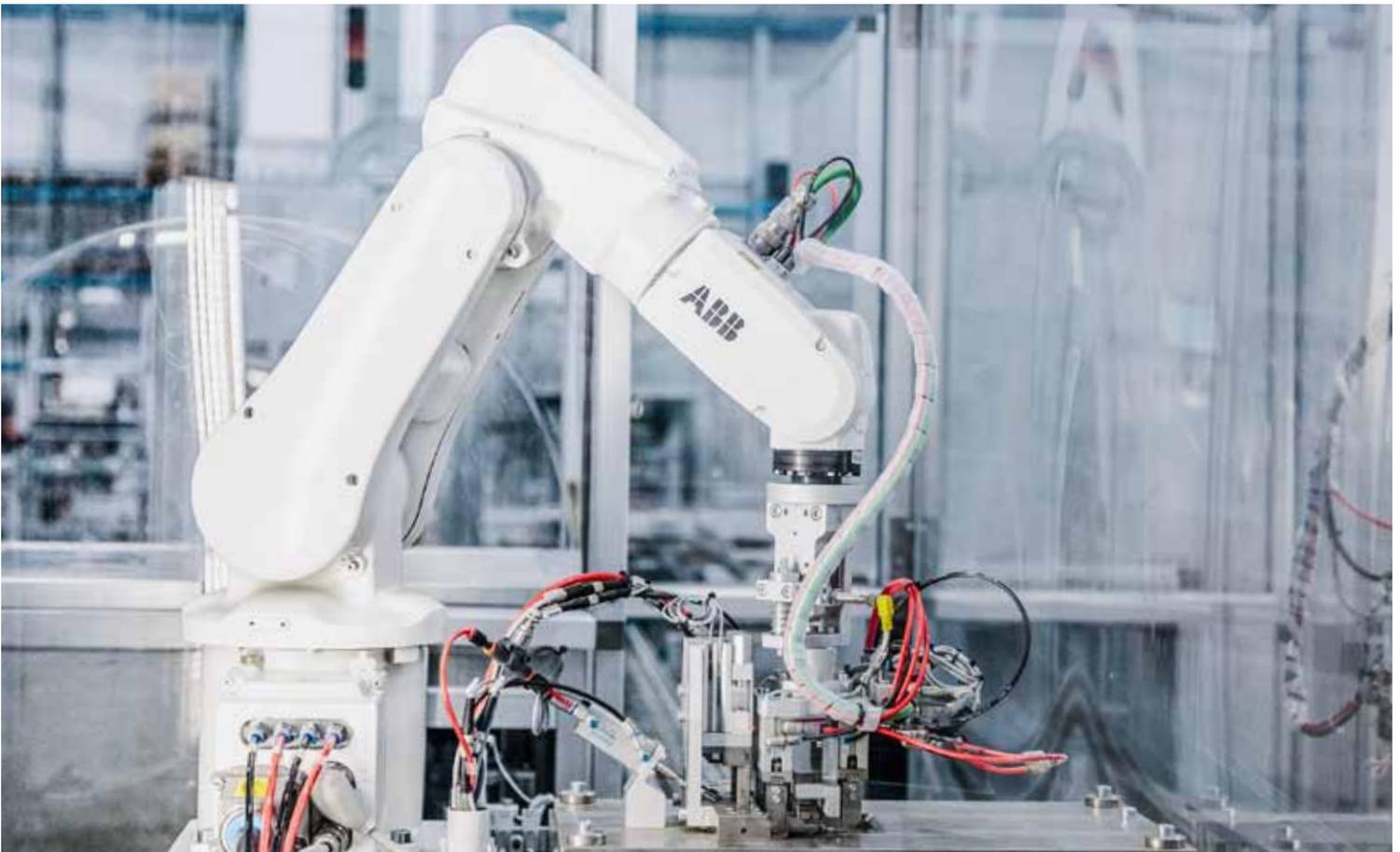


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A customer magazine
of the ABB Group

robotics



The future is now

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New software tools maximize robot productivity

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Audi upgrades its car-painting process

Creativity unleashed 21

Robots that make perfect welds all the time

Power and productivity
for a better world™





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In pursuit of perfection

Production at a circuit breaker factory in Italy more than doubled since more than 40 robots were installed.

robotics ²|13



Per Vegard Nerseth
Group Senior Vice President
Head of ABB Robotics

Welcome to the next issue of ABB Robotics magazine — the second for 2013. In the last issue we focused on metal fabrication; inside these pages we look at a variety of industries that are enhanced by robots and examine how the ‘robot ecosystem’ will evolve in the future.

More than any other action businesses can take, integrating robots increases productivity, lowers overhead, provides flexibility, reduces waste and increases quality. Companies are becoming acutely aware of these potential benefits and are trying to incorporate robotic solutions into their operations. Sometimes this creates challenges, but at ABB we find these types of challenges exciting. We offer solutions that facilitate the implementation of automation and provide easy-to-use products to maximize our customers’ robots’ uptime.

To simplify all stages of robot integration, we want companies that depend on robots to be able to manage them from any device, anywhere on the planet. But this is not a vision of the future; this is a reality that we proudly present in the issue you’re reading right now.

On page 9, read about ABB’s new, innovative tools to help program, commission, operate and supervise your robot from any connected location. And speaking of new ways to use robots, on page 17 we profile a novel application for washing gigantic trucks in the mining industry. These robots remove the dirt that would otherwise lead to corrosion.

This issue also features robots that polish faucets in China, which helps keep harmful lead out of water (page 18); Audi’s robotic paint solution that saves around 20 percent in costs at its factory in Germany (page 12); a story about more than 40 robots that helped double production at ABB’s own circuit breaker facility in Italy and much more. And I would be honored for you to read my article on the future of the robotic industry (page 20).

So sit back, relax and enjoy this issue of *Robotics*. If you have any questions or comments about the magazine, please feel free to contact us.

**Best regards,
Per Vegard Nerseth**



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Wash out! ABB's robotic truck washing application is easy to use, flexible and makes workers' jobs' safer.

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Robotic automation of faucet polishing helped Supor Kitchen & Bath lower costs, raise productivity and limit health risks.

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Events calendar 2014

Come and see ABB's newest solutions at the following events:

> March 13 - 14

Technology Days
2014, Auburn Hills,
USA

> May 8 - 14

Interpack 2014,
Düsseldorf,
Germany

> June 06

AUTOMATICA
2014, Munich,
Germany

News

Ready for take off

ABB proudly introduces the new IRB 6700 family of robots, featuring a multitude of next generation improvements designed to deliver the lowest total cost of ownership.

