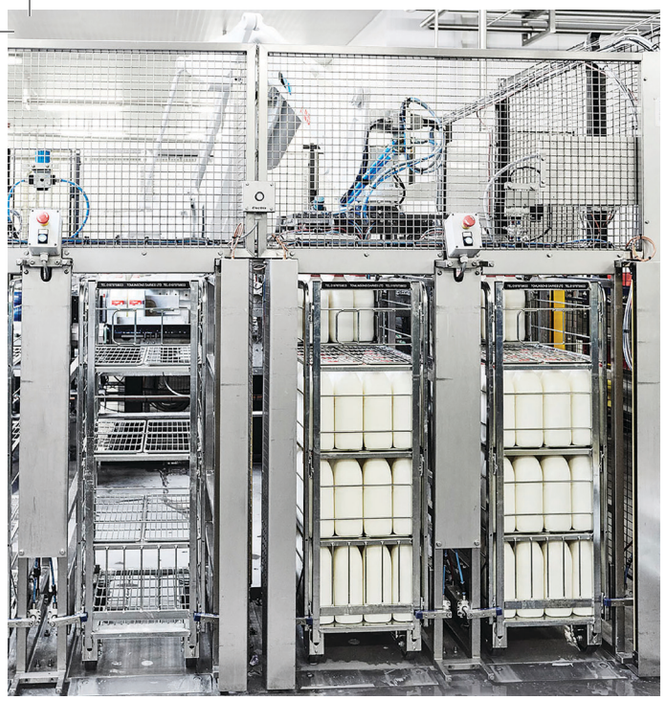
The dairy leap of faith

Keen to explore the benefits of a robotic automation solution, Tomlinson's incorporated the TP1002 trolley packer into its production line.

"To boost productivity across the dairy, we realised we would need to automate the loading of the trolleys," explains Philip Tomlinson, Managing Director at Tomlinson's Dairies. "We approached Mechelec Automation because we knew they had the relevant experience to implement a system which would meet our specifications, including removing the risk of jamming and improving health and safety. Both challenges have been overcome whilst efficiency has improved, and production output has greatly increased. We can respond to orders and deliver our products faster than ever before. The system currently operates during set periods but in the future, it will be used 24/7 as orders increase and production needs to be ramped up."

Bottles of milk are fed from a filling line through a conveyor system, before passing into a multilane set up, which divides them into four lanes. They are then collated into the required format, with four lanes consisting of five bottles per lane. Two groups of five bottles are collated either side of the machine until there are twenty bottles either side waiting to be loaded onto two trolleys.

One group of five bottles is then pushed into the robot gripper which lifts and rotates them 180 degrees towards the first trolley. The trolleys have four shelves with the bottom shelf being loaded with the first twenty bottles. When all four shelves are full, the trolley is taken to the cold stores whilst the second trolley is loaded, and the next empty trolley is positioned, after which the process is then repeated.





Where previously it took four workers a minute to fully load two trolleys, the automated system has reduced it to forty seconds. As a result, Tomlinson's productivity has improved by 50 percent.

Overall success

The jamming of the trolleys is no longer a problem either because the bottles of milk are brought to the trolleys which remain at the same level. This contrasts with the previous approach when they had to be manoeuvred to fit in line with the loading system.

Health and safety has also significantly improved. With no need for manual packing of the milk bottles, the risk of repetitive strain injuries has been eliminated.

Furthermore, hygiene is very important at dairy production sites such as Tomlinson's. To pass regulatory inspections conducted by the Food Standards Agency, all products must be of the highest quality when they reach the consumer, which calls for daily cleaning of all processing equipment.

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"Efficiency has improved, production output has increased and we can respond to orders and deliver our products faster than ever before."

Philip Tomlinson, Managing Director, Tomlinson's Dairies

The TP 1002 Trolley Packer allows staff to get easier access to the end of the line so that it can be cleaned. The ABB robot has an IP67 rating which means it can be washed down regularly without risk of damage to equipment.

Another benefit of the robotic packing system is its inherent flexibility. Although currently set up to handle four-pint bottles, the TP1002 can be easily reprogrammed to handle other bottle sizes if required. It can also be reprogrammed to load different trolleys, or shrink-wrapped products if necessary.

"If a customer wants an automated solution which can switch between products and work with various trolley types, we can pre-commission it so that the recipes are built into the system," explains John Salisbury at Mechelec Automation. "The flexibility of production at a dairy goods manufacturer is significantly increased where robot automation is installed due to the many capabilities and opportunities that the programming software provides."

Spoiled for choice

When asked why he chose an ABB robot to be integrated within the TP1002 trolley packer system rather than any of the other options available, John Salisbury's response was simple, "There was no other robot which could handle 180kg at full speed with the reach of 3.15m. We needed a robot which could manage the weight of a number of bottles of milk as well as extend its arm the appropriate distance to reach the trolleys. ABB robots are also reliable. We also have a good relationship with ABB – they allowed us to trial the robot when we initially began this project."



Confectionery cutting

Boomf benefits from 600 percent growth with ABB robot installed by Newtech

An ABB robot has been installed by system integrator Newtech at a company that specialises in the production of personalised marshmallow confectionery. Started in 2013 by founders James Middleton and Andy Bell, Boomf enables its customers to print their choice of photos, graphics and messages on to marshmallows.

The idea proved so popular that within a year the company's manual production line at its factory in Reading began to struggle to keep up with orders. Much of the delay was happening at the cutting stage. The expectation of high quality meant that each product needed to be carefully cut, causing a bottleneck in the production flow, and a lot of wastage.

With the company specialising in such a niche product, the founders feared that solving this problem with automation would require custom-built equipment and machinery.

Unique solution

James used his physical manufacturing background to begin researching solutions online. Looking at various cutting machines for the food industry on YouTube, he came across a video of a robot cutting application which used an ABB six axis robot and an ultrasonic blade to cut cakes. The automated system was integrated by Newtech, an ABB Robotics UK Authorised Value Provider.

"As soon as I saw the video, I thought that's the solution we need. We got on the phone, contacted Newtech and then we went up to trial some solutions," enthused James.

Trial and error

Like any robot installation, trials are required to ensure the best results. Because the original machines were set up to cut cakes or cheese, they weren't suitable to cut marshmallow which is an inherently sticky product. Through applying a mechanically Teflon coated blade to the ABB IRB 1200, Newtech were able to come up with a solution. The Teflon coated blade passes through an oil reservoir before the cut is made in order to ensure a suitable surface for cutting. Once the marshmallow is portioned, the blade passes through a cleaning tank before repeating the process.

When the process was performed manually, Boomf employed ten people to cut the trays of marshmallow into 40mm by 40mm squares. After every five or six cuts, the blade would need to be cleaned. In total this took five minutes. Due to miscuts, there was also a lot of wasted product. Now that the process has been automated, the procedure takes 17 seconds. Newtech also integrated intelligent vision software into the robot cell to ensure that Boomf would get the perfect cut each time. According to James Middleton, "There's next to no wastage now and that's been a real benefit to the figures."

> "Investing in robots is a great decision for any company that wants to ensure their future in an increasingly digital market."
>
> James Middleton, founder, Boomf

Response to market

In addition to improved product quality, the robot solution has raised productivity levels significantly. Now Boomf have the flexibility to respond to changes in demand. The confectionery company receive a large increase in orders during holiday periods and need the resources in place to cope with fluctuations. Improving the process has also enabled Boomf to focus on other areas of the business such as expanding delivery to more countries and looking at how its other production processes could be automated.



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The automated cutting process at Boomf takes 17 seconds in comparison to five minutes when performed manually

Further, using an IRB 1200 within a machine cell allowed Boomf to improve the health and safety at the site. James Middleton was a victim of the manual process before the automated system was installed. He severed a nerve in the end of his finger whilst cutting a batch with a knife. Removing the human interaction from the cutting process removes the risk of such accidents and the employees can apply their skills to other areas of the business such as operating the robot.

Overall, Newtech's automated solution has been a real success for the company. Ease of use is ensured through the use of a HMI which enables staff to operate the cell following simple training.

Enhanced expansion

In terms of finances, Boomf were well aware that as a start up there would be a lot of cost. However, through investing in a robot the company has already experienced the benefits, and in their second year of business have grown at an astounding rate of 600 percent. James Middleton added, "It's the benefits of having the robot that's allowed us to grow that much in one year."

When asked about what he would say to UK manufacturers who were thinking of investing in robotic automation, entrepreneur James Middleton was encouraging. "I'd say go for it. The success that we've had with our robot speaks for itself. An investment in robotics is a great decision for any company that wants to ensure their future in an increasingly digital market."



Automotive - steel bale stacking

Leading premium car manufacturer improves process efficiency with ABB

BMW Group's Swindon plant has continued with its investment in robot automation, with the installation of an ABB IRB 8700 to perform its bale stacking process. Previously, scrap steel bales weighing over 200kg were conveyed from the baling machine onto a rotational conveyor and dropped two metres into a scrap bin. Once full, the scrap bin was transported to the local metal recycling facility via a Heavy Goods Vehicle (HGV) where the bales were emptied.

There were a number of issues with this approach. Firstly, the process generated a lot of noise, posing a potential health risk for people in close proximity. Secondly, the lack of control over the two metre bale drop invariably resulted in a chaotic filling pattern which caused conveyor stoppages at times when bales piled up. Further, the high energy impacts through the bale drop increased the risk of mechanical damage to the bins, which could result in downtime if the bins had to be removed for repair.

Lastly, the takt time of the previously installed distribution conveyor was on par with the baling cycle at approximately 30 seconds. This meant that there was no margin for process stability which potentially slowed down the entire baling process.

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By carefully stacking steel bales into the scrap bin, ABB's IRB8700 robot has helped minimise noise and speed up the bin filling process



Problems solved

After conducting various trials to get a better understanding of whether the previous system could be retained with modifications to the process, BMW Group Swindon opted for a new concept utilising ABB's IRB 8700 robot, which would help minimise the impact of the bale drop and ensure more effective filling of the bin. The largest ABB robot on the market, the IRB 8700 has a payload of up to 1000kg and a reach of up to 4.20m.

Close collaboration between BMW Group's Press Engineering Department and ABB Robotics UK resulted in the robotic handling system which is in operation today. The bales are still pushed along a mechanical bale chute but now first enter a bale separation unit where each bale is separated from the bale queue, enabling the robot to take one bale at a time. Armed with a servo-driven gripper, the IRB 8700 picks the bales and places them via a pre-defined pattern into the scrap bin. As before, once the bin is filled it is collected by the HGV.

