FOUNDRY

AUTOMATION

A MAGAZINE FROM **ABB**

FEBRUARY **2006**

CESARE GATTI AND ITALY'S MP FILTRI Depend on robots for efficiency

Page 4 >

Saw blades live longer with the help of robots at MGG Tegelen.

Page 10–11 >

DaimlerChrysler casts its own light metals in Germany

Page 7–9 >

Talking trends at ABB's Alu-Motive Forum in Munich

Page 12-14 >

Contents



FOUNDRY
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Editorial

Forging connections

> In October 2005, ABB sponsored the first event in what I expect to become a tradition that reflects ABB's long-term commitment to the foundry business: the first global Alu-Motive Forum, a gathering of key players in the foundry industry - representatives from foundries, machine builders , system integrators and industry organizations as well as analysts. ABB sponsored the forum to provide a platform to facilitate networking and business transactions. From the feedback we got, it was very well-received by the participants.

With some 18,000 robots to date being used in the foundry sector, there is a broad range of experience to draw from, yet people don't often get a chance to hear the latest trends. Perhaps more important, people don't get to talk with one another about pressing issues that affect all of us. As we face big changes, with parts of Asia entering the business in a big way, it will become only more important to stay ahead of the curve.

To help you do just this, in this issue of *Foundry Automation* we take a look at some of the new applications and trends, including some that were presented and discussed at the Alu-Motive Forum. From Daimler-Chrysler's replacing gantry robots for its casting of aluminum cylinder heads (page 4), to MGG Tegelen's unique alternating saw-blade application (page 10), to Ryobi's smart use of RobotWare software for online programming to avoid downtime (page 16), there is a lot to read, and these are just a few of the stories.

After divesting itself of the induction furnace business, ABB remains deeply committed to continuing to make its work in the foundry business even stronger. I hope that this issue of *Foundry Automation* gives you the ideas you need to stay on top of the trends. I strongly believe that all of us are charged to give our best performance in 2006. We at ABB are prepared to contribute with further innovative developments to help you succeed in the foundry business.

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Calendar

Euroguss
7-9 March 2006
Nuernberg, Germany

Industrie 2006
27-30 March 2006
Paris, France

SIMTOS Seoul International Tool Show
12–17 April 2006
Seoul, Korea

METEF/Foundeq
17–20 May 2006
Brescia, Italy

Partner Seminar 2006 Västerås
1–2 June 2006
Sweden

World Foundry Congress
5-7 June 2006
Harrogate, U.K.

Die Casting Asia
28–1 July 2006
Shanghai

IMTS
6-13 September 2006
Chicago, U.S.

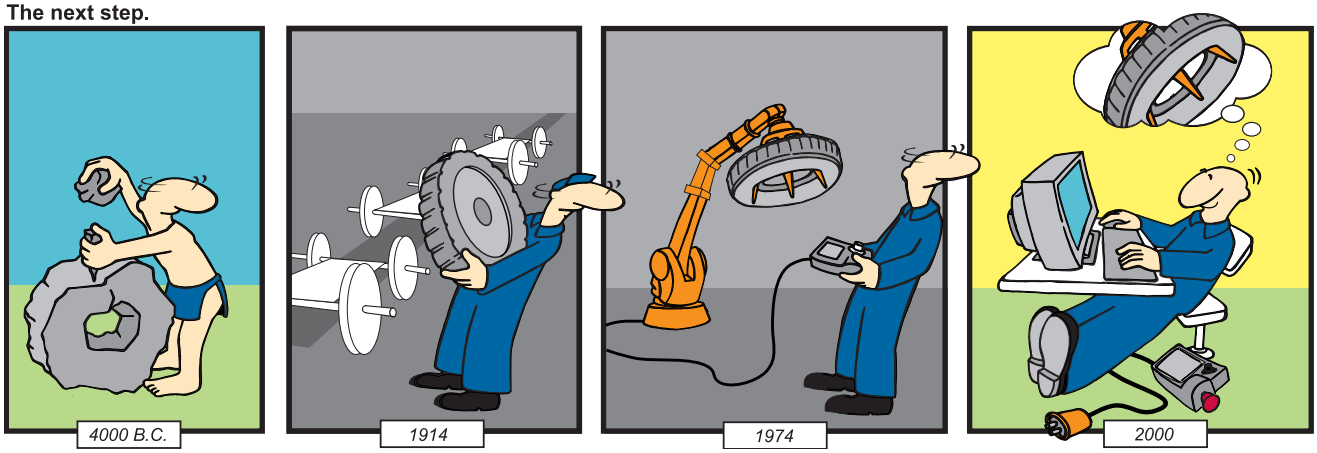
International Foundry Forum 2006 Cemafon
28–29 September 2006
Portugal

New web portal for ABB Robotics

> To provide better sevice to its customers, ABB Robotics is making significant changes to its website, not the least of which is a new URL that is easy to remember: www.abb.com/robotics

The new portal should be up in spring 2006, with language versions up by summer.