With the introduction of the IRB 6700 not only have accuracy, payload and speed been increased, but power consumption has been lowered by 15 percent and service has been simplified. In determining what improvements to include, ABB studied the detailed field reports from the IRB 6700's predecessor and engaged closely with customers during a yearlong study.

"Our aim from the beginning was to deliver a robot with the lowest total cost of ownership available," says Ola Svanström, ABB Product Manager for Large Robots. "When we asked our customers what they valued most in our large robots their answer was virtually unanimous: reliability. So, we revisited every aspect of our current range to improve everything we could in this regard. It may not look that different from its predecessor on the outside but the hundreds of small improvements on the inside are what count."

Every robot in the 6700 family has been designed to accommodate Lean integrated dressing (ID)—an ID solution meant to achieve a balance between cost and durability by integrating the most exposed parts of the dress pack into the robot. Equipping an IRB 6700

with Lean ID makes it easier to program and simulate with predictable cable movements, creates a more compact footprint, and lengthens service intervals due to lessened wear and tear.

"As a direct result of close collaboration with our suppliers, the IRB 6700 also includes a new generation of accurate, efficient and reliable motors and compact gearboxes," says Mattias Lövmemark, ABB Project Manager. "We spent a great deal of engineering effort making the robot as rigid as possible to better protect and prepare it for the harsh environments in which it operates. We also tested and validated more robot prototypes than ever before to ensure our predictions for reliability are accurate in the real world."

When designing the new robot, easier serviceability was identified as a critical aspect for improving its total cost of ownership. Service routines for the machine have been shortened and intervals between them have been increased. Access to motors has also been improved and technical documentation for maintenance has become easier to read and understand through the use of improved graphics and 3D simulations called "Simstructions."



At its introduction, the IRB 6700 family included four variants ranging in payload from 150 to 235 kg and reaches of 2.65 to 3.20 meters. Four additional variants will be added over the next 18 months to meet the needs of higher payloads up to 300 kg, as well as shorter reaches on lower payload models.

Scan the QR code (right)
to see the IRB 6700
family of robots in action.



> June 18 - 21
European Customer Days, Barcelona, Spain

> September 8 - 13
IMTS 2014, Chicago, USA

> September 23 - 26
InnoTrans 2014, Berlin, Germany



Features:

- Multiple variants: One family of robots with payloads from 150 to 300 kg and reaches from 2.6 to 3.2 meters
- Robust yet precise: Collision resistant with moment of inertia capabilities and highly accurate next generation motors
- Built around Lean ID: Cost effective Integrated Dressing (ID) for easy programming, reduced wear and small footprints
- Simplified maintenance: Longer service intervals, highly accessible components and optimized service routines
- Lowest Total Cost of Ownership: Key improvements combined with better energy efficiency add up to a 20% lower TCO

iREX 2013

ABB on full display at the iconic Japanese tradeshow

Once every two years, tech-savvy Tokyo showcases robots of every breed at the International Robot Exhibition, or iREX.

ABB chose iREX 2013, held over November 6–9, to introduce some of its most important products and concepts in years—products that represent the beginning of a new wave of robotics technology.

Some of the products featured at the show included the new IRB 6700 family of robots (see page 4 for more information) and the Dual Arm Concept robot. The prototype cell for the Dual Arm Concept has been in operation for many weeks and has already assembled tens of thousands of emergency stop switches.

Other demonstrations at iREX 2013 included an award-winning, high-speed picking cell and ABB's new 8 kg payload IRB 360 Flexpicker, new software from the Manage your robot package (read more about it on page 9) and a full range of service offerings for every application.



Everything old is new again

Switching old robots with refurbished ones kept the beer flowing at a brewery in Athens.

Text: Tania Kollia **Photos:** Chris Stewart

Alongside a busy highway in Athens, Greece, the pleasant scent of malted barley wafts through the air. Its origin is the Athenian Brewery facility, part of Heineken International. The plant has a bottling unit that can produce some 1.6 million bottles of beer a day, packed in 75,000 cases, during the peak summer season.

Inside, six out of a total of 75 employees supervise the fully automated bottling floor of the facility. State-of-the-art machinery cleans, fills, labels and packs 500 milliliter bottles of Amstel beer into crates of 20. The noise and activity is impressive, as is the return rate: only 3 to 4 percent of the bottles are new.

The robots on the production line – six refurbished IRB 6400s from ABB – are industrial workhorses originally produced for the automotive industry. Four of the robots unpack empty bottles while two more refill the plastic crates using a pick-and-place application; the robots are capable of selecting own-brand bottles in a box of mixed returns.

“The benefits of these robots are that

they can do a very hard job very quickly and very reliably,” says Mr Eleftherios Agrafiotis, Athenian Brewery’s Head of Core Maintenance.

In 2010, after 10 years of continuous use – the packers perform about a million 10-second cycles per year – the brewery had to make a decision about the robots’ worn condition during a scheduled maintenance overhaul.

“There were two possibilities,” Mr Agrafiotis says. “The first option was to buy new robots, and the second was to go for refurbished ones. The cost was not comparable – and one-and-a-half years later, I can say that the refurbished ones were the best solution as they’ve been running without any problems.”