The bale placing pattern means that the scrap metal bin reaches an optimum filling level of 60 bales over two levels. At a total of almost 13 tonnes, this remains within the maximum permitted load for transport on public roads. By optimising the space available, the potential slippage of bales during bin pick up is also greatly reduced.

To ensure permanent and uninterrupted scrap disposal, the system consists of two bale stacking stations so that when one bin has been filled, the other can begin to be filled straight away.

Quieter, faster stacking

The control over the process provided by the robot means that the drop is now only 50mm. This has significantly reduced the noise generated, leading to an improved working



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The increased speed of the robot system has resulted in an average reduction of five seconds cycle time for the bale stacking process

environment for employees as well as optimising the space available within the bins. In addition, the bales are not always a perfect cube and occasionally have shards of metal sticking out. Therefore, if the drop were any less there could be damage caused to the bins through the bales being displaced and knocking against the sides.

The advantage of the servo gripper is that it can be integrated as a 7th axis directly in to the robot controller. Operated by an ABB motor unit controlled from the ABB robot controller as an external axis, this eliminates the need for a separate control system. This works more efficiently than a hydraulic system which would have been the alternative choice. It is also very maintenance friendly.

Furthermore, the speed of the IRB 8700 means that even with the introduction of an organised bin filling pattern, the takt time of the bale stacking process has been reduced by 16 percent to 25 seconds as opposed to 30 seconds.

Pre-built and commissioned in a warehouse at BMW Group's Swindon plant, the robot cell was installed over the four day production free period during Easter 2016. Robert Low, Account Manager, ABB Robotics explains, "When you manufacture a popular volume product it can be very challenging at times to get release windows for production facilities. The Easter break was the only opportunity we had to integrate the new system so the fact that it was able to be prebuilt and commissioned weeks beforehand in a different location on site was a great advantage."

Although there are thousands of robots manufacturing vehicles every day in the BMW Group worldwide, this application is the first of its kind and naturally raises some interest from various internal departments and external partners.

"As a fast-paced moving business, BMW Group Swindon is constantly looking into opportunities to optimise its efficiency," Robert Low, Account Manager, ABB Robotics continues, "Robot automation very often plays a major role in this. With the IRB 8700 robot providing the best combination of required speed, flexibility, reach, payload, space requirements, maintainability and cost-efficiency within the baling process, let's see what the future will bring to other applications at the plant."



Composites production

Robots help Solvay find new possibilities for high volume composites production

Four ABB robots are helping a leading manufacturer of multi-specialty chemicals to develop new ways of expanding the use of lightweight composites for adoption in industrial applications. Installed at Solvay's application centre in Heanor, Derbyshire, the robots are being used to help test, refine and demonstrate methods for reducing the cost and time associated with the creation of composite materials and composite material parts for use in high volume production markets such as the automotive, aerospace, mass transportation, marine and renewable energy sectors.

Solvay is a leading supplier of composite materials, process consumables and tooling for industries demanding rapid response and short lead times. Representing a $13m investment, the centre is dedicated to finding new ways to apply mass production technology to the manufacture of composite material formats and components to enable them to be used more widely throughout industry.

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Solvay uses ABB robots as part of its aim to develop new ways to optimize composites production



Created by combining two or more materials with different physical and chemical properties into a single material, composite materials offer greater strength and rigidity at a much lower weight than traditional materials such as alloys commonly used today. Typically, a composite manufacturing process entails combining a reinforcing fibre and a matrix that both holds the fibre together and gives it rigidity. Depending on the part being produced, different fibres and matrices can be used. A thermoset matrix, for example, requires a resin and a hardener, which both start as liquids before undergoing an irreversible curing process to solidify them.

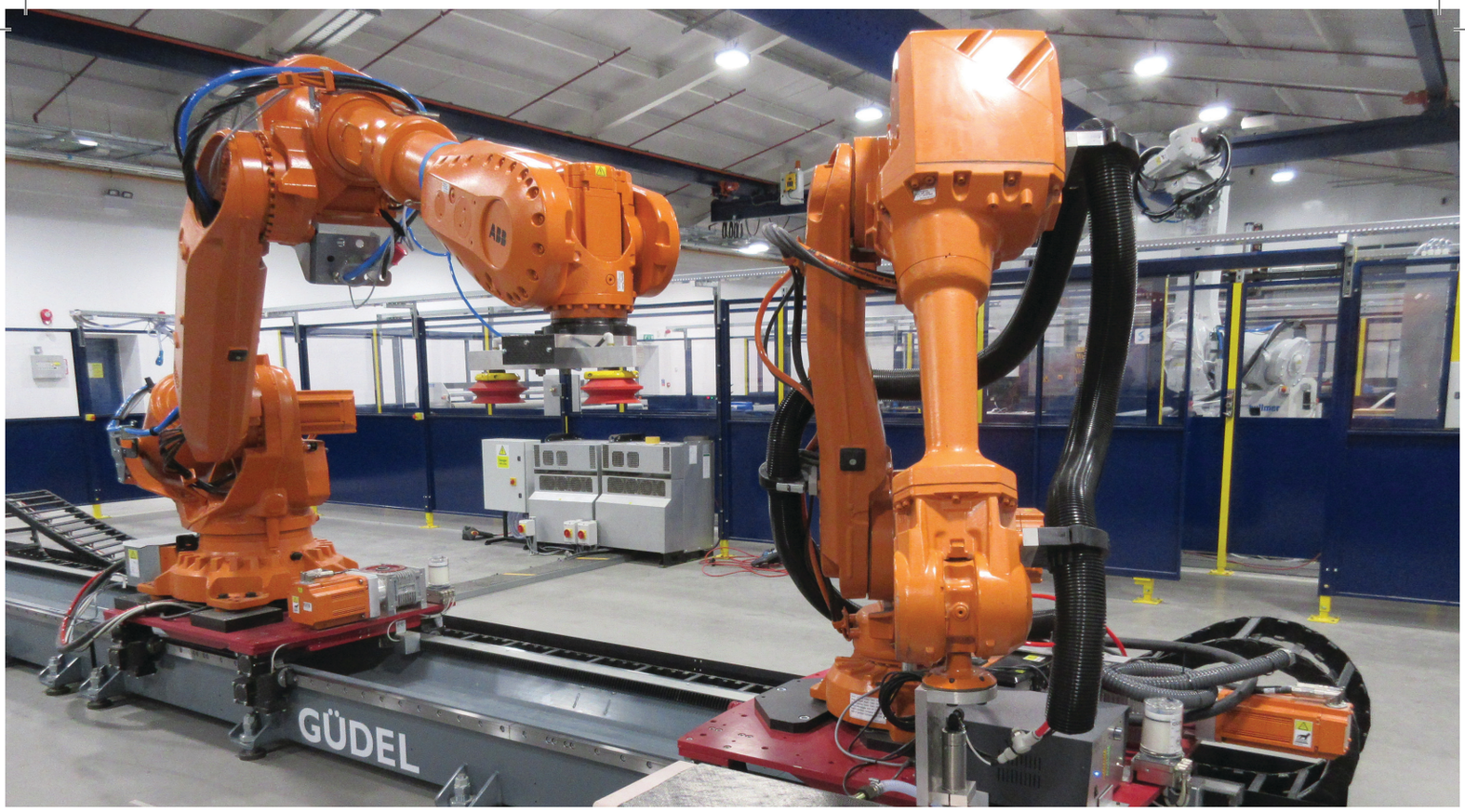
Despite the benefits that composite materials can bring, a challenge has been the cost and time incurred in their manufacture as well as conversion to components.

"While carbon fibre-epoxy composites offer an ideal alternative to traditional alloys, they have been expensive to produce and have historically required long manufacturing times," says Richard Hollis, Applications Research and Technology Engineer at the centre. "As a result, their use has tended to be limited to applications where cost is less of an issue, for example Formula One, supercars, racing yachts and aircraft, where improving performance and speed and reducing fuel consumption are key requirements."

Cutting costs and time

To reduce the cost and time of manufacture, the centre has developed new materials such as rapid cure thermoset prepregs and HP-RTM resin systems.

In a prepreg manufacture process, the fibres are impregnated with the resin, with the finished composite being supplied in a roll format to the part manufacturer. In an HP-RTM process, the part manufacturer buys the reinforcement and the resin uncombined, and the fibre gets impregnated in a closed mould tool under extreme pressures.



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Two of the four ABB robots are used in a cell handling trimming of dry fibre preforms

ABB's robots are being used in various integrated cells alongside equipment from other manufacturers as part of the centre's aim to find ways to optimise composites manufacturing processes using the latest automated production technologies.

The centre uses two ABB IRB 4600 robots, able to handle payloads up to 60kg, and two IRB 6700 robots, for payloads up to 250 kg.

"Our main goal is to find ways to produce composites at a higher rate and affordability," says Richard. "Having robots in our centre enables us to develop new product formats and processing technologies allowing us to demonstrate our ability to automate the part manufacturing for many industries where high volume production of composite structures was not previously deployed or even possible."

Robots show what's possible

Two of the robots work independently in separate processes. The IRB 6700 is used in a process involving the implementation of localised slashing and cross-plying of UD prepreg material. During this process, a roll of prepreg material is first cut into squares with an ultrasonic knife. Fitted with a vacuum end effector, the robot picks up a square from one roll and lays it at a 90° angle on top of a second roll of material to create a 0/90 crossplied prepreg. This was historically a manual, time-consuming process.

The second IRB4600 is integrated with a numerically controlled cutting machine, which takes the prepreg roll format created within the automated cross-ply cell. The cutting machine cuts out ply geometries associated with an automotive component and presents them to the robot. The robot picks up the cut pieces, up to eight pieces together, and deposits each piece in turn to create a 2D composite 'blank'. This blank is subsequently cured and trimmed using a robot.

The remaining two robots – the other IRB 4600 and IRB 6700 – are used in a cell handling trimming of dry fibre preforms. Integrated together on a track motion system, the two robots are used to handle and trim preformed parts prior to the curing stage of manufacture.

In developing the applications for the robots, the aim was to find ways that they could be used to deliver improved speed, accuracy, repeatability and quality over manually operated processes.