The next step.



By Claudia Flisi
Photos Maurizio Camagna

Let robots take the heat

At MP Filtri in Italy, robots working in the foundry was just the beginning. Machine tooling is now automated, and the company has plans for using robots in other areas as well.

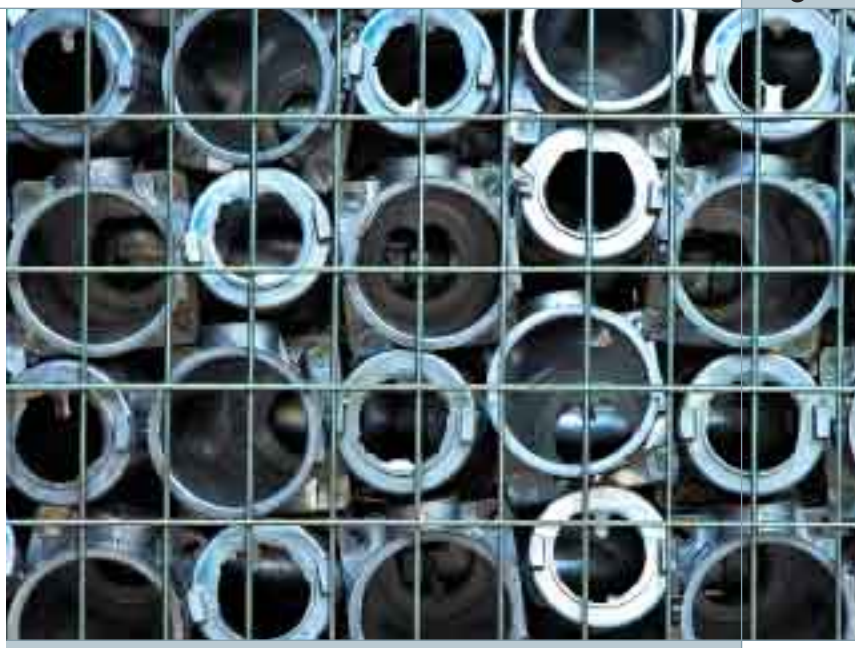
Robots lubricate filters at MP Filtri.

> It's hard to find a factory employee willing to operate a hot press for any length of time. The heat, stress and noise of the job take their toll, giving rise to quality-control issues as well as danger to the worker himself. Robots are therefore an increasingly attractive alternative in foundries, especially when the volume of work is large.

MP Filtri of Pessano con Boragno (Milan), Italy, one of the world's top manufacturers of hydraulic oil filters, came to this conclusion in the 1990s. At the beginning of the decade the company decided to expand aggressively by seeking international business, and it soon found itself competing against giant corporations from the United States – its main competition – and Germany, among others.

Its in-house foundry was and remains an important element in MP Filtri's business strategy, says Giovanni Pasotto, managing director and son of Bruno Pasotto, MP Filtri's founder and still-active president.

Giovanni Pasotto explains that the company's competitive advantages are many. The company maintains a high quality of service, emphasizing attention to the customer and speed of delivery. It also focuses on specific market sectors so MP Filtri can cater to their needs. These sectors include moving vehicles such as cranes, excavators, tractors, earth movers (this is MP Filtri's largest market segment); industrial installations for steel and iron works; injection machines for plastics and aluminum; and a



Filter parts await further handling.

small but image-rich niche market in offshore platforms. "We compete extremely well in terms of range of product," Pasotto says.

One other important advantage is that the company has its own foundry for aluminum filters, which enables MP Filtri to control the entire production process. "We can move more quickly than our competitors, while [at the same time] ensuring high quality," says Pasotto.

The strategy behind these competitive advantages was working in the early 1990s and orders were coming in, but the company struggled to find qualified workers to handle the demands of the job. Foundry work requires highly motivated, skilled personnel and MP Filtri could not find enough of them. So the company decided to turn to robots. While just about all foundries have robots for injection machinery ("because you wouldn't invest in such equipment without them," explains Pasotto), the company wanted to be more forward-thinking in its production design.

In 1995 an ABB robot, IRB 4400, arrived at the foundry, followed by another IRB 4400 and an IRB 2400 a year later. The choice of ABB was based not on price but on its reputation for superior customer assistance, service and client satisfaction.

The foundry robots remove newly moulded filters from the hot presses, lubricate them and deposit them on slides where they can cool before collection for successive tooling. "Our workers were happy to see the robots arrive because now they are relieved of a hot, hard, noisy, repetitious task," says Massimo Frignati, the manager for the MP Filtri foundry. He points out that robots can produce 60 filters an hour, weighing from 50 grams to three kilograms, as opposed to manual production of six filters an hour.