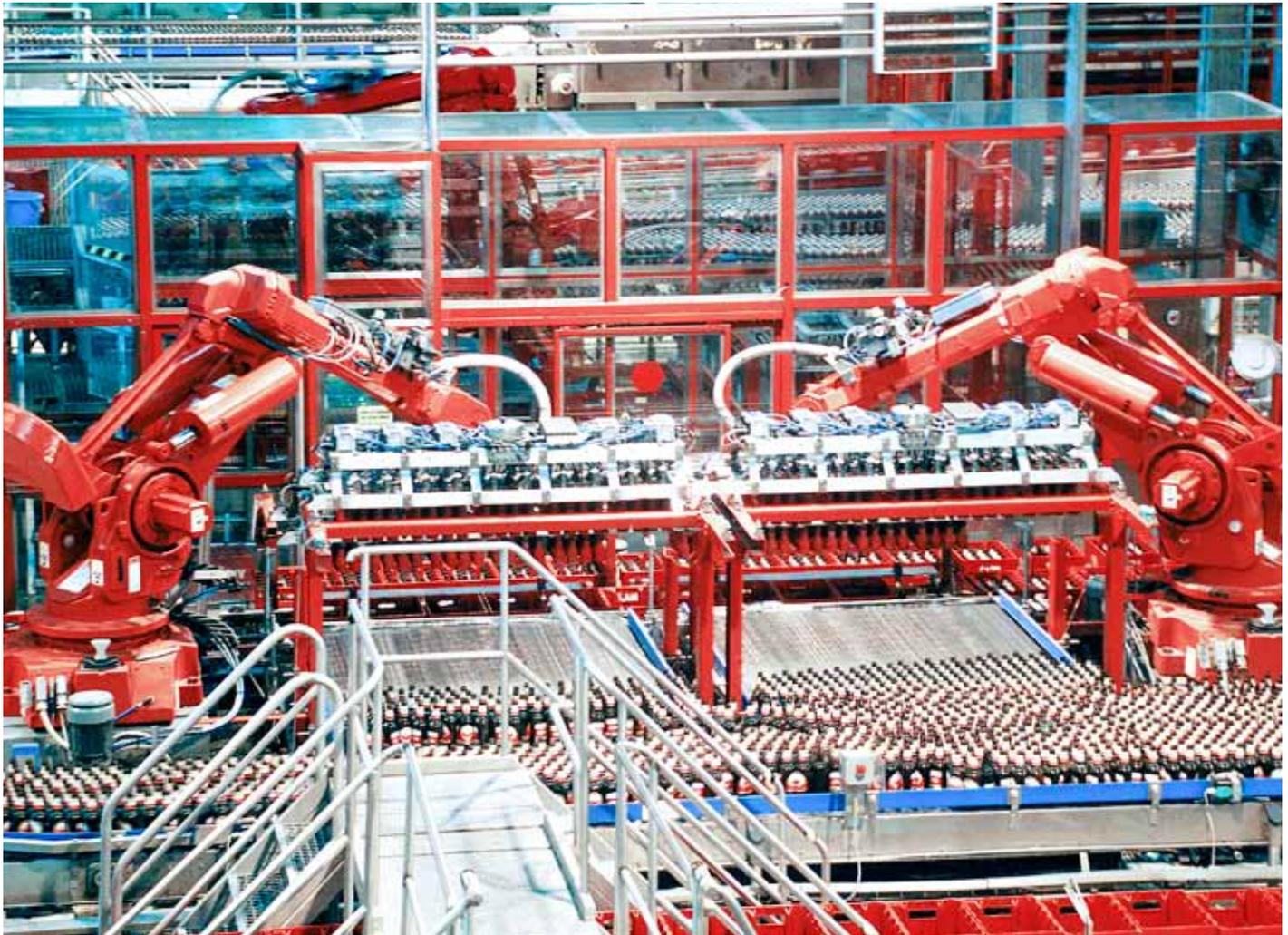
Mr Agrafiotis points out that in addition to the low, manageable cost of their refurbished robots, ABB also offers a warranty. Mr Christos Skarlatakis, Electrical Engineer at ABB in Greece, was involved in the work to exchange the robots. He says that refurbished models can double the lifetime of a customer’s operation.





All robot refurbishment is done at ABB's Global Reconditioning Centre in Ostrava, Czech Republic.





The IRB 6400 robots use a pick-and-place application to identify and remove brand bottles in boxes of mixed returns.

“We removed the worn robot and brought in a refurbished one, serviced by ABB professionals, so the robots could keep doing the same thing without changing the program of the controller or the installation – just by changing the mechanical arm,” Mr Skarlatakis says.

Still, removing the old robots and installing the refurbished ones without interrupting the production line was a challenge.

“There was no access to the position of the robots,” Mr Agrafiotis explains. “Plus we had one more restriction: time. We had less than 10 days to replace the robots, and for me it was a miracle that we managed to change them in time. So I would like to thank ABB, because I didn’t believe it was possible, and I was wrong.”

Each robot weighs nearly 2 tonnes, so the changeover was made in two phases (three robots at a time). The old ones were chained to a monorail hoist surrounded by scaffolding and lifted out; the reverse was done when the refurbished ones were set in place.

Athenian Brewery

Athenian Brewery SA is one of the most important brewers and beer traders in Greece. Founded in 1963 by a team of Greek entrepreneurs, the company is now a member of the Heineken N.V Group of Companies. The company is headquartered in Athens.

Athenian Brewery’s first plant started its operation in 1965 in Athens, producing beer under the Amstel brand. In 1975 a second plant was inaugurated in Thessaloniki; in 1985 Athenian Brewery bought its third plant, inside the Industrial Zone of Patras; and in 1993 another plant was added, in Lamia, for the bottling of IOLI natural mineral water.

Today the company brews and bottles some of the most famous brands on the beer market, namely Amstel, Amstel Premium Pilsener, Amstel Pulse, Amstel Bock, Heineken, ALFA, Fischer, Buckler and BIOS 5. In addition, Athenian Brewery imports Amstel Light, Mc Farland, Erdinger, SOL, Murphy’s, Duvel, Chima, Kirin, Carib, Moretti, Foster’s, Desperados, Krusovice and others.

The Discrete Automation and Motion and the Process Automation divisions of ABB in Greece, together with the Robotics Service department of ABB in Italy, cooperated to get the job done.

“It all went fine,” says Mr Skarlatakis. “The project ended within the defined schedule, and the customer was really satisfied because the production line

remained as it was from the beginning.”

Thanks to the successful installation, the brewery plans to use another refurbished robot in a future extension.