"Our aim has been to find ways to use automation to achieve the greatest value adding processes and time savings in collaboration with our customers for them to adopt in their own processes," concludes Richard. "Capable of repeatable performance and high accuracy, even at high speeds, robots can play a key role in automated composite production and handling processes."

Automotive accessories

Robots help Dairytube Engineering to branch out



An ABB IRB 4400 six-axis robot is enabling Dairytube Engineering to supply bull-bars and stainless steel trims for the automotive sector

Improved precision and flexibility delivered by ABB's technology is helping Dairytube Engineering to seek new business opportunities outside of the dairy industry and expand its range of steel tubing products. Equipped with a Thermal Dynamics Ultra-Cut 100 High Precision plasma cutting system and XTR High Precision robotic torch, an ABB IRB 4400 six-axis robot is now being used to manufacture products for automotive companies as well as specialist parts for dairy industry applications.

Based near Kells in Ireland, Dairytube Engineering Limited has traditionally specialised in the manufacture of stainless steel tubing products for the dairy industry, including dairy bends up to 10mm, manifolds and special fittings to order. With the improvements brought by the robotic system, Dairytube now also supplies bull-bars and stainless steel trims for the automotive sector.

Flexible automation

Norman Shekleton, managing director for Dairytube Engineering Limited, explains: "We supply a wide range of metal goods for different industries which often involves cutting preformed sections of tubes into highly complex shapes. This seemed like the perfect operation to automate, and therefore a robotic solution was called for, to help us handle the often varied cuts needed."

Norman continues, "What we got was a system that provided the best of both worlds for us. For example, the dairy industry requires dross-free cuts and weld-ready cut surfaces to prevent contamination, whereas automotive components need to look aesthetically pleasing and be consistently accurate, especially when it comes to lettering. Our new robotic system offers the perfect solution for both."

Quality and quickly

Capable of handling loads up to 60kg, ABB's IRB 4400 is enabling Dairytube Engineering to achieve fast and simple production across its entire product range. The high precision ensured by ABB's TrueMove path control technology, coupled with the improved cut quality delivered by the plasma cutting system and robotic torch is helping Dairytube to achieve a high quality product finish.

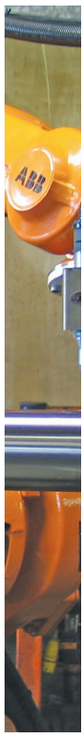


Further improvements have been achieved by the system's use of an innovative technique known as Water Mist Secondary (WMS) as part of the plasma cutting tool. In most plasma cutting systems, an expensive argon-hydrogen mix is used as a shield gas to obtain high quality results. The WMS process allows Dairytube to use ordinary tap water as the plasma gas, obtaining excellent results at a much lower cost.

Norman comments, "I was very impressed with the quality of cut I was able to achieve from our new automated solution. By using Water Mist and nitrogen on thin gauge material we were able to achieve results comparable to laser cutting. It is a great solution that will enable us to expand our product offering."

Agricultural machinery production

Welding cell helps agricultural machinery manufacturer to cut production times



The latest step in a drive to automate Shelbourne Reynolds' Suffolk factory, the cell is used to handle difficult and time-consuming welding tasks

An ABB robotic welding cell is enabling Suffolk-based agricul-tural machinery manufacturer Shelbourne Reynolds to dramatically reduce production times for its range of articulated hedge cutting tractor attachments. Handling the several hundred welds entailed in the production of the attachments, the cell has so far cut welding process times by 66 percent compared to the company's previous manufacturing process.

The installation features a specially adapted version of ABB's FlexArc cell, which brings together a robot, positioner and the welding equipment needed for the process into one integrated package.

Effective delegation

Installed as the latest step in a drive to automate Shelbourne Reynolds' Suffolk factory, the cell is used to handle the company's more difficult and time-consuming welding tasks. As well as the hedge cutting attachment, the cell is also used to produce other equipment, including a grain stripper and subassemblies for combine harvester headers, both of which involve complex welds.

"The decision on which tasks to automate with the robot was based on the amount of time they took compared to our existing process and the potential savings that could be achieved," explains Michael Scarfe, Manufacturing Manager, Shelbourne Reynolds. "For this reason, we introduced a cut-off point whereby anything that previously took an hour
or more to weld was allocated to the robot cell."

With the assistance of ABB, a time study was conducted with estimated time savings being identified for various welding processes in order to identify the ones best suited for handling by the cell.

Welding time reduction

The result has been a significant reduction in welding times, with products now being welded in one-third of the time previously required. Not only that, but complex welds, such as those involving welding around pipes and tubes, are now performed to a much higher aesthetic standard than previously.





"Circular interpolation processes involving welding around tubular objects can be a challenge for even the most skilled manual welders, particularly when time is of the essence," says Mr Scarfe. "The robot cell is able to handle these processes at a much faster rate, producing consistently strong, high quality and visually pleasing welds."

Manual welders freed

For Shelbourne Reynolds, a key benefit has been the freeing-up of the manual welders who previously made the products that are now being produced by the cell.

Compared to the previous team of six needed to handle the welding process, the robotic cell now only needs one team member to supervise one of two production shifts.

"It would be true to say that some of the team were understandably apprehensive when we first introduced the idea of a robotic welding cell," admits Scarfe. "However, the idea was always to use it to complement, not replace, our manual operations."

Proof of this is demonstrated by the fact that no-one has been made redundant since the cell was introduced. Instead, workers have been redeployed to add value to other production processes, including fast turnaround tasks and those which are too large for the cell to handle.

Comments Scarfe: "Finding skilled staff is very hard, particularly when it comes to processes such as welding and plating. We are therefore very keen to hang onto the people we've got and to find ways to utilise their expertise in the manufacture of other products."

One example is the manufacture of the Stripper Header used on larger combine harvester vehicles, which, at 42ft in length, can be produced more economically by manual welders than a robotic cell.

Best of both worlds

"As a small manufacturing operation with limited production space, we need to have maximum flexibility in our operations and to make best use of the facilities we have available," says Scarfe. "Having a combination of automated and manual production facilities really gives us the best of both worlds; the robotic cell gives us fast, accurate automated production in a compact footprint, whilst our skilled manual workforce enables us to produce high quality welds on our other products where using a robot is not practical."

To enable Shelbourne Reynolds to get the most from the cell, ABB provided in-house training for two of the company's manual welding team, including guidance on operating and programming the robot.

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The introduction of the robot cell has released the company's skilled manual to work on other production tasks





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The robot welding cell is used to produce hedge cutters, grain strippers and subassemblies for combine harvester heads

"Our two team members who've been trained in operating the cell have really taken to their new role, says Scarfe. "Moreover, their expertise and knowledge of welding processes has been invaluable in helping us to get the most from the robot cell. Far from being wary of the robot taking their jobs, our team have been actively looking for new ways in which it can be used."

The benefits brought by the robotic cell have also had knock-on effects on other areas of the business, including the way that new products are being designed. After being shown what can be achieved with the cell, the company's design team has started to design its products to make them more suitable for automated production. One example includes the 'strongbacks' used in the manufacture of the hedge trimmer and the other products which have been transferred to the robotic welding cell.

Our long term aim is to introduce another cell to help us further expand our production capabilities, explains Scarfe. "For now though, we want to find as many ways to use our existing cell as possible. We've already got five products on it and want to keep adding more until it is fully utilised 24/7. The Flex Arc cell is ideal for short batch manufacture with quick fixture changes, making it an ideal match with our Just-In-Time (JIT) manufacturing and reduced inventory philosophies."

A passionate advocate of automation, Michael Scarfe is no stranger to robotic production, having been involved in robotic welding production projects from car seat manufacture in the early 1990s to more recently electron beam welding of turbo chargers.

Says Scarfe: "I have always been interested in finding new ways in which robots and automated equipment in general can be used to shave time and cost off the production bottom line. As robotic automation projects can often be quite involved, it's also good to work with a supplier that can help at every stage. I have worked with various robot suppliers in the past but have rarely received the same degree of openness and assistance that I have received from ABB in this recent project."

Technology advances

ABB helped to play a key role in optimising the cell's performance from the outset. Using ABB's RobotStudio software, a simulated version of the cell was created which enabled programming and testing to be performed in an offline environment. This reduced much of the set-up time when the actual cell was assembled on site, allowing Shelbourne to commence welding operations within just three days.

The installation is also supported by an ABB remote service technology. This technology sends data on the robot's performance remotely to ABB via GPRS technology. The information can then be stored and used for reference, and alarms can be directly monitored. Trends can also be spotted before problems become evident.

In the event of a problem, an SMS message is automatically sent an on-call service engineer, who can immediately access a detailed data and error log and quickly identify the exact fault.



Ladder and platform production

Robots help Youngman Group compete with China



ABB has helped the access equipment manufacturer, Youngman Group, to achieve flexible production and improved productivity, as part of a £2.5 million investment in state of the art automated technology. The investment, which included two fully-automated welding cells complete with ABB's IRB 1600 robots has enabled the company to compete rigorously against imports from lower cost economies, while aiding flexible production and reducing stockholding.

The investment was agreed following a management buy-out in 2005 when it became clear to new management that investment in its UK operation made more sense than continuing to outsource manufacturing processes to China. There had been little investment in the Youngman business leading up to the buy-out. All of the main production processes were manual, including cutting, cropping and welding aluminium tubes, while the manufacturing volume flexibility was only achieved by increasing the use of temporary skilled labour.

Competition overseas

Speaking about the initial concerns raised by the new management team, Paul Bentley, managing director of the Youngman Group explains: "We recognised that we needed to invest in the future of the company as it was clear that costs were continuing to rise and the company was facing cheaper competition from European and Chinese manufacturers. The other major concern was that in the face of a slowdown in the traditionally cyclical construction market, the company would be slow in reducing costs and then slow to recover if labour had to be recruited and trained in skilled welding roles. Due to this, the decision was made to move towards robotic welding."

The company's production engineers quickly identified laser cutting and robotic welding as the optimum areas for improvement and approached ABB with the task to undertake the turnkey project. The first step in the project was for ABB to establish the design requirement over seven different frame designs and five different frame lengths and then to create a solution that would provide Youngmans with the flexibility and ease of production required.