In addition to increased productivity, the three robots can be managed by one employee, whereas in the past each hot press required a dedicated worker. "We have less waste, more consistency, fewer errors, better quality control and more uniform production," says Frignati. For example, the percentage of rejects dropped from 10 percent to 2 percent. He adds that since their arrival, all three machines have been working without a problem.

Given the successful integration of robotics into MP Filtri's foundry, it is not surprising that robots would find their way into machine tooling as well.

Cesare Gatti, head of the machine tooling shop, explains, "We realized we needed to invest in robotics when we bought new machine tooling equipment and realized that our personnel

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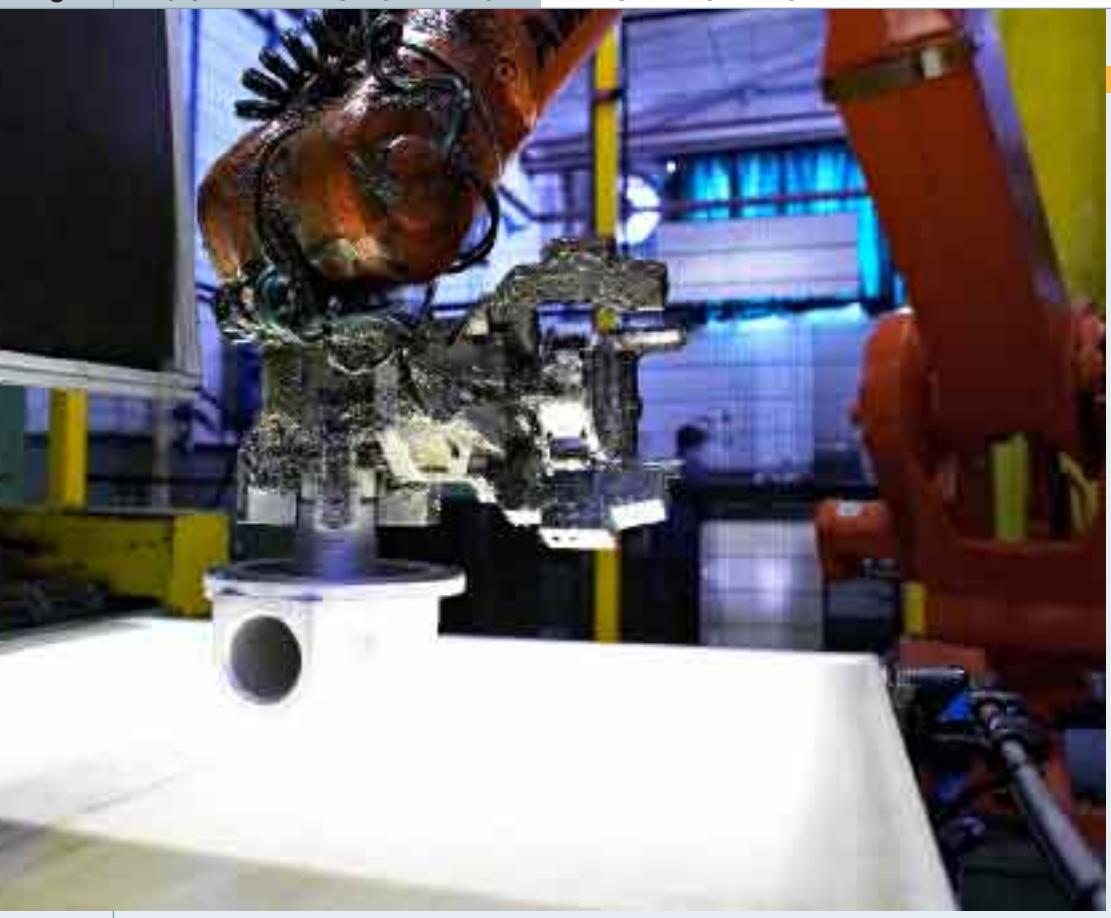
Unfiltered advantages

MP Filtri currently uses six ABB robots: two IRB 2400s, three IRB 4400s and one IRB 6600. Three are used in the company's foundry; three are in machine tooling. Their advantages include:

- **Greater productivity. The production line can accomplish in two hours what used to take eight man hours.**
- **Better, more consistent quality.**
- **Rapid payback. Managing director Giovanni Pasotto estimates that payback for the first robots came in about two years and could have been even faster "but the first six months were a learning experience for us."**

"We compete extremely well in terms of range of product."

Giovanni Pasotto



A robot deposits a lubricated filter on a slide.