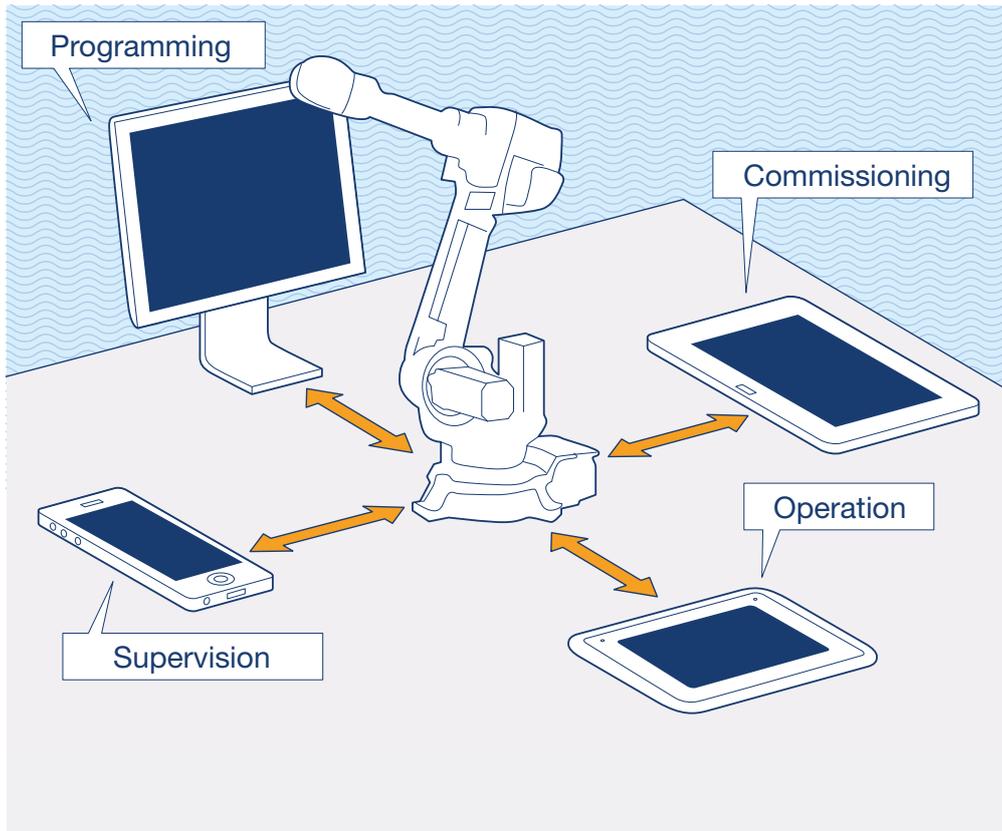
Scan the QR code (right) to see a film about the brewery’s refurbished robots.



Manage your robot

ABB continuously seeks to provide innovative software tools for its robots in all applications. These tools help to program, commission, operate and supervise robots better, giving users a more cost-efficient and productive workplace robot.

Text Jean-Paul Small Illustration Kjell Thorsson



The best robot is the one with a complete set of tools to maximize productivity over its lifecycle. ABB has launched a variety of software tools to do just that, and while they are helping revolutionize robot functionality, these tools to help “Manage your robot” are just the beginning.

“We have a vision of how robots are going to be used in the future, and the tools we offer today to help users manage their robots are just the first step towards that vision,” says Bertil Thorvaldsson, ABB Robotics Product Manager.

The robots of tomorrow will become increasingly connected and intelligent. With cloud computing evolving daily, connectivity is becoming easier and more accessible. ABB robots will come connected to the cloud as a standard feature, offering opportunities for value-added services to help enhance robot performance.

ABB is already working on creating even more intelligent robots. One of the starting points for smarter robots is the robot controller, which is currently separate from the robot. As hardware is replaced with software future robots will feature smaller controllers, allowing the controller to be placed directly inside the arm and creating an opportunity to have user-interface functionality from a variety of options including smartphones, tablets, laptops and computers.

These devices will be also be powered by the cloud and feature value-added services provided by third-party companies. This will be possible because of an open interface that will offer app, content and service providers an opportunity to provide their products in an ecosystem that ABB controls, thus delivering value-added services for the user that help to maximize robot productivity.

Programming:

ABB has launched RobotStudio 5.60, the latest version of its PC-based 3D programming tool. Featuring touch-screen interface and improved graphics, RobotStudio helps operators maximize productivity over the life of their robot.

Commissioning:

ABB will introduce three new apps for robot commissioning to complement the pre-existing “Manage” app. The new apps include “Tune” for editing programs, “Adjust” for robot calibration and “Jog” for manual control of the robots. These four apps are designed to be run on tablets using Windows 8.1.

Operation:

ABB’s human-machine interface (HMI) CP600 can now operate a robot using touch panels, as well as Panel Builder – the tool for creating customized user interfaces. This allows for better integration with other ABB products such as PLC Webserver and drives.

Supervision:

The future of robot supervision is here. The mobile MyRobot app – with functionality previously offered only on a PC connected to the Internet – connects to the ABB Robot Care portal and can check on robot operations from any place at any time.

In pursuit of perfection

Designing, developing and manufacturing low voltage circuit breakers at ABB SACE's Frosinone plant in Italy has been streamlined with the addition of ABB robots.

Text: Claudia B. Flisi **Photos:** Maurizio Camagna

At the ABB SACE factory in Frosinone, Italy, (90 minutes south of Rome) the benefits of using ABB robots in production are plain to see.

The Frosinone facility has been manufacturing electronic and thermomagnetic low-voltage circuit breakers since 1988, producing core components and assembling final products. In 1993, two ABB robots joined the production line to handle soldering tasks, but it was not until 2000 that Frosinone decided to more aggressively take advantage of robotic capabilities.

Two SACE Division engineers—Savina Fardelli, Production Engineering Manager, low voltage breakers, and Marco Dolce, Process Engineering Manager—decided to rethink the entire system of production, using robots to make it more efficient with lower costs and improved quality.

“We can reconfigure the shapes and sizes of our products very easily because of the flexibility of the robots,” Fardelli says. “We can also introduce new lines quicker and at a lower cost by retraining our existing workers.”

It was in 2000 that an IRB 140 robot arrived at the plant to be put to work on the

packaging line. Fardelli and Dolce decided that the robot (and all the others to follow) should be painted white rather than the traditional orange. “We wanted to communicate a sense of cleanliness, luminosity, and surgical precision,” says Fardelli of the decision.

In 2006, more robots—a mix of 120s, 140s, 1600s, 2400s, 4600s, and 360s—were added to handle soldering, packaging and assembly tasks. Four years later other welding robots arrived. At the end of 2012, more than 40 ABB robots were working in Frosinone—half of them performing welding and assembly functions—and the rest working in a variety of roles including quality control, testing, packaging and pick-and-place applications.

Since the robots were installed, cost benefits have been clearly evident as production has more than doubled without an increase in the number of employees. In 2000, the plant produced around one million low voltage case circuit breakers; today it produces more than 2.5 million moulded case circuit breakers plus another 75,000 air circuit breakers.

Over the same period there have al-

Since the robots were installed in 2000, production of moulded case circuit breakers has more than doubled.





By the end of 2012, more than 40 ABB robots will be performing welding, soldering, packaging and assembly tasks.