Greater working area

The answer was to install two fully automated welding cells. In each cell, an IRB 1600 robot, ABB's compact bending backwards robot, is mounted onto a servo-driven track to increase the working area of the cell. The track motion system is designed to ensure reliable and effective utilisation of a robot's capability and greatly extend its working area, enabling one robot to reach long workpieces. With the positioning of the welding torch critical to the joint required, the track motion system successfully ensures the accuracy of the robot whilst maintaining the speed of production.

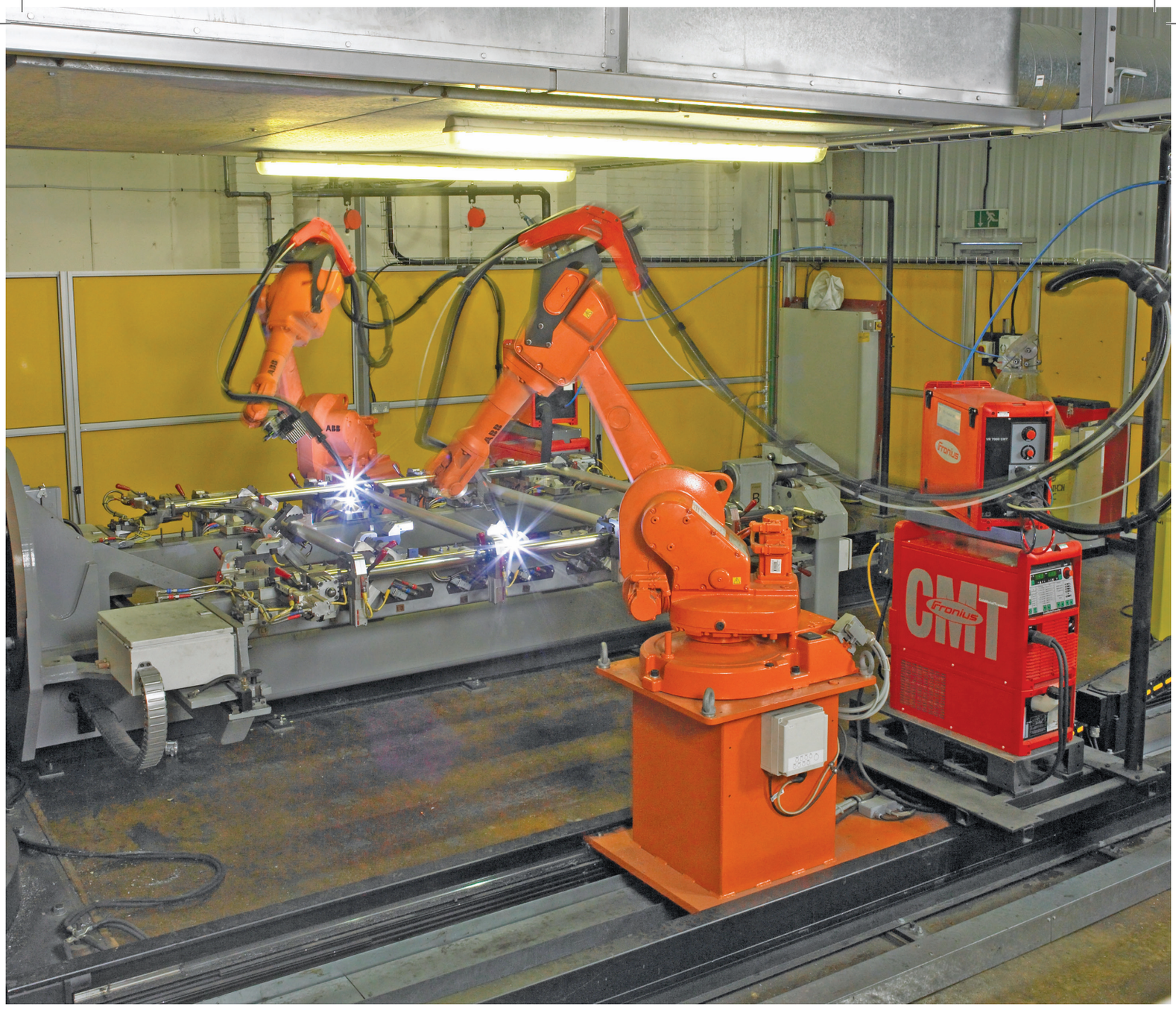
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>
> Paul Bentley, Managing Director, Youngman Group

Cold Metal Transfer (CMT)

One of the most important elements of the Youngman Group's investment was the development of the Cold Metal Transfer (CMT) welding process to match the finished product requirements.

The solution uses a controllable aluminium weld pool in all positions to allow precise control of the heat input to produce high quality welds with minimum product distortion and an improved aesthetic appearance.

Speaking about the development of the CMT welding process, Steve Bartholomew, account manager for ABB robotics comments: "The development of the CMT welding process called on our most experienced welding engineers to develop a complete right first time solution, which was created in combination with ABB's RobotStudio simulation software.



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Two fully-automated welding cells complete with IRB 1600 robots have enabled the Youngman Group to compete with lower cost economies

The results speak for themselves, with Youngman experiencing a dramatic increase in flexible production, enabling the business to meet even the most challenging production demands."

Finally, ABB's fifth generation IRC5 robot controller, is used to enable the robot, track and welding equipment to work seamlessly together, providing instant responses to changes in welding parameters, travel speed and robot positions. Each 80mm weld path has an average of eight positions, with individual weld data, robot and track positions.

Operation around the clock

Bartholomew adds: "We programmed the welding cells to operate around the clock, six days a week and are pleased to note the investment has already begun to significantly improve production efficiency. Youngman were at an advantage at the outset, with the choice to look forward and invest in automated technology having been made ahead of the economic downturn, enabling the business, which was already performing well, to present a strong case for investment."

Paul Bentley adds, "With no corporate hierarchy to hinder approval of the investment and a supportive union, it was unanimously accepted that the investment would help to secure the future of Youngman employees with the added benefit of enabling the business to compete globally. The welding cells operate around the clock, six days a week and we have already noted significant improvements. The next step is to continue looking at further investment in robotic manufacturing equipment. We are committed to our vision of growing the company in a very competitive global market which we believe can be achieved by a continued investment in state of the art manufacturing capabilities."

Vehicle towbar manufacture

Witter Towbars continues investment in robotic automation with ten new welding cells

Witter Towbars, the UK's leading towbar manufacturer, made the decision to continue its investment in robotic technology with the installation of ten new ABB welding cells for arc welding at its plant in Deeside, North Wales.

The company manufactures a complete range of towbars and towing related accessories including cycle carriers, roof racks and towing and non-towing steps. Following on from its last investment, Witter Towbars approached ABB with the requirement for new welding cells to help improve plant efficiency and control, and provide full traceability of weld parameters by enabling monitoring of the weld data.

Working closely with Witter Towbars, ABB examined the key stages and requirements of the production line to determine what the robots would need to achieve and how. The answer was to provide Witter Towbars with ten welding cells, each featuring an ABB IRB1600 ID robot. The robot, which has an extremely slim arm, can combine multiple-axis movements and 360 degree rotations, ideal for performing the complex welds on round tubing needed in the towbar manufacturing process.

Company goals achieved
Since being installed, the IRB1600 ID robots have helped the plant achieve a 20 percent improvement in efficiency. The robots' ability to complete 360 degree welds has also reduced cycle times and has improved both path accuracy and the overall quality of the weld.

The installation is also helping Witter Towbars to meet its own stringent requirements. The cells have been planned to accommodate the company's production line requirements, which limited the amount of floor space available for ABB's equipment.

Using ABB's RobotStudio offline programming software, each cell has been virtually tested before being installed, enabling the company to anticipate and resolve any potential problems in advance, There was also a requirement for improved fume extraction to improve workplace health and safety.

Speaking about the robot cells, Gary Nuttall, Senior Manufacturing Engineer at Witter Towbars explains, "Our history of investment in automation has helped to drastically reduce the number of manual welds carried out over the past five years. We still have a manual weld facility, but it is now only a fraction of what it was and is only used on specific, very old products that cannot be carried out using a robot."

Gary continues, "Our employees now form a multi-skilled workforce and have a much nicer plant to work in. The new cells contribute to an improved appearance at the plant as it is cleaner and quieter, producing a pleasant working environment for our employees. The new lines are an important development for the plant and the company as a whole as they will be used for two of our new product lines; commercial roof racks and a new four-bike cycle carrier, ZX400."

The new ABB welding cells form part of a larger investment Witter Towbars made in its modern manufacturing facility in North Wales, which also houses newly installed laser cutting machines as well as ABB's welding technology.

Integrated features
The IRB 1600ID is ideal for arc welding applications as its dress pack is integrated inside the robot's upper arm. Containing all of the equipment necessary for arc welding, including power, welding wire, shielding gas and pressurised air, the integrated dress pack is a key feature of the robot automation system that is now in place at the plant.

An integrated welding cable follows the arm's movements, which ensures it doesn't get caught in any surrounding fixtures or work pieces. Gary Nuttall credits the process arm's manoeuvrability as a major selling point. "The older robots we were using had a form of manipulator using eight index positions. With the new full manipulator, tubing that used to require a number of separate welds can be completed in a single 360 degree movement, helping to reduce our cycle times, improve path accuracy and enhance the quality of the weld."

Aggregates handling

Two year ROI forecast on robot installation at CED Thurrock

CED Stone Group based in Thurrock in Essex, has experienced a number of improvements to its pallet-ising process since upgrading its robot installation to an ABB Premium Refurbished IRB6640 model. The IRB 6640 has the ability to stack the 25kg sacks of aggregate quicker and higher than its 25 year old predecessor, resulting in an average of 1,680 bags palletised per day.



An ABB IRB6000 palletises an average of 1,680 bags of aggregate per day at CED Stone Group, Thurrock

Quarter - century robot

The supplier and manufacturer of natural stone products had a 25 year old ABB IRB6000, sold by a non ABB System House, installed at its site for the past five years. The initial decision to automate its packing and palletising process was made when CED won a large contract with Steintec Paving Systems, whose prominent projects include paving the O2 arena in London, the European Investment Bank in Luxembourg and the historic Jaffa Road in Israel.

Since that time, the original model had broken down and with no parts available to replace it, CED contacted ABB Robotics UK for an alternative solution. The company has a historical relationship with ABB as Byron Griffiths, System Service Account Manager, installed a robot at the CED Scotland site 15 years ago.