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MP Filtri at a glance

MP Filtri of Pessano con Boragno (Milan), Italy, is a classic Italian success story. The company was founded by Bruno Pasotto in 1964 because Pasotto wanted to go into business for himself and saw the market for hydraulic filters for oil as a promising opportunity. MP Filtri quickly became Italy's market leader and is today one of the top 10 in the world in this specialized area, producing 1 million filters annually in aluminum, cast iron and steel in a wide range of sizes. The company's 150 employees generate 25 million euros in sales per year and have offices in eight countries: Canada, China, France, Germany, Italy, the United Kingdom and the United States.

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were too slow to take advantage of the capabilities of the machinery. Since we already had ABB in the foundry, and those working there were happy, we decided to stay with them."

An IRB 2400 and IRB 6600 arrived in 2002 and were joined by an IRB 4400 in 2005.

Whereas the foundry robots have improved quality in a high-stress situation, the ones in machine tooling have improved productivity and precision. The IRB 2400 and IRB 6600 are used to pick up filters after they have been washed (the weight of the filters determines which robot will handle them), hold them up to allow water to drip off, then place them in precise rows in a basket. When a layer of the basket is full, the robot "sees" that and picks up cardboard dividers and lays them over the filters to create the next layer.

The IRB 4400 manipulates aluminum filters as they are machine tooled in a series of programmed steps: It picks up each filter, places it on a platform to ensure the correct positioning, picks it up again, inserts it into the machine tooling equipment, removes it, inserts it into another machine that cleans the filter with a burst of air, removes the filter again and places it on a pallet.

Gatti says that there has been "an enormous difference with the robots. We gained a lot in productivity, because we have no more downtime."

Three robots can be controlled by one employee.

Both Gatti and Frignati would like to introduce robots into other processes in their areas, and Giovanni Pasotto is also willing to entertain such investments, because the payback is so immediate. According to Pasotto, by 2008 the company will have new automation processes and will be using robots for painting, machine tooling and aluminum processing. "We will automate machine tooling because we are committed to improving quality, to be more competitive on the world market," he says. "Plus, robots don't give you any problems. They are productive and efficient, and they free up our employees to do other things." ⊙

By Holger Walch
Photos Norbert Raab

Casting in perfect harmony

An IRB 7600 pours aluminum into the cylinder head mould.

Four robots carry out complex casting applications at DaimlerChrysler's light alloy foundry in Mettingen.

> The IRB 7600 dips its ladle into the molten aluminum and takes out a precisely measured amount of the liquid metal. At exactly the same moment, a second IRB 7600, which is installed directly next to the first one, pours the contents of its ladle into a cavity mould that is moving past on a conveyer. When the next mould arrives on the conveyor, the robots switch tasks. Despite their extreme proximity to each other, the two power robots work in perfect synchronization.

We are at the foundry at DaimlerChrysler in Mettingen, near Stuttgart, Germany. One of the largest light alloy foundries in Europe, it produced around 25,000 metric tons of gravity casting and 24,000 metric tons of die casting in 2004.

For Ralph Koppenhöfer, who is in charge of the light metal cylinder head No. 2 foundry, having your own foundry is indispensable as a car manufacturer.

"We don't just develop the parts and make prototypes," he says. "We want to actually produce them ourselves, because that's the only way to build up knowledge."

ABB robots are involved in many of the key processes – core handling and casting as well as cleaning the final castings. "We started with ABB when we first got into robotics," Koppenhöfer >

Monitoring the robot is easy with the Flex-Pendant.

>

recalls. "We installed our first robots in the core assembly. Then, working with ABB, we developed the foundry robot."

DaimlerChrysler also opted for ABB robots – the IRB 7600 with a handling capability of 400 kilograms – when it converted the foundry production for robot use in late 2004. At the center of this installation is a conveyer with 12 casting stations on which cylinder heads are cast for both Mercedes automobiles and for light commercial vehicles.

The K12 installation stands directly next door, itself converted to robot use two years ago. Two IRB 6400 ROBOTS are at work here. These have a handling capability of 200 kilograms; otherwise the two installations are identical.

Albrecht Gruner, of the foundry's planning department, explains the development of the robotic solution: "We'd made inquiries at ABB about our conversion plans. The challenge was to keep the conveyor moving during the whole production process. That's unusual, as most conveyors stop and start. The robots would have to imitate the movement of the conveyor."

Many simulations were run at ABB in Friedberg before the right solution was discovered. Conveyor tracking was the key to the best solution.

The circular tracking in Mettingen is achieved through an incremental encoder drive with two transducers. abb engineer Dirk Hablick explains the principle:

"We receive the data for the movements required through a small cog wheel that connects into the conveyor's drive. The robots are connected electronically to the conveyor. If the encoder turns quickly, the robot program runs proportionally quickly to keep on track with the conveyor. If it stops, so does the robot. The robot is able to imitate movements to within two or three millimeters."

The limited space available to house the robots demanded an innovative solution. The robots were replacing a gantry robot that used to place the ladles into the moulds.

"We already had the conveyor and the industrial furnace," explains Albrecht Gruner.