Frosinone

Founded: factory in Frosinone built in 1969 (as SACE), became part of ABB SACE in 1988

Location: ABB SACE in three locations in Italy:

- Bergamo (since 1934)
- Dalmine (since 2008)
- Frosinone (since 1969)

Product lines: Centre of Excellence in ABB Group for design, development and

manufacture of low voltage circuit breakers (moulded case circuit breakers and air circuit breakers).

Activities at Frosinone: Engineering, quality control, supply management, assembly and manufacturing of the following:

- MCCB's Tmax T1-T8-XT-Isomax S3
- MCCB's Formula
- ACB's Emax E1-E6-X1-T7

so been no layoffs. Workers who formerly handled simple tasks now have more sophisticated assignments, and training is an on-going process. Additionally, because robots make less noise than non-robot automated systems, the overall sound level is more manageable for the humans who work alongside them.

And the advantages go beyond increased output, maximized manpower and decreased noise; there are time benefits as well. As Dolce points out, the design of an automated non-robot system may require three engineers and considerable time to construct the necessary equipment. A robot line requires one programmer and, at maximum, a few days to develop the appropriate production line structure.

Lowering the number of product rejections is another of the engineers' main cost-saving goals. In fact, their aim is to reduce rejections from three percent to zero through an increased use of robots.

"Our main focus is to lower the cost of making our product without sacrificing quality," says Dolce.

The robots are also compact, saving valuable space and energy on the factory floor. For example after introducing an IRB 120 robot, space requirements on the floor shrank from 200 square meters to 50 square meters. And because of its efficiency, a robotic production line consumes 30 percent less energy.

Speed, a valued feature of ABB robots, is not as important for circuit breaker production as it is for, say, high volume consumer products. The robots at Frosinone are not used at their full speed because precision and accuracy are emphasized, and flexibility is paramount in the cost-saving equation.

In an on-going effort to keep product quality up and costs down, Dolce and Fardelli are currently working on a new assembly line featuring robots that has been up and running since March 2013.

Scan the QR code to see how robots helped double production at the ABB SACE facility.



Flexible alternatives

Known the world over for its commitment to innovation, Audi AG paints its vehicles using cutting-edge robots from ABB.

Text ABB Photos Audi

It's no secret that Audi AG is one of the biggest automakers in the world. Around 1200 cars, from sedans and coupes to convertibles and super-cars, are produced daily at its plant in Neckarsulm, Germany.

Painting the cars is part of the production process at Neckarsulm. Until recently, the painting process was done using machines that were 15 years old and in need of modernization. Audi chose ABB to supply flexible robots to handle all of the essential painting applications.

The basic requirement for the new robotic solution was more flexibility in order to paint Audi's range of automobiles, including the A4 Sedan, A5/S5 Cabriolet, A6 Sedan, A7, A8 (standard and long-wheelbase version), R8 Coupe and Spyder, and Lamborghini Gallardo Coupe and Spyder.

For exterior painting ABB installed IRB 5500 robots, and IRB 5400 robots were brought in for interior paint jobs. Both robots can move in six and seven axes and

ABB provided IRB 5500 robots for exterior painting and IRB 5400 for interior paint jobs at Audi's production facility.





Around 80% of the paint robots' programming can be done before a new model is available thanks to ABB's RobotStudio simulation software.



thus can paint difficult-to-reach parts, ensuring an efficient and uniform paint job.

Audi's color change process also required increased flexibility. Before the new solution was installed cars were color block painted to minimize losses during color change. In terms of a sequence-stable production, it is better to apply the colors for the paint job and adjust them to each car model, and with ABB's new solution this is now a reality.

Also, unlike the previous Spray Mate plants that had a loss of about one liter of paint per color, the new robots only lose a few milliliters of paint. ABB's solution ensures that only as much paint that is



Summary of system benefits

- Flexibility
- Improved quality
- Increased color change efficiency
- Offline programming

needed is inserted into each cartridge, so the color change in the primer and base coat line material is much more efficient.

Audi achieved further savings by replacing manual paint jobs with robotic automation using speed rotary atomizers. This saved up to 20 percent in costs.

Additionally, around 80 percent of the robots' programming can be done before the first prototype of a new model is available. Based on ABB's RobotStudio's 3D software, the robots movements and painting parameters are calculated in advance. When the prototype is available, the residual volumes can be optimized to the car body in the system.

Compared with the previous method of robotic programming, in which several prototypes were required to program the system, this saves an enormous amount of time and material.

By the end of 2013, the remaining painting machines in Neckarsulm will be replaced with ABB's flexible robotic painting solution, helping the popular car maker to streamline its processes and remain at the cutting edge of production.

Audi AG

With the brands Audi and Lamborghini, the Audi Group is one of the world's leading automobile manufacturers in the premium and super sports car segment. Audi produces vehicles in eight locations, two of which are in Germany. In the US and China, deliveries rose by around 20% each.

A cell for tough welds

An integrated welding cell helped major agricultural machinery manufacturer Shelbourne Reynolds cut production times by 66 percent.

Text: Ed Neale Photos: Daniel D. Moses



An ABB robotic welding cell is enabling agricultural machinery manufacturer Shelbourne Reynolds to dramatically reduce production times for its range of articulated hedge cutting tractor attachments. Handling the several hundred welds for the production of the attachments, the cell has so far cut welding process times by a whopping 66 percent at the company's factory in Suffolk, UK.

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.

Installed as the latest step in a drive to automate Shelbourne Reynolds' 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 such as 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 with our existing process and the potential savings that could be achieved," says 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."

The result has been a huge reduction in welding times, with products now being welded in one-third of the time previously required. And complex welds, such as those involving welding around pipes and tubes, are performed to a much higher aesthetic standard than before.

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 of the installation.

Another key benefit has been the freeing-up of the manual welders who previously made the products now being produced by the cell. Compared with the previous team of six needed to





The customized ABB FlexArc cell at Shelbourne Reynolds features a robot, positioner and welding equipment.

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,” says Scarfe. “However, the idea was always to use it to complement, not replace, our manual operations. 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 utilize their expertise in the manufacture of other products.”

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.

Helping 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.

“As robotic automation projects can often be quite involved, it’s good to work with a supplier that can help at every stage,” says Scarfe. “I have worked with various robot suppliers in the past but have rare-

ly received the same degree of openness and assistance that I got from ABB in this recent project.”

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. Negative trends can also be spotted before problems even occur.