Onsite obstacles

Given this experience, Byron was called in to help with the Thurrock project, which involved a number of challenges, not least transporting the robot and its associated peripheral equipment to the site. Byron explains, "The biggest hurdle we faced was the remote location as the process takes place in what's essentially a shed in a quarry. Transporting all of the heavy equipment there was difficult but luckily there was a power supply in the shed already."

Howard White, Southern Area Manager at CED said, "There were initial teething problems with the light guard as we chose to use this part from the original equipment with the brand new system. We expected this to happen but ABB resolved the issue straight away. In fact, the whole installation only took a week. I expected about three weeks of messing about and settling in, but in the end there was hardly any downtime."

The project also included adding a new safety circuit to meet the latest regulations, as well as a new controller, the IRC5, which combines flexible, high-level programming with basic features and functionality.

Howard White explains, "With visual-input diagrams, it's much easier to understand."

Two year ROI

Furthermore, the manual workers who took over whilst the original robot was out of operation were relieved to be returned to their usual roles at the site. The CED staff had hand stacked a total of 4,000 bags over a period of seven months which the robot alone can now achieve in less than three days.

This boost in productivity has surprised Howard White. "We originally estimated that the return on investment would take around five years, but the versatility of the robot combined with its speed has meant the payback should take no longer than two."



Aggregates handling and distribution

Day Group mobilises packaging process using ABB robot

Aggregate supplier Day Group handles over three million tonnes of construction material each year. The company has been running for over 70 years and as a family-owned business has a dependable history of providing high quality products.

The company sources large quantities of both primary and recycled aggregate from a number of quarries across the UK, all of which require bagging before customer deliveries are made. This poses a logistical problem, as transporting heavy loads of aggregate over hundreds of miles increases both handling and energy costs. The alternative, building on-site factories for the purposes of bagging, also requires capital expenditure.

Having recognised these challenges, the Day Group approached ABB Authorised Value Provider RM Group. The two companies had already worked together on previous projects when Day Group rented RM Group's mobile packaging plant.

Logistical benefits

Comprised of a trailer equipped with an IRB 460 ABB robot inside to palletise the bags, the mobile packaging plant provides a versatile, efficient and easily transportable solution for bagging products at source. Day Group realised the benefits immediately and ordered its own fleet of nine mobile packaging plants which have been deployed around its many quarries.

Llewelyn Rees, Managing Director at RM Group explains, "When companies like the Day Group buy a quarry, if they go for planning permission for buildings, it can take a couple of years. With the mobile system, it's literally there, and it's bringing the raw material out of the quarry immediately. As soon as they have an asset, they can get underaway with removing the materials."

The efficiency of the bagging process is greatly assisted by the compact and lightweight design of the IRB 460. Capable of operating at up to 24 cycles a minute, the robot can perform the process quickly with less inertia on the trailer. In addition, its zero tail swing and small footprint means it can fit within the confines of the trailer.

The inherent flexibility of the mobile solution means it can be used anywhere to handle a wide variety of different products.

> "If we have a depot that has a breakdown, we can pack the lorry up and it can be at the other site tomorrow. Production is unaffected; the product can be stockpiled and fed straight onto the lorry, packaged and delivered to the consumer."
>
> Malcolm Burton, Yard Manager at Day Group's South Cerney and Southampton depots

Malcolm Burton, Yard Manager at Day Group's South Cerney and Southampton depots explains: "Our biggest challenge is meeting changes in customer demand. Each company we supply wants different products. The adaptability that the IRB 460 offers means we can palletise a vast range of aggregates from nought to three millimetres through to 40 millimetres. It can even take track ballast if need be."

Increased throughput

The IRB 460 also adds flexibility in terms of production capacity. Burton explains, "It ticks over at 15 bags a minute, but it can go up to 22 bags if required." This flexibility allows Day Group to respond quickly to changes in demand, which tends to vary according to the seasons. The aggregates supplier is at its busiest during the summer months with demand tailing off slightly in the winter.

The nature of the products being demanded can also change with the seasons. Day Group experiences high demand for salt for gritting purposes during the colder months. Again, the mobile packaging system adds value to this application by allowing the packaging process to be transported directly to the docks. The salt can be bagged straight from the ships and distributed from there. This significantly reduces fuel costs which would be incurred if the salt were to be brought to the packaging plant.



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The IRB 460 at Day Group adds flexibility in terms of production capacity

Burton also notes that process mobility can significantly reduce downtime. "If we have a depot that has a breakdown, we can pack the lorry up and it can be at the other site tomorrow. Production is unaffected; the product can be stockpiled and fed straight onto the lorry, packaged and delivered to the consumer."

Remote assistance

Remote assistance is included so that in the event of a breakdown at Day Group, the issue can be resolved in the shortest time possible. RM Group's eWON package allows users to dial into the system and view PLCs and HMIs using cameras to identify the problem.

Rees explains, "Nine times out of 10 we can identify where the issue is. In the past, a supplier would send an engineer but this could take anything up to a week. Remote access means we can be there instantly."

The remote monitoring system usability is also maximised by Day Group staff. As a manager of two yards, it's an advantage that Burton can log on to his laptop and diagnose the problem from wherever he is. "If I get a problem at one of the sites, I can help the lads resolve it over the phone. It's definitely been worthwhile having the cameras and software installed," he says.

Furthering innovation

Based in mid-Wales, RM Group originally started as a packaging services company. Discovering that much of the equipment on the market failed to meet its requirements, the company began manufacturing its own packaging equipment. It wasn't long before RM Group realised the benefits that robots could bring to packaging applications across its customer base and began to integrate them into its systems.

Since it began business, RM Group's customer base has grown to include sugar factories and animal feed suppliers through to coal products and aggregates. With the help of ABB and the range of robots on offer, RM Group is expanding into the food industry this year.

Inventiveness is key to RM Group's success. In recognition of the company's track record as an experienced robot systems integrator, ABB awarded RM Group Authorised Value Provider status in 2015. Llewelyn Rees explains, "We've always had a philosophy of never standing still. You can't sit back and just sell machinery. Customers are always asking us, 'Could you do this differently, or could we make that?' Our strong point is that we've never said no."

It is this forward-thinking attitude that has made RM Group's use of the IRB 460 in its mobile packaging lines such a success. Llewelyn Rees envisions that the Day Group installations and similar projects could be replicated across the UK. Says Rees: "The more mobile packaging plants that are taken up, the better it will be for the environment. More mobile plants will mean that companies could significantly reduce their fuel usage by eliminating the need to transport large quantities bulk materials over long distances."

"There are benefits to be had not only for the customer but for the UK as a whole," he concludes.

For the Day Group, the IRB 460s and the mobile packaging application are part of the aggregates supplier's plans to grow, with Burton concluding, "If we get bigger, no doubt we'll be seeing another mobile packaging line in the not too distant future."

Bespoke machine production

Creative machine builder minimises footprint with ceiling-mounted robot



A workcell measuring just 0.8 by 1 metre, with an ABB IRB 120 robot hanging upside-down from the ceiling, helped provide an innovative solution for global contact lens manufacturer CooperVision at its R&D facility in Southampton. The cell provided a reduced cycle time of 30 percent by enabling the faster transfer of contact lenses between the moulding and curing processes.

"I wanted to make the most of the available space and suspending the robot from the ceiling seemed the best way to minimise the footprint," says Rod Mitchell, technical director of Midlands-based machine builder Notio, which built the cell.

His company specialises in bespoke solutions for applications where production equipment is not readily available. Mitchell integrates solutions involving mechanical engineering, electronic engineering and software to find a suitable design to fit the application and the budget, aiming to bring a creative perspective to machine design.

"We are specialists at solving quirky problems for unusual applications, typically the ones that larger companies are reluctant to tackle because there is too much engineering and not enough sales involved," he says.

Notio does the whole job - drawings, sourcing of parts, documentation and everything else up to commissioning. In fact the name of the company, Notio, is Latin for notion or concept, indicating the company's investigative approach to manufacturing problems.

A visionary approach

CooperVision's Southampton facility, where the new workcell is installed, develops production processes for introduction in serial manufacture in the company's plants worldwide.

The workcell has been set up to develop a process for manufacturing a wide range of contact lens mouldings with total backward traceability in a cleanroom environment.

The robot used, the ABB IRB 120, is a small multipurpose industrial robot that weighs just 25kg and can handle a payload of 3kg, certified for ISO 5 cleanroom areas (Class 100). The robot was selected for its small size and its speed, with a key demand being the ability to handle eight parts in ten seconds.

To make the cell even more cost-effective, the robot's built-in controller is used to manage the whole cell, eliminating the requirement for a PLC as well as a HMI.

"Controlling the cell is a fairly simple job and this solution offered the lowest cost," comments Mitchell.

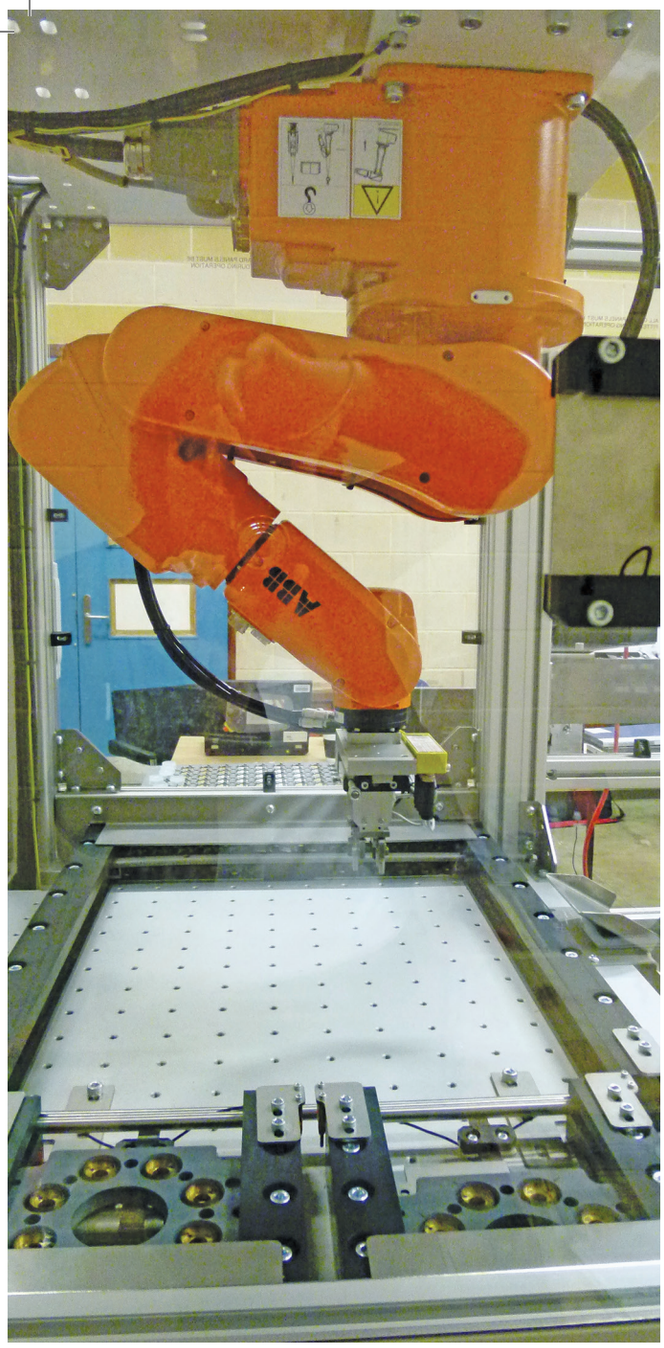
The cell at CooperVision is used to transfer contact lenses moulded to curing. Initially, a mould consisting of two pieces, one for the front and one for the back of the optical surface, is made up. The space between the two halves of the mould is filled with monomer.The assembly is cured and the mould is then discarded. The process requires high precision as well as high volume.