"We had to find space between these for the robots and make sure that even if they overlapped each other, they didn't get in each other's

>FACTS

Why robots?

The use of robots in casting applications has a number of advantages:

- Greater flexibility than with gantry robots as mechanical coupling is unnecessary
- User-friendliness
- Ability to operate in narrow spaces
- Flexibility to operate with different types of cylinder head.

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DaimlerChrysler Mettingen foundry at a glance

Mettingen, Germany, is the site of the light alloy and cast iron foundry for DaimlerChrysler.

The product range of light alloy castings includes cylinder heads, the camshaft drive housing, crank cases, oil sumps, subframes, engine mounting and gear boxes.

The annual capacity of the light alloy foundry is approximately 25,000 metric tons of gravity casting and 24,000 metric tons of die casting per year.

Two robots take turns loading and pouring aluminum.

"We want a system supplier with know-how."

Ralph Koppenhöfer

movement space. Under the old system, all the machinery had to be fine-tuned to cope with just one type of cylinder head, which made us very inflexible. With the robots we can use this installation for every type of cylinder head."

A conveyor system feeds core packages to the ladling carousel. The sand cores are placed in the moulds by a special machine. The next stage is the casting process, which is carried out by the two abb robots. The individual robot is given the relevant parameters for the particular type of cylinder head that is next in line. These come through the conveyor, where all the data is available. The robot then loads the corresponding program and carries it out.

The two robots share one industrial furnace. While one is scooping up aluminum, the other is pouring the metal into the mould and vice versa. This way they are able to maintain a 30-second rhythm. After the metal has been poured, it is allowed to cool for 220 seconds inside the closed mould. The casting is then taken out of the mould and allowed to cool further.

The two installations produce roughly 2,000 cylinder heads a day. In all, 17 different types of cylinder head are produced. There are usually four or six types in production at any time. Each type may have a different casting weight.

"The weight varies between 26 and 35 kilograms," says Markus Schwarz, who is responsible for the conveyers in Mettingen. The high precision that is demanded when measuring the molten aluminum is provided by a complex system designed specifically for the ladle.

The decisive factor for Ralph Koppenhöfer in choosing which robots to invest in is how well the system actually works.

"We want a system supplier with know-how," he says. "One of the key criteria was finding a supplier who could do everything on its own. That's where ABB trumped the others."

Onsite service is of equal importance. ABB has a member of staff permanently deployed at the DaimlerChrysler works at Untertürkheim who is responsible for all the related plants in the area, from Bad Cannstatt to Mettingen.

Says Koppenhöfer: "By deploying someone here, ABB has done a great deal for onsite service. That's very important. Someone whom we can turn to at the drop of a hat, that's irreplaceable."

ABB supplied the two casting plants not only with the robots and their associated grippers, which were developed jointly by ABB and the Austria-based Fill GmbH, but also the robot software, the personal computers to serve the robots, and engineering as well as start-up support. ABB also helped with construction of the bridge on which the robots stand.

Koppenhöfer says he is especially impressed by the robots' user-friendliness and strength. He's also very complimentary about the contribution made by all the ABB personnel. And he's very taken with the technical competence of the robot specialists. "Everything fit perfectly," he says. ⊙

Sand castings await further handling.

By Patrick Sensen
Photos Steffi Bos-Emmerson

Improving the daily grind

Grinding, milling and shot-blasting get the robotic touch at MGG Tegelen.

> Anyone who has ever worked with a band saw machine knows that it requires manual labor to get the best results. As the machine is used, the saw blade becomes blunted, requiring the operator to make more and more corrections as time goes on. A robot working by itself just follows its program, and as the band becomes worn, instead of making corrections, it just carries on with the program and the finished pieces become increasingly imprecise.

So, it's not surprising that Dutch foundry MGG Tegelen could produce manually approximately 300 products with one saw before it became blunted or broken, yet after switching to a robot, the performance was actually lower initially, with a maximum of 150 products being produced before the saw blade no longer functioned properly.

But MGG Tegelen wasn't content to leave it at that. The company, located in the southern Netherlands, specializes in aluminum sand-core products. Rather than going back to doing the application manually, MGG Tegelen worked to improve the support system of the saw. By making some key adjustments to the speed and the robot program, MGG is now able to produce a thousand products or even more with a single saw blade.

How did MGG Tegelen manage to increase from 150 to 1,000 products? The key was simple: The process was changed so that the cuts alternate each time between the left and the right side of the blade, which allows the blade to wear evenly and thus last significantly longer.

In 1998, the first grinding robot was introduced at MGG. The robot was centrally located in the cleaning area, and the product was brought to the various cleaning stations for sawing, deburring and milling processes.