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

“Our long-term aim is to introduce another cell to help us further expand our production capabilities,” says 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 utilized 24/7. The FlexArc cell is ideal for short batch manufacture with quick fixture changes, making it an ideal match with our just-in-time manufacturing and reduced inventory philosophies.”

Scan the QR code (right) to see a short film about Shelbourne Reynolds’ innovative welding cell.



Summary of system benefits

- Flexibility
- Improved quality
- One integrated package, featuring a robot, positioner, and welding equipment
- Reduction in production time
- Increased turnover

Shelbourne Reynolds

In 1972, after Keith Shelbourne bought Reynolds Engineering Ltd, Shelbourne Reynolds Engineering was born. At its more than 8300-square-meter facility, Shelbourne Reynolds currently employs 120 workers, and uses CNC machines, laser steel cutters and, of course, welding equipment to produce its offerings, half of which are being exported to 50 countries worldwide.

Clean machines

ABB's robotic truck washing option offers users a fully automated solution that is safe, reliable and efficient.

Text: Jean-Paul Small **Photos:** ABB

Dirty, muddy and corrosive locales, such as those found in the mining sector, are terrible for work trucks. They erode the truck and its equipment, which significantly decreases the lifespan of both, which limits their availability and increases costs across the board.

But manually washing trucks in these scenarios is problematic, too: it requires many workers using difficult-to-handle, high-pressure hoses around sensitive instruments; it's only possible during the day, while weather conditions dictate when the trucks can be cleaned; it takes around five hours from start to finish; and there is a lack of consistency.

ABB's new truck washing solution addresses all of these concerns and



- +** **Summary of system benefits**
- Only one operator required
 - Functions in all types of weather, day and night
 - Saves energy and water
 - Reduced cycle time
 - Limits the amount of detergent and degreaser used, which helps the environment
 - Keeps trucks on the road

more. Its easy-to-use platform needs only one operator to start the cleaning process; it's available every day, all day, consistently cleaning trucks of all sizes in all kinds of weather, and finishing the job in less than two hours; and it can be programmed to avoid sensitive areas on the truck.

The system works by identifying the truck's position with laser sensors installed in the end effector, and then moves IRB 6650S robots to ensure they are in the ideal position to clean. Pressure from hoses, positioning and amounts of detergent and degreaser are all programmed beforehand. This means the pumps run for shorter periods, using less water and saving more energy. Using less detergent and degreaser is also a boon for the environment, and with an increase in the trucks' general availability and reduced cycle times of up to 60 percent, the robotic option is clearly a beneficial investment that pays off for a long time.

Workers who were previously washing the trucks manually can be reassigned to other tasks, limiting their exposure to potentially dangerous, high-risk activities while developing professionally.

This revolutionary mining application is one of many new ways that robots can be used to maximize asset utilization while minimizing costs.



Valves with vitality

Supor Kitchen & Bath lowered costs and raised productivity while manufacturing products that are free from health risks.

Text: Jill Zhang Photos: Wang Jing

That lead is poisonous to humans has been known for years. Its presence in water can be a problem for infants whose diets consist of baby formula powder and water. Lead can appear in water from corrosion of materials that contain lead.

From its inception, Supor Kitchen & Bath in China's Liaoning Province has been aware that lead, specifically faucets with lead content, are bad for people's health. Due to this the company first sought out solutions aimed at reducing the lead content in its wares, and eventually decided to manufacture lead-free products. Supor's research suggested that stainless steel was the right material with which to create products to combat this clear health hazard, and today the company's key product is the lead-free faucet.

"Before the 1980s, Chinese people used iron faucets," says Jake Zhao, General Manager of Supor Kitchen & Bath. "Since the 1980s, well-known sanitary ware companies, such as American Standard, Kohler and TOTO, entered China to market their brass faucets."

According to Zhao, the result was that most faucets in the Chinese market

were made of brass. Facilitating foundry, machining and electroplating, brass faucets have lead content that generally ranges from 3 to 6 percent.

Due to the health issues related to lead poisoning and new regulations that ban the use of lead in drinking water—particularly in the US where Supor sells many of its products—Zhao says that the company's decision helped it stay ahead of the game. All of the company's faucets are now made of stainless steel, reflecting consumer demand for safer, environmentally-friendly products.

"Health is the greatest wealth in life," says James Li, Head of ABB Robotics China. "ABB and its customers are committed to delivering products that drop human health hazards to a minimum while also respecting the environment."

With some 12 years in the industry, Zhao, a graduate of the Harbin Institute of Technology in Heilongjiang, says the main reason that the output of stainless steel faucets did not show a marked increase over the past decade was the cost of polishing. This hidden cost made the case for using robots compelling.

"Stainless steel is not easy to polish as it's harder than brass," says Zhao.



Producing stainless steel faucets is both a lucrative business and environmentally-safe.

"Traditionally we used manual polishing, but with costs reaching heights of RMB 100 per faucet we felt that was not sustainable. We thus began the process of replacing manual polishing with automated equipment. Based on our research and development, we found that robots were the ideal solution."

After some false starts with suppliers that did not provide adequate technical support, Supor decided to work with third-party companies, but again costs were high and progress slow.



Liaoning Supor Kitchen & Bath Co. Ltd

Established in 1994, the Supor Group has business interests ranging from port logistics, sanitary ware and small appliances, pharmaceuticals, real estate and other areas. It is one of China's top 500 private enterprises, and its overall brand is one of the best known in China.

Liaoning Supor Kitchen & Bath Co. Ltd is a stainless-steel products manufacturer affiliated with the Supor Group. Launched in 2010, Supor Kitchen & Bath started pilot production of stainless steel faucets and other hardware fittings in late 2012 that can now be found in many parts of the world.

Today, six production lines are in operation at Supor Kitchen & Bath, providing work for approximately 400 employees. It's estimated that company's total investment will ultimately reach RMB 3 billion.

This led Supor to contact ABB. After negotiating with representatives from ABB China, Supor purchased 175 ABB robots, including many IRB2400 and IRB4600 models. Lightweight and inexpensive with good dust proofing, ABB's robots carry out brushing and sanding work on the stainless steel faucets. Supor used the robots on a trial basis on its two production lines in Yuhuan, Zhejiang Province, before buying more units.

With the purchase not only did Supor solve its polishing problem, it also gained access to hundreds of ABB engineering and technical staff. Located in Shanghai, service staff are on hand to provide on-site project support every day, all year round.