Time and space saver

The robot cell has been introduced to remove a manual step from the process, aiming to save time and free up staff. The reduction in cycle time has been achieved by using the robot to transfer parts from the injection moulding process that arrive in batches of eight, to a tray with over two hundred parts, which are placed and orientated to a specific pattern ready to go into the cure process.

As the target tray is fairly large, this impacted on the footprint of the installation and the solution was to suspend the robot from the ceiling of the cell.

"Operating the robot from the ceiling of the cell was a novel idea to us. It's a creative approach that saves space, which is important to us, so the whole cell now takes up no more footprint than



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01 Using a ceiling-mounted robot helped to reduce the overall installation space required

02 The cell will be reconfigured to use in other processes at CooperVision in future

the robot baseplate," says Robin Frith, R&D project engineering manager at CooperVision.

"Notio has the knowledge and skills to meet our critical quality specifications and develop applications that we can successfully introduce into manufacturing. They also help source components, enabling us to work with the manufacturers and platforms that best suit our needs.

"The cell will be used for about a year here, but it's quite an adaptable cell so we will probably reconfigure it and get more use from it somewhere else."

"I wanted to make the most of the available space. Suspending the robot from the ceiling seemed the best way to minimise the footprint."

Andy Knight, Director, CHX Products

Metalforming and sculpting RoboFold demonstrates the art of robotics



London-based design con-sultancy RoboFold is quite literally demonstrating the art of robotic technology. The company is using two ABB IRB6400 industrial robots to help architects and designers to explore new ways of bending and forming metal, opening up new possibilities for architectural and furniture design.

More usually employed for cast cleaning and pre-machining in metal industry applications, the two IRB6400 robots are used by RoboFold to produce single-piece metal objects customised to a customer's specific requirements.

Tools down, robots on
Both six-axis robots are fitted with vacuum cups, which hold pre-scored metal sheets, ranging from 60-80cm^2 up to 1.5m^2, as they are curved and folded according to instructions supplied by RoboFold's own robotic CAD system. The CAD program dictates the movement of the robots, which move simultaneously according to the pre-determined trajectories needed to fold the metal into the desired shape or shapes. As all of the information for the folding process is contained in the data from the CAD system, there is no need for any hard tooling.

Automated adaptability
The use of the robots is the culmination of a quest started by RoboFold proprietor, Gregory Epps, in 1997. "I firmly believe that there are no limitations in design or in the possibilities of turning a design into a real-life object," explains Epps.

"My interest in finding new ways to create single piece curved surfaces first started about 17 years ago. In particular, I became very interested in how to develop a system for producing curved folded metal panels. My search for ways to do this is what eventually led me to the ABB robots."

A key benefit of using the robots is their inherent flexibility, which enables them to handle any design programmed into the CAD system.

"Before I bought the robots I had made previous attempts at developing my own machines that could bend metal along a curve. However, none of them could be readily adapted to handle different jobs," says Epps.

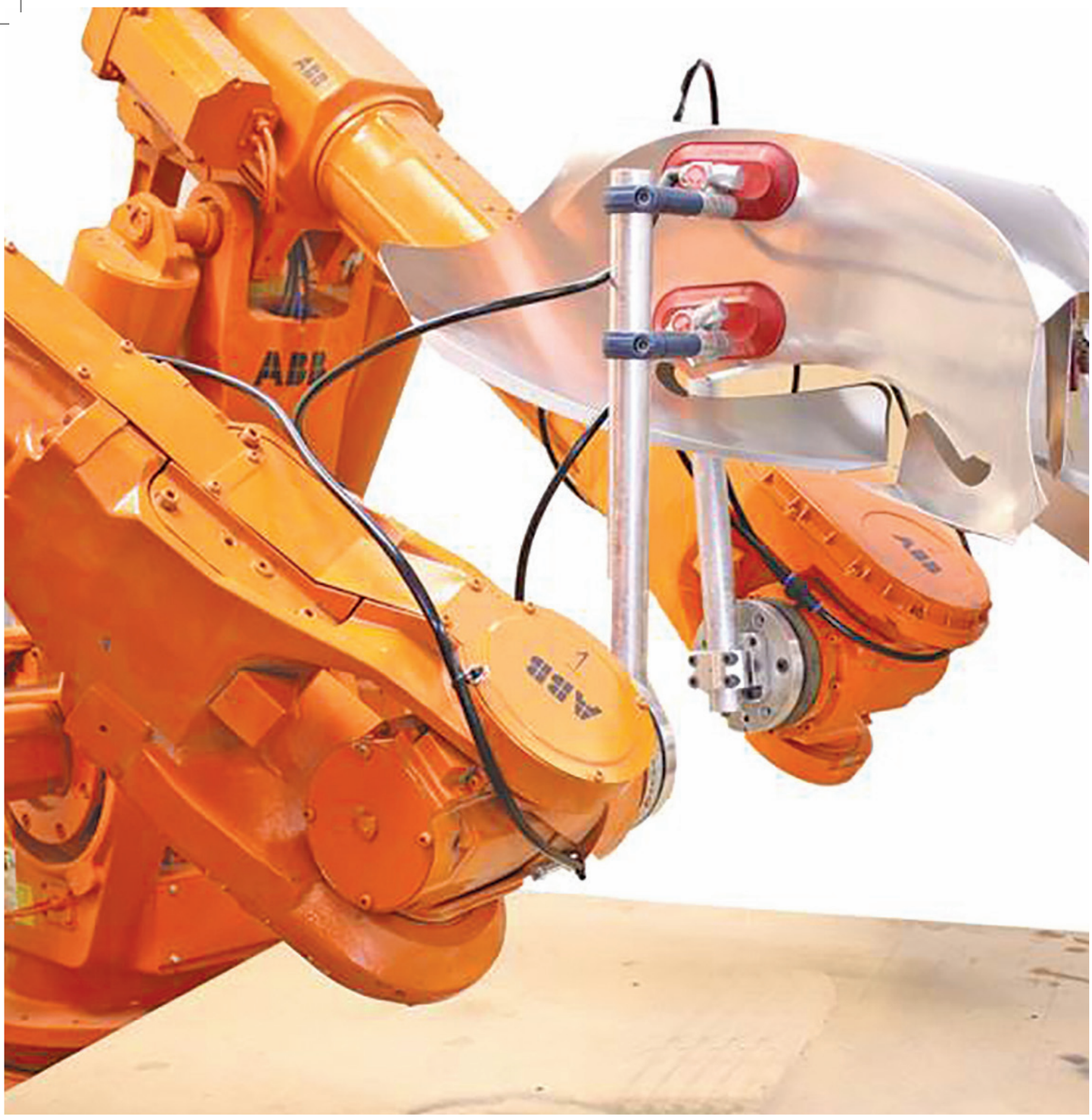
By using the robots, this problem has been overcome. All information about the shape and form for the metal is contained in the CAD instructions, which direct the movement of the robot to produce the object required. Furthermore, RoboFold also has the ability to simulate the process before it has been carried out, enabling any areas for fine-tuning to be identified and rehearsed before the physical production process begins.

Digital moulding
The ability of the robot to work directly from the CAD file has also helped to overcome another problem typically encountered in metals fabrication processes, specifically the need to produce a mould.

"As almost all of the work we do is bespoke and non-standard, it would be both impractical and uneconomical to produce a mould for every object we make," explains Epps. "With our robotic system, the CAD file is effectively the mould, but, unlike a traditional mould, it can be readily changed and adapted whenever necessary."

Bending the possibilities
Another benefit of the robotic system is its speed. Typically, metal sheets can be formed and shaped within just two minutes. This, combined with the elimination of the need for a mold, makes it both much faster and less costly for RoboFold's customers to see their concepts turned into reality.

"With the robotic system, we've really achieved the best of both worlds, coupling the accuracy, speed and capabilities of automation with the human appreciation of form and function," says Epps. "Using the robots has opened up a world of new possibilities for the way in which metal can be shaped, with an end result that looks much better than other products formed using alternative processes."



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Robots enable RoboFold to achieve the best of both worlds, coupling the speed of automation with the human appreciation of form

Started in 2008, Robofold specialises primarily in the design and architectural markets. The company has attracted attention for its work produced by the robots, which has included custom-built furniture, facades for buildings, structures for renowned architect Zaha Hadid, and, in 2012, a custom-made metal egg used as part of the world's biggest Easter egg hunt.

"I firmly believe that robots are for working with people, not replacing them," concludes Epps. "The future of manufacturing, especially here in the UK, cannot just be about efficiency. It should be about making useful, aesthetically pleasing things using the best tools available."

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"Using the robots has opened up a world of new possibilities for the way in which metal can be shaped, with an end result that looks much better than other products formed using alternative processes."

Gregory Epps, RoboFold proprietor

Hand-crafted ceramics production

Stoke-based ceramics manufacturer produces high quality flagons with ABB

Robots help ceramic flagon manufacturer to achieve high quantity production with a high-quality finish.