Since then MGG has, through careful development and fine-tuning of its robot concept, made vast improvements that have resulted in higher production and greater efficiency. What started as one grinding robot has now become five, with the capacity to handle 50 percent of the total production. The robots have functioned so well, in fact, that there are plans

to extend the number of grinding robots to increase the capacity to about 80 percent of the production. The company has truly earned the title of "grinding robot specialist."

Milling is also an area where the company has developed its robot expertise in a number of ways that have resulted in improved results. One big problem was dealing with burring and other irregularities in the grade of the casting. Robots are traditionally not well prepared to deal with irregularities such as burring. So, to anticipate this, MGG created a tool to measure the amount of electrical current generated when the robot is deburring the piece. More burring means more electric current. So, if the robot senses more current, it slows down, enabling the milling to remove the burr with more precision.

The accuracy of the cleaning process is dependent on several items. Besides the irregularities, the casting has deviations within limits of 2 mm. The robot itself has a certain accuracy and inflexibility and finally of course the tolerance within the gripper. Altogether this may result in an unwanted product deviation. By using a 3D sensor, the deviation is measured.

"As the robot knows the routine and we have measured the deviation, the robot knows how to correct the offset and the cleaning process can start accurately," says Geert Valckx, managing director of MGG Tegelen.

John van de Ven removing the sand core.

Benefits of automated grinding

- Return on investment for MGG's purchase of a grinding robot that can work in three shifts has resulted in payback time of approximately two years.
- Production increased from 300 to 1,000 parts per saw blade.
- Manual checks are no longer needed for the cleaned product.
- Fewer products needed to be kept in stock.

Due to highly accurate cleaning, MGG has eliminated the need for manual correction and visual inspections, allowing it to start the next production process, shot blasting, directly after the cleaning cell.

The grinding robot places the part on a table after it has eliminated the grades completely. A second robot picks up the part and hangs it in the shot blasting machine. The machine turns 180 degrees so that the part is in the range of the shot-blasting wheels and the machine starts shot-blasting the part. The part that is coming out is now in reach of the handling robot. The handling robot takes the part out and removes the shot-blasting grid. After finishing the job, it puts the part on a slide table so that the operator can check the part and the next steps in the process can be carried out.

The new shot-blasting cell was installed in May 2005.

While the switch from manual cleaning – sawing, milling and shot-blasting – to automation with robots hasn't been without its difficulties, the end result is that production cycle times have increased significantly and MGG is required to keep fewer products in stock. The bottom line is that robots have increased production and saved the company money.

"Looking back on the first grinding robot, we were able to clean small products in big series. Now, with all the improvements done and all the experience built up, MGG is also able to clean big products in small series," says Valckx. ⊙

>FACTS

MGG Tegelen

- A part of Hayes Lemmerz International Inc.
- Founded 1945 by Sjraar Giesen.
- Based in Tegelen, the Netherlands.
- Yearly turnover of more than 60 million euros.
- Aluminum sand-core products.
- Production includes five ABB IRB 6400 robots.

Text and Photos Bert Menninga

The future is here

Profound changes in the automotive sector are affecting suppliers worldwide. But foundries aren't waiting for the future to come to them, they're coming up with a range of innovative solutions that are helping change the face of the industry.

> The facts on the future of the automobile are in, and they can't be ignored, says Ferdinand Dudenhöffer, director of the Center for Automotive Research in Germany. The auto industry is undergoing a series of profound and sometimes conflicting changes that will have a huge impact on the foundry business.

New markets – India, China and countries such as Iran – have emerged with a need for cheaper cars. The age of the average customer in the U.S., Japan and Europe is increasing, and will soon typically be a single man over 60 who wants to be able to choose his own "unique" vehicle. The demand will only continue to rise for vehicles that use less fossil fuels – or none at all.

These factors, says Dudenhöffer, are affecting all the players within the auto industry, from the big auto companies to the smaller and fluctuating group of companies that supply an increasing portion of the entire automobile, including foundries. Even these companies supplying the industry are changing, merging and being sold by and to other companies and venture capital firms.

"Supplier turnover is expected to increase by more than 75 percent by 2015," Dudenhöffer said at a recent Alu-Motive Forum sponsored by ABB Automation in Munich. The October 2005 forum gathered together a range of analysts, representatives from foundry organizations and key foundry companies from across the Americas, Europe and Asia to look at the issues facing the industry and some innovative solutions that point the way forward.

"There will be a higher development cost, but the return on investment will need to be much shorter ..."

Jean-Michel Bachtarzi

Some of the implications for foundries are clear, according to Dudenhöffer. The greater focus on fuel efficiency means more of the car will be made of light metals. Producing a cheaper car for new markets means increased competition for production from those same markets. The demand for custom cars requires smaller but many more batches. "Product development and life cycles are shorter," said Jean-Michel Bachtarzi, global business director of Acheson. "There will be a higher development cost, but the return on investment will need to be much shorter."