As an added bonus workers previously working on the line have been freed up to take on other tasks.

"Six workers used to conduct manual machining on each production line after the robots had done their polishing work," says Zhao. "But after three months, we now use just two workers thanks to ABB."

Zhao says the aim is to eliminate all manual work in future, substantially lowering costs. Supor also plans to use robots in other processes, such as stacking and sorting.

"ABB robots working in Chinese industrial enterprises provide professional system solutions that satisfy the flexible demand of industrial production processes, and ensure the stability of product quality," says Li.

Since the purchase from ABB, Supor has both solved its polishing problems and improved its brand image. In the future, Supor plans to give consumers what they want in terms of quality, safety, cost and brand, driving market integration and innovation ever forward with its range of products.

"Healthy and eco-friendly sanitary ware is the future," says Zhao.

Scan the QR code (right) to see ABB Robotics' polishing solution for stainless steel faucets.



Summary of system benefits

- Reduces health risks
- Workers freed up to pursue other tasks
- Flexible solution
- Improved brand image

The future is now

Head of ABB Robotics Per Vegard Nerseth discusses the benefits and challenges of an increasingly automated world.

Text: Per Vegard Nerseth Illustrations: Kjell Thorsson

Robots have become a normal part of the human experience—from vacuuming floors and assisting the elderly to entertaining at concerts and diffusing bombs on the battlefield. We have seen robots transition from incredibly expensive machines with limited functionality to today's modern industrial robots that can do amazing things while offering a quick return on investment.

Not only have these robots started working their way into every aspect of our daily routines, they have also reduced injuries in the workplace, increased the competitiveness of companies in a fierce global market, elevated the quality of affordable products, increased profits for countless businesses, and created a universe of high-paying and rewarding jobs.

Employment questions

Many detractors have sounded the alarm, warning of a job-stealing robotic world of the future. Nevertheless, real-life experience is showing us otherwise. According to a recent International Federation of Robotics (IFR) report, in countries that have adopted the largest share of robots, unemployment has actually declined over time—meaning there is a positive relationship between robot adoption and job creation.

The IFR report notes that between 2000

and 2008 the robotics industry created 8–10 million new jobs, either directly or indirectly. That's more than 1 million jobs globally per year. Although the economic recovery has stalled job growth on all fronts, the report predicts that another 4 million jobs will be created in this 'robot ecosystem' between now and 2020.

Along with these benefits, however, come some economic challenges. As the IFR study notes, many new jobs are created by robots; however, these jobs require skill sets that are sometimes hard to find among the existing population. For instance, the managers of the future will have to be well-versed in robot operations, service and logistics, as well as be able to train new operators. And for those individuals just joining the workforce, systems and institutions need to be in place to ensure they get the right counseling when thinking of how to enter the job market.

Technical challenges

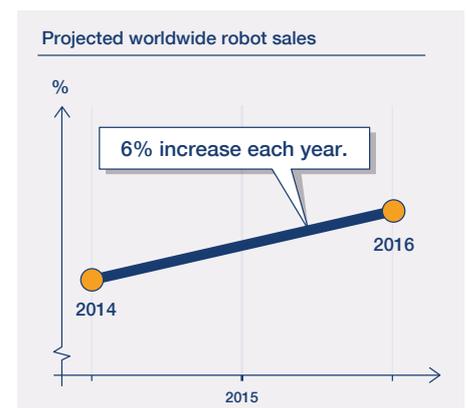
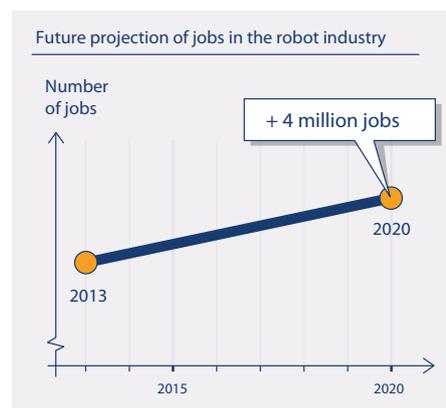
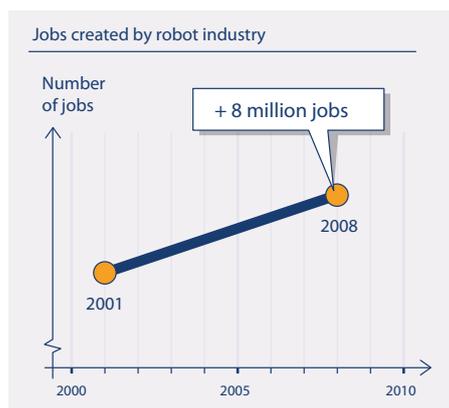
As robots find their way into an increasing number of distinct applications, they will inevitably find themselves working alongside humans. This will be especially pronounced during the transitional phase in which robots are still incapable of perfectly reproducing human dexterity, but have enough dexterity and ability to work with delicate objects.

The industry, working in conjunction with lawmakers and regulators around the planet, will need to agree on ways to mitigate the inherent risks of human interaction with robots by developing new global standards governing this interaction as well as innovating new solutions to meet these standards.

Ease of deployment and programming is also a large technical challenge that the industry is grappling with. As an increasing number of companies find that robots are within their affordability range, it is clear that one of the final barriers to adoption is the perceived complexity of programming and designing robotic systems.

A bright future

Certainly these challenges are not small matters, but they are opportunities not crises. In fact, the robotics industry and governments around the world have already begun addressing them in substantial ways. The IFR predicts that between 2014 and 2016, worldwide robot sales will increase by about 6 percent on average per year, reaching an annual supply of industrial robots of more than 190,000 units. Instead of reviling robots as job stealers, we need to recognize that they are the future and create policies that encourage safe and economically sound robotic growth.



Creativity unleashed

By combining home-grown innovation with ABB robots, casting industry supplier MPI Inc. has helped significantly increase productivity and quality at its facility.

Text: Nick Chambers **Photos:** ABB

For more than 5000 years, the process of investment casting, also known as lost-wax casting, has produced metal products. Today the process is used to manufacture everything from surgical implants to jet engine turbine blades.

It works like this: Wax patterns of the product to be cast in metal are created, attached to a runner and then dipped in a ceramic slurry. The ceramic is allowed to dry and the wax melted and removed, leaving perfect molds of the product. These ceramic molds are subsequently filled with a molten metal. When the metal hardens, the ceramic shell is removed leaving perfect metal copies of the origi-

nal wax patterns. Ensuring the best possible wax patterns and runner assemblies are produced in the wax room is the key to creating a quality metal casting.