An automated production solution built by ABB Authorised Value Provider The Automated Technology Group (ATG) featuring four ABB robots is helping a Stoke-based ceramics producer to produce high quality flagons to a hand-crafted finish. Used as part of four production cells, the robots have helped to increase output and reduce scrap product by helping to speed up flagon production whilst ensuring improved quality and consistency.

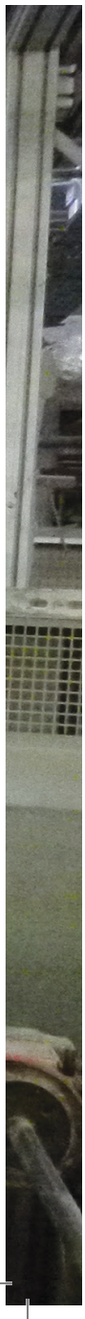
Originally founded in 1810, Wade Ceramics currently operates two production sites, with its site at Bessemer Drive in Stoke specialising in the production of flagon containers used by several premium-brand alcoholic spirits manufacturers.



The company produces up to 80,000 flagons a week, including both refillable and non-refillable versions. As well as standard bottle designs, it also produces containers to its customers' specific requirements, with past and current designs including fish, dogs and even mermaids.

Just like any hand-crafted product, production of the flagons is an intricate process. Every flagon passes through multiple stages, starting with it being cast in clay and ending with decoration and inspection of the final glazed product prior to packaging and despatch. Every flagon is fired twice in the company's two kilns; first after the casting and fettling stage and again after the application of the coloured glazing that gives each flagon its distinctive finish. At every stage, each container needs to be produced to the tightest possible tolerances to ensure it meets the company's strict quality standards.

"The flagons we produce need to reflect the values of the luxury brands we deal with," says Stuart Shickell, Head of Engineering for Wade Ceramics. "Even the slightest imperfection, whether it is the width of a bottle neck or inconsistencies in the colour or glazing, can result in one or more products being rejected. As each flagon takes between 16 to 20 hours to produce, we were keen to minimise the risk of any problems occurring during our manufacturing process."



The case for automation

As one of the last surviving ceramics companies in Stoke, Wade Ceramics has been no stranger to change. Originally offering around 50,000 products in its portfolio manufactured across three sites, the company took the decision in 2000 to slim down its product range to focus on decanters. In 2010, the company opened its current factory at Bessemer Drive, with new machines and kilns. With increasing production demands, Wade Ceramics was keen to find ways to improve production by further automating its production line.

Installed in Christmas 2016 during a two-week production shutdown, the automated system supplied by ATG has helped Wade Ceramics to increase production and overcome several issues that had previously affected manufacturing output and product quality.



One of these issues related to the positioning of the flagons prior to the first kiln firing. Flagons placed too closely together sometimes became fused during the firing process, resulting in them being rejected for scrap.

This issue has been overcome by two robot cells featuring ABB IRB1600 robots positioned on the in-feed to the first kiln. Each cell includes a vision system that locates each flagon as it is conveyed to the kiln infeed and ensures it is correctly positioned to prevent it fusing together with other flagons during firing.

Another issue concerned inconsistencies in the glazing around the base of the flagons. Applied as a powder coating, the glaze gives each container its distinctive colour. To meet Wade Ceramics' high product quality standards, the glaze must be evenly applied over the complete surface of every flagon. Previously, imprecise wiping after the application of the glazing powder was causing some of the powder to be removed from the bottom of the flagons, resulting in an uneven finish.

To tackle this, ATG developed an additional robotic cell incorporating an automated 'foot wiping' system which helps to ensure precise and consistent wiping of the flagon base without removing the glazing powder. The cell uses an ABB IRB2600 robot, which picks up each flagon before wiping its base on a rotating cleaning mat and then passing it to the conveyor to the second kiln. Developing this solution was not without its challenges, as Simon Miles, Applications and Proposals Manager – Systems Division for ATG explains:

"One of the biggest hurdles in developing the foot wiping cell was the need for the robot to be able to keep pace with the powder glazing machine. To keep everything perfectly synchronised, we needed to get the whole foot wiping process done within a target Takt time of just 16 seconds."

To achieve this meant not only getting the products to the robot from the glazing machine, but also making sure that the flagons were properly tracked when they arrived at the robot and when they were arranged on the Kiln batts located on the outfeed conveyor to the second kiln.

"Getting the process exactly right involved extensive testing to arrive at the best set-up that would allow the cell to operate at the maximum speed," says Miles. "To enable the robot to stay within the target Takt time, the system tracks the position of the flagons as they enter the foot wiping cell to allow the robot to squarely pick up the flagon. Similarly, once the flagon base has been wiped, the robot places the finished unit in a specific location on the kiln batt on the outfeed conveyor, enabling it to get into position to accept the next flagon as quickly as possible."

An added complication was the need for the cell to also include an extra step required for non-refillable flagon variants, which requires the robot to remove a temporary shield plastic cap from the top of the flagon on exit from the glazing machine and prior to placement onto the kiln batt.

The thorough testing carried out by ATG, together with the accuracy and speed of the IRB2600 robot, means that both the foot wiping process and removal of the plastic caps for non-refillable flagons can be comfortably performed within the 16-second window. Not only that, but the improvements delivered by the robotic foot-wiping process have meant that the flagon reject rate has now fallen to just 1.5 percent.

The value of prior preparation

With Wade Ceramics running its production 24 hours a day, seven days a week, and with little spare space available at the factory, the complete automated system, including the four robot cells, had to be built and tested at ATG's Northampton site. Working in conjunction with Wade Ceramics' engineering team, the system was extensively tested to help ensure it would be ready for operation with the minimum of disruption once installed at the company's Bessemer Drive site.

"The complexity of this project, coupled with the need to get the automated system up and running as quickly as possible once it was installed, meant carrying out thorough testing to ensure any problems were ironed out," explains Simon Miles. "As a result, we were able to install everything on site within Wade's two-week Christmas shutdown in 2016, with production being ramped up as the system became fully operational."

Automation secures the competitive edge

The company's ability to maintain a high production output without compromising the quality of its products has given it a key advantage over its competitors, which has been greatly enhanced by its use of automation.

"The methods that we use, together with the design of our production process and the improved performance achieved through our use of automation, enables us to produce around 3.5 million flagons per year, more than any of our competitors, whilst maintaining the very highest standards of product quality," explains Stuart Shickell. "We now have the best of both worlds, using automation and robots to boost our efficiency whilst maintaining the traditional hand-crafted look and feel of our products that is core to our reputation."





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"The methods that we use, together with the design of our production process and the improved performance achieved through our use of automation, enables us to produce around 3.5 million flagons per year, more than any of our competitors, whilst maintaining the very highest standards of product quality"

Stuart Shickell, Head of Engineering for Wade Ceramics.

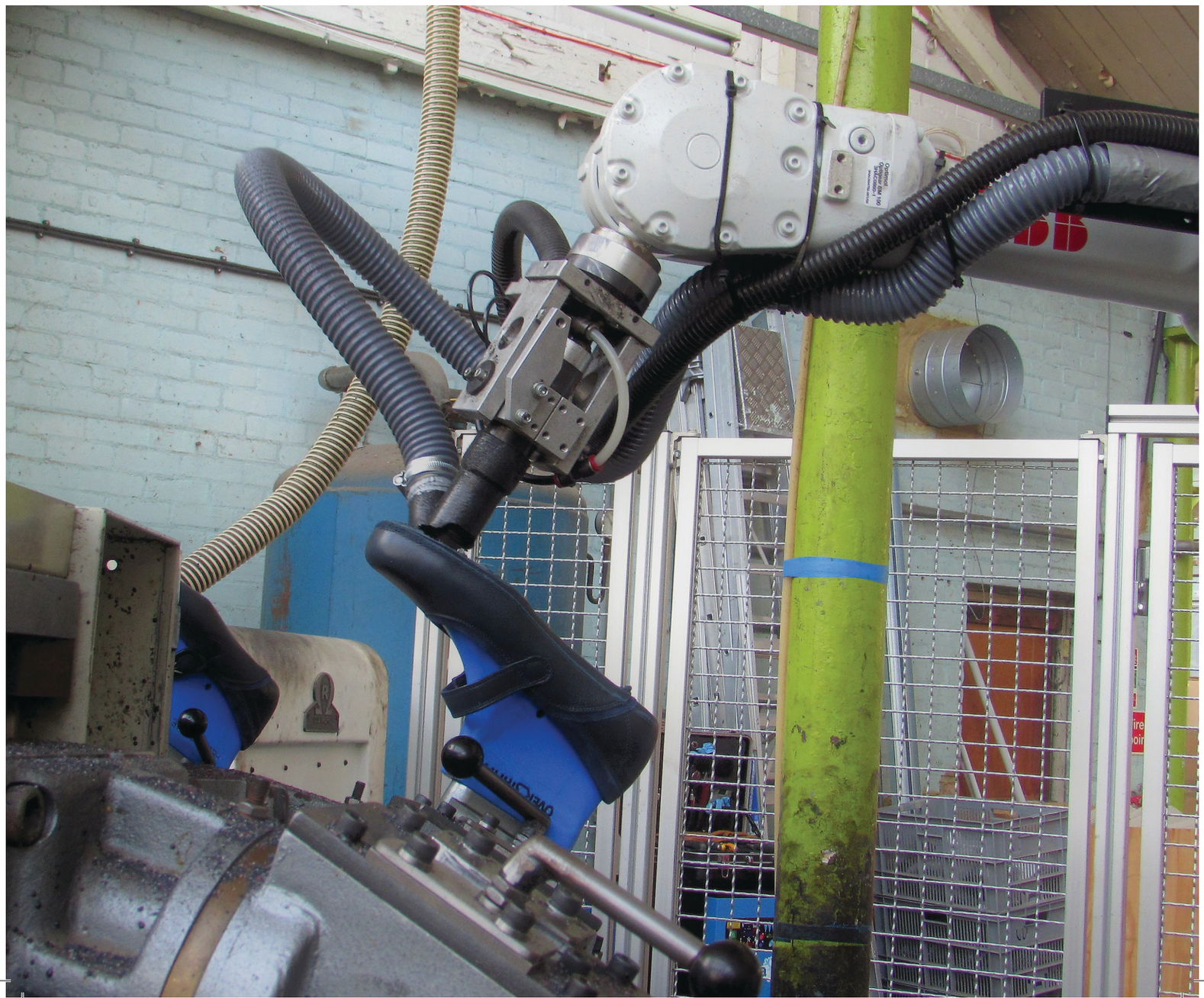
Shoe manufacture

ABB robots help small shoe factory take some big steps

ABB robots help a specialized shoe manufacturer boost competitiveness and create a reputation for big choice for its customers.