In short, foundries will need to become not only more flexible, but more efficient at what they do.

According to Bachtarzi, this means it is going to be increasingly important that the big automakers and their biggest suppliers in turn

"Supplier turnover is expected to increase by more than 75 percent by 2015."

Ferdinand Dudenhöffer

"The advantages are that it is totally dry, has no abrasive material, disposal of waste is reduced..."

Chris Cooper

make sure that there is a good fit between them and their partners and that they get solutions tailored to their needs. They will need plug-and-go solutions that reduce set-up time and are simple to use, while at the same time they need process control to ensure efficiency.

What kind of innovations are already underway that address these issues? One typical solution from Acheson is a form of lubrication – liquid dust – that requires no water, is unaffected by heat and uses significantly less lubricant than more conventional lubricants. Not only is there a cost-savings, said Bachtarzi, but there is no contamination of water either. It is this kind of innovation that combines smart thinking with an understanding of the needs of the industry that will drive things forward: "If you use only the lube or only the engineering and forget that the lube is actually part of the engineering, you lose the point," said Bachtarzi.

A totally different type of innovative application was presented by Danilo Verzeletti of Evolut. The Italian system integrator has a new

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On greenfields and partnerships

The foundry business may be centuries old, but the industry is anything but old-fashioned. Keeping up with the trends isn't always easy for those managing foundries and working as system integrators, but "if we don't get information, we're going to get hurt," said Gabriele Galante, CEO and founder of Italian foundry equipment manufacturer IMF and president of the European foundry association CEMAFON.

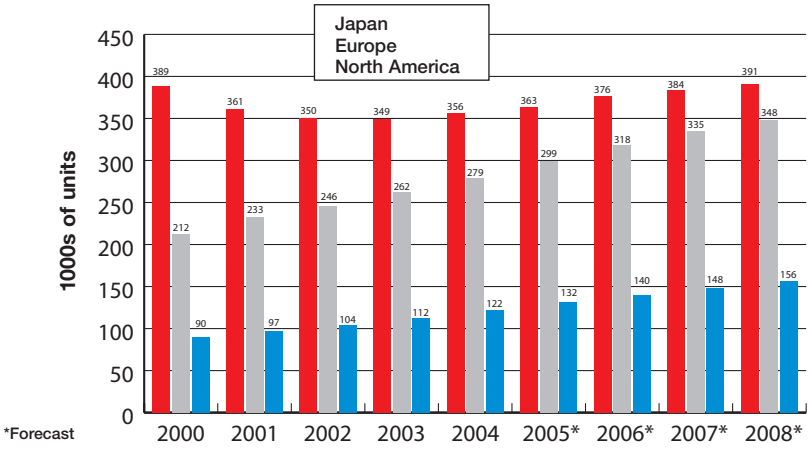
Galante not only keeps up with trends, but he is hardly one to sit back and watch things move forward without him – he prefers to be a trendsetter. "We have to change our working and selling philosophy, explore new markets and go fishing where we can find fish."

And Galante did just that. Or rather, it was Tetsua Kurita of Industrial Co., Ltd. who approached Galante so that the two companies could do it together, forming an unusual partnership across cultures to build a cutting-edge greenfield foundry in Japan for Kurita that could provide a quality of product that could compete against foundries in markets with lower labor and overhead costs. The foundry is due to open in March 2006

"One of the most important parts of this operation is to have reduced to the minimum and shared the risks involving the really innovative parts," said Galante.

Gabriele Galante and Tetsua Kurita have become cross-cultural partners to build a greenfield foundry.

Gudrun Litzenberger of the German Engineering Federation



Forecast 2005 – 2008
Estimated operational stock of industrial robots in Japan, Europe and North America, (IFR)

Crunching the numbers

The International Federation of Robotics regularly releases worldwide data on a range of issues that affect all industry, including foundries. Gudrun Litzenberger of the German Engineering Federation – VDMA – presented a preview of the results for 2005 at the Alu-Motive Forum.

Among the interesting findings presented were that while the large automobile manufacturers – OEMs – in Europe, the U.S. and Japan are decreasing their demand for robots, demand from automotive part suppliers continues to increase, with an expected growth of 6 percent through 2008. In terms of technology, Litzenberger noted that "the increased use of sensor technology, vision technology and tailor-made solutions for particular problems seem to mark a trend." Japan remains the No. 1 country when it comes to the number of robots in use and the demand.

>

deburring system that can modify the process speed in real time – a real-time speed adapter – and can be programmed offline. The real-time speed adapter allows the robot to change speed, path and pressure according to the dimensions of the burr. According to Verzeletti, Evolut's new deburring system is up to four times as efficient as manual deburring.

For cleaning, Chris Cooper of Vulcan Engineering described a new process that uses liquid nitrogen instead of high-pressure water and hand cleaning. "The advantages are that it is totally dry, has no abrasive material, disposal of waste is reduced or even eliminated, it's environmentally benign and creates no heat, and can be used at ultra-high pressures." The system, which can be easily used by robots, is an alternative to shot- and waterblasting, and avoids some of the disadvantages, such as waste and damaged parts, that can occur.

On a more technical level, Bob Hegel of Idra Prince described the advantages of semi-solid rheocasting (RSS), a method of casting ideal for high-performance casting of parts that are complex or have heavy parts, such as pump filter housing. According to Hegel, benefits include that "the casting cycle time is reduced by 12-25 percent, and the die life is increased by 50 percent."

These are just a few of the range of new developments and solutions presented at the Alu-Motive forum, and you can read more in depth about some of the rest of them in the magazine, including MGG-Tegelen sawing application (page 10), Ryobi's work with offline programming (see page 16) and Fill's cleaning and finishing system for cylinder heads (see page 20).

The bottom line, of course, is that everyone working in the foundry industry must continue to look to the future in order to stay competitive. As Ferdinand Dudenhöffer said: "We need to look at the customer expectations of tomorrow, which will influence the new products of tomorrow." ⊙

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ABB's Alu-Motive Forum, which was held in Munich, Germany from Sept. 28-30, was attended by some 85 participants and speakers. There were 15 countries represented, including China, Japan, Korea and the United States, as well as numerous countries in Eastern and Western Europe.

Companies represented included Acheson, BMW, Buehler, Daimler-Chrysler, Edertek, Evolut, Fill, Idra Prince, Italpresse, Manzoni, MGG Tegelen, Ryobi, Specma, Vulcan Engineering, Wanfeng Group and Woosung Diecasting, among others.

In addition to the various presentations, participants were able to visit the BMW Landshut facility, where aluminium and magnesium crank cases are produced.

Mathys Pirk, segment manager for foundry at ABB, announced at the meeting that the Global Alu-Motive Forum was just the first in what will be a series of forums that will be sponsored by ABB in conjunction with World Foundry Organization and CEMAFON. "We plan to have an Alu-Motive forum every two years," he said. The next forum will be in 2007.

By Matthias Gamisch and Christian Pumberger
Photos Fill

A talent for metal

Cleaning and finishing cylinder heads efficiently requires smart solutions.

> To be successful in business you need reliable partners. Austria-based Fill GmbH has worked hard to be a reliable partner, providing one-off solutions to its customer VAW mandl&berger for many years. So it was no surprise when Fill, a company that provides system solutions for metal machining, was asked by VAW mandl&berger to supply it with a cylinder head processing plant.

The challenge was to provide highly technical and functional quality in a restricted space.

At its company headquarters in Linz, Germany, VAW mandl&berger produces a million cylinder heads annually for the motor industry. Customers include some of the biggest names in the industry, including BMW, Ford, General Motors, Isuzu, Opel, Rover and Volkswagen.

VAW mandl&Berger and Fill have worked together in a number of areas, including the design of the cylinder head or crankcase, the construction of tools such as core-casting moulds and ladles and the production of the castings (including the handling of the raw materials).

The M47 cylinder head made by VAW is used in the BMW 318D and the BMW 320D/520D automobiles. The cylinder heads for both engines are fundamentally the same, differing only in the alloy that is used. In addition, the M47 R is used in the Rover 75 2.0 CDT. VAW mandl&berger delivers the cylinder heads after the initial production phase to BMW Steyr, where the cylinder heads go through cleaning and finishing and are then fitted into the engines.

The assembly production cell for BMW M47 cylinder heads was planned and put into operation in the shortest possible time by a project team that was formed for the job in the foundry's technical school at VAW.

A gantry robot lifts each cylinder head from the conveyer belt and takes it to the station where the sand core is broken up by a hammer. At this point, an IRB 6400 robot picks up the cylinder head and places it in Fill's Swingmaster decoring system. There the core is reduced by the swinging movement. The cylinder head is emptied as the Swingmaster moves.

From there, the IRB 6400 takes the cylinder head to a circular saw where the rough edges are removed. Next, the pieces are assembled and undergo a cleaning and finishing process. The gate is removed, and the camshaft and the gearbox sides of the cylinder head are milled and deburred. The work is done to a tolerance of +/- 0.5 mm. Before it's taken away, individual slots in the camshaft are punched out. After a visual check, the cylinder head is guided back into the plant and automatically packed into the right box for transportation.

The production area is soundproofed for noise and security protection. The shavings that are produced in the processing of the cylinder heads are separated by alloy type and then recycled. The cylinder heads are produced at a rate of one every 60 seconds over three shifts a day in this newly designed processing plant. ⊙

An IRB 6400 robot milling and deburring M47 cylinder heads.

Software system saves time and money

RobotStudio software allows Japanese foundry Ryobi to avoid