Over its 41-year history wax-room equipment producer MPI Inc. has strived to produce innovative solutions that result in high quality products. “At MPI we’re constantly looking for ways to make our products and processes better so that our customers have a higher quality product,” says Jeffrey Rich, company VP and General Manager from the company’s Poughkeepsie, New York location.

Traditionally, investment casting was carried out by hand, with even the most skilled workers sometimes producing er-

rors that resulted in inconsistent assemblies and increased scrap. While shell rooms – where the assemblies are dipped in a slurry of ceramic – have been automated with robots for quite some time, this has not been the case with the wax room.

“The future of MPI is really the future of the wax room,” says Rich. “One of the biggest challenges is getting our customers to see the value that automation can provide. There is some push-back due to the perceived complexity of robotic systems and the fact that many of these shops handle very low volume jobs. They believe that the investment in robotic tooling is just too high to ever see a return on investment. However, what



MPI's new model 20-14 automated pattern assembly system uses two IRB 2600 6-axis robots.



“What our customers have found is that the value of standardization through automation far outweighs the cost of the investment.”

– Jeffrey Rich, VP and General Manager of MPI

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MPI understood that to achieve higher productivity, lower waste and unparalleled levels of quality, fully automated wax rooms were needed. The company’s goal was to create a next generation pattern assembly prototype using robotics. Initially, MPI collaborated with Rensselaer Polytechnic Institute and the New York State Energy Research and Development Authority (NYSERDA) to create a system based on 3-axis Cartesian robots. However, the restrictions of those robots eventually limited the creativity of MPI’s engineers and they decided to search elsewhere for new solutions.

An exhaustive search for a robotics partner led MPI to ABB due to the well-known reliability of its robots, along with its global reach and technical know-how.

President, owner and founder of MPI Bruce Phipps says the company’s engineers find ABB’s robots to be very user-friendly, among many other significant benefits. “We’ve worked closely with ABB to develop unique programming that allows us to accomplish wax welds that were previously unattainable,” he says. “This has led directly to incredible successes with major customers in the aero-



MPI Inc.

MPI is the worldwide leader in wax-room equipment and has been involved in the investment casting industry since 1972. MPI has developed and introduced more systems and products than all of its competitors combined. Among other things, MPI was the first company to bring to market programmable wax-flow control, fixed purge of the injection system and paste wax from a liquid wax supply. With numerous patents and patents pending, MPI offers unique wax-room solutions. MPI’s newest technological breakthrough, the Automated Pattern Assembly System (APAS), is the world’s first fully automated, high-accuracy pattern assembly system.

space industry.”

MPI’s Model 20-14 Automated Pattern Assembly System uses two ABB IRB 2600 6-axis robots, instead of the 3-axis Cartesian system it replaces. The 20-14 can weld 25 percent larger wax assemblies, is capable of multi-plane welding for advanced products such as single crystal turbine blades and increases casting yields by 10–30 percent, depending on the application. And compared with manual wax pattern assembly, the 20-14 creates incredibly high quality fusion welds that are perfect 100 percent of the time. It is able to accomplish this at a rate approximately two to five times faster than manual assembly.

Keith Hedrick, MPI’s Automation En-

gineering Manager, says the true returns from automation come from repeatability and the reliability of the equipment. “Robots work each and every day, and they make the products exactly the same each and every time.”

Robotic automation also solves the traditional problem of finding employees with the necessary skills and abilities to create good quality welds for wax runner assembly. An individual can be trained how to operate the machine in less than one day.

Scan the QR code to watch a short film about MPI’s robots working in investment casting.



Innovative products from ABB

Integrated Vision

ABB Integrated Vision is a powerful smart camera system that makes vision-guided robotics applications faster and easier to deploy than ever before. Using 2D vision guidance, manufacturers have the ability to track products more accurately, improve supply chain management,

improve quality, troubleshoot challenging lines and processes and significantly expand their use of robotic automation. The advantages of vision-guided robotics can save time, money and resources, all of which significantly improve a company's bottom line.



Production screen

ABB Production Screen brings smart phone logic to its robot-controller device, the FlexPendant. The new software package uses graphical objects, known as widgets, to perform basic robot functions. Widgets can be created using either ABB ScreenMaker or third-party software such as Microsoft Visual Studio.

The software's on-screen custom-

ization and user-friendly navigation are designed for use with a variety of applications such as arc welding, spot welding and dispensing. Widgets can be programmed to perform information, control, monitoring and notification functions. Customers simply choose which widgets they need as well as what they should look like.



Integrated Force Control – Adaptive motion technology

ABB Integrated Force Control automates complex tasks that once required skilled personnel and advanced fixed automation. The robot is equipped with tactile sensing that saves installation costs, shortens programming time, reduces process cycle time and improves quality.

The adaptive functionality of Integrat-

ed Force Control can be used in many applications, including assembly, product testing and machining. The technology includes powerful functionality that allows the robot to maintain a constant force between itself and the objects it is working with, which is invaluable in both machining and testing applications.



Air Control Unit

The ABB Air Control Unit (ACU) is a high performance, cost-efficient air flow controller for paint applications that is easy to integrate into new and existing installations. This extremely accurate and reliable unit controls air flow to paint atomiz-

ers with an incredibly fast response time, even at a lower working pressure than existing solutions. When taken together, the ACU's features add up to less wasted paint, faster throughput and significant operational cost savings.



ABB FlexPendant retractable cable

The FlexPendant retractable cable (FPRC) is an automatic cable winding system for teach pendants. Spring driven, the system is a certifiably fast and easy way to maintain a clear and safe work area. By keeping teach pendant cables off the production floor and out

of the way of equipment, cable damage is reduced. The FPRC has been tested to minimize noise frequency on cables and to reduce signal loss. Thanks to its spring-loaded retraction system, the FPRC automatically wraps teach pendant cable inside the reel.





Improving uptime without costing the earth.



ABB provides products, systems and services that increase industrial productivity and energy efficiency for a wide range of picking, packing or palletizing applications. Our robots, drives and servo motors provide a high level of hygienic, flexible and reliable automation in these labour-intensive application areas. ABB's automation can really be the key to improving uptime, product quality and workplace safety, whilst reducing energy consumption and waste.

For more information visit www.abb.com/robotics