Improved flexibility to cope with an expanding product range and the reassurance of prompt service and support were two key factors that convinced DB Shoes to replace its existing production robots with the latest ABB robots.

With a history dating back to 1840, Northamptonshire-based DB Shoes offers a wide range of footwear, including specialist wide-fit ladies' shoes. From its factory in Rushden, which employs 20 people, the company offers its ladies shoes in a range of styles with a choice of four different fittings. Specially made for customers with wider feet, the shoes feature a distinctive deep-fit design which helps to hide their depth, with the sole of the shoe running part way up the leather upper.







To achieve this, the upper is bonded to the sole in a polyurethane (PU) direct injection mould. Much stronger than adhesive and quicker than stitching, the moulding process creates a strong yet flexible shoe that can withstand over 11 million flexes without the bond failing.

A key challenge in DB Shoes' manufacturing process is the range of different parameters that need to be applied. As well as different designs being needed according to whether a shoe is for a left or right foot, the company also offers seven different sizes with five different sole moulds plus an additional choice of three stretch panel designs. Combined, this amounts to around 210 different options, each of which needs to be turned into a distinct program for the robots.

To help maximise output, the company uses two PU injection moulding machines, each equipped with an ABB IRB 1600 robot. Each machine has twelve stations, enabling six pairs of shoes to be produced at a time. The production process is comprised of two stages. First, the leather uppers are placed onto shaped moulds, known as 'lasts', which are offered upside-down to the ABB robot to be 'roughed'. The roughing process involves a rotating abrasive disk being guided around the area of the shoe where the upper and the sole will meet, known as the 'bite line'. By abrading the smooth surface of the leather, the roughing process helps to maximise the bond between the sole and the upper by enabling the polyurethane to fully penetrate during the moulding process.

By automating this process, DB Shoes has eliminated the need to manually mark the bite line and rough the surface of the shoe, which can be time-consuming and sometimes result in potential inconsistencies in product quality.

Once all the shoes have been roughed, the uppers are then manually inverted, with each placed into a mould into which a mixture of resin and chemical is injected to create the sole. As the resin and chemical mixes, it creates an exothermic reaction, with the total moulding process lasting around four minutes per shoe. As the initially liquid polyurethane sets, it penetrates the roughed areas of the shoe to create the strongest possible bond.

Answering the call for greater flexibility

Before installing the ABB robots, DB Shoes had previously been using 20-year old robots of a different make to handle the roughing process. Although these robots had worked well, they were struggling to cope with handling the multiple programs needed to produce DB Shoes' full range.

“Although our old robots were continuing to operate perfectly well and could handle the different programs that were needed for the 12-station mould, it was becoming difficult to manage the mounting range of programs needed to produce our expanding range of shoes,” says David Denton, Managing Director for DB Shoes. “To help make things easier, we needed an upgrade that could handle our full current requirements for multiple shoe designs and be easily adapted to handle new designs in the future.”

Initially turning to its incumbent supplier, DB Shoes found that it was unable to obtain the right replacement solution or the level of support that would meet its needs.

“As the robots are a key part of our production process, we were looking for a solution provider we could rely on to be on hand quickly in the event of any problems,” explains David. “Unfortunately, the company we were previously dealing with just didn’t have the right expertise or infrastructure in place to be able to support us.”

After contacting Bedfordshire-based ABB Authorised Value Provider, Premier Automation, David was recommended a solution utilising the two ABB six-axis robots.

“Changing to ABB presented a solution on two fronts,” says David. “Firstly, the controllers for the two new robots have more than enough memory to accommodate all 210 of our current production programs, with the ability to handle more if required. Secondly, both ABB and Premier Automation are near our factory, and have the resources in place to provide a fast response in the event of a problem or query.”

Given the key role of the automated roughing process in the production of the shoes, it was important to minimise any disruption during the installation and commissioning of the new robots. For this reason, Premier Automation spent around six months developing and testing the replacement robot cells, including creating a library of template programs for each shoe type that can be easily adapted by DB Shoes for new shoe ranges.

“Having an aesthetically pleasing product is a core part of our commitment to providing our customers with the highest quality footwear. It was therefore imperative that the robots were correctly set up to ensure that the roughing process was carried out on the correct part of the shoe, particularly when it comes to our stretch panel options, which need to be carefully handled as the roughing wheel could tear the material,” says David.

“Premier Automation worked hard to learn and understand our production process and to address any potential issues that might affect the quality of our products.”

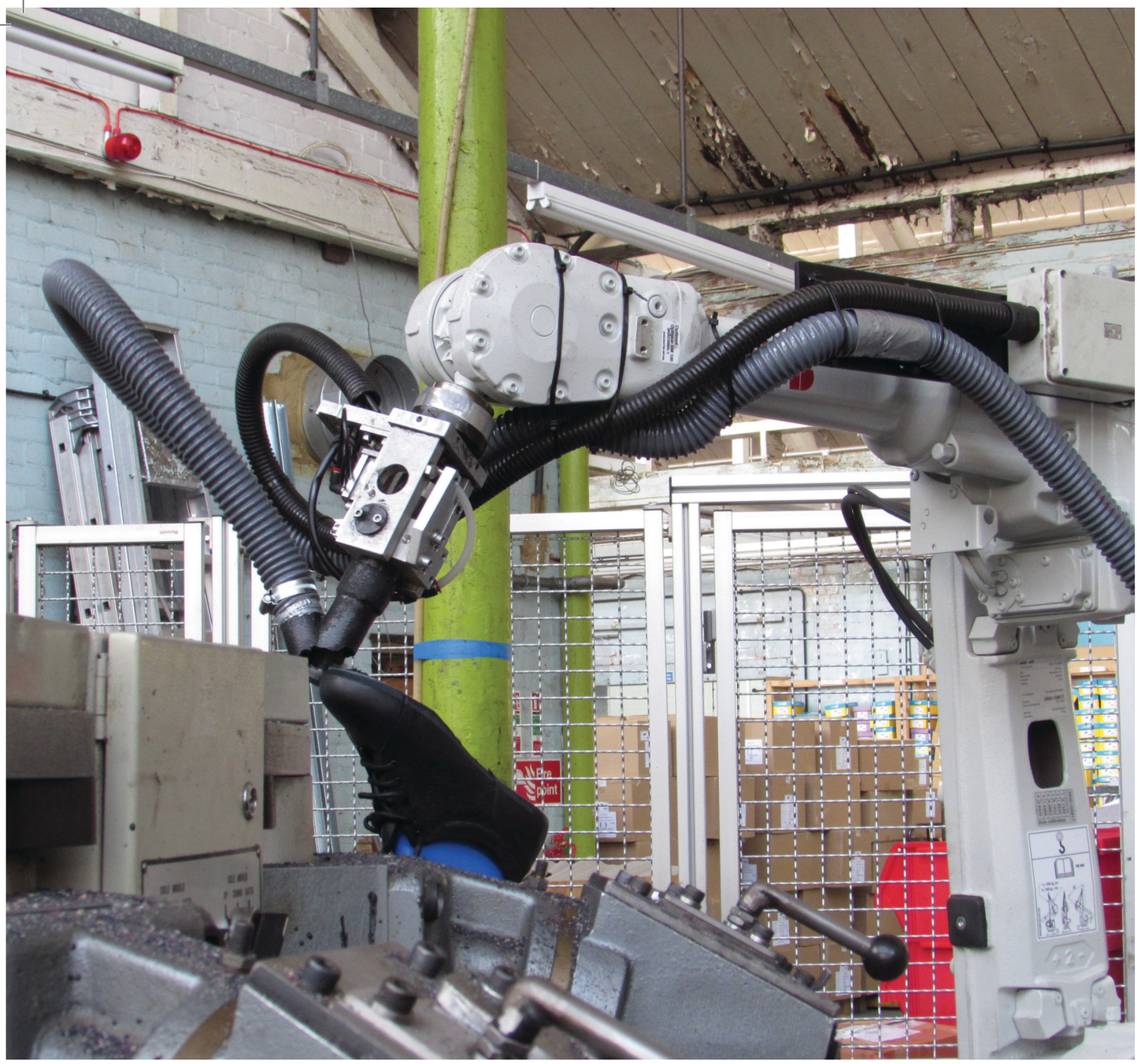
As a result of this pre-preparation, the time taken for the new cells to be installed and set up was reduced to just three days, with little overall impact on the company’s production output.

“To help reduce the impact of installing the new cells, we had been operating on overtime the week before to build up extra stock,” explains David. “To help further minimise disruption, we also upgraded each machine individually rather than having them both out of service at the same time.”

Since the robots were installed in December 2017, they have worked perfectly, enabling DB Shoes to produce around 300 pairs of shoes each day, with the potential to handle 700 if required. For David, a key benefit of the robots is their ability to be quickly switched between any program in the company’s full shoe range.

“The flexibility of the robots, coupled with the templates set up by Premier Automation and the training they provided to myself and other members of my team, means that it is very easy for us to change between different shoe types and sizes,” says David. “If we want to change a template or set one up for a new type of shoe, it’s as easy as just copying one of the existing templates and making the edits needed to create a brand-new template using ABB’s handheld teach pendant controller.”





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The ABB IRB 1600 robot roughs the edge of the shoe to allow polyurethane to penetrate the fibres of the shoe during the moulding process

Overall, David is very pleased with the new robot cells, which are well on course to offer a payback on investment within three years. “With 60 percent of our sales coming from our online business-to-business and business-to-consumer retailing activities, we need to be able to offer the broadest range of shoes and deliver them quickly without compromising our quality standards,” he says. “Thanks to the expanded capabilities of the robots, we are able to offer the sort of production performance and turnaround that you’d expect from a much larger operation.”

With many smaller UK manufacturers still unsure about whether to make the switch to robotic automation, David advises: “In my opinion, the key to success in an installation like this is to know what it is you are trying to achieve from the very outset and to make sure that you have someone who owns the project and knows the production process very well. It also helps to be able to count on the support of both the robot supplier and the system integrator, who can be on hand and give help if needed.”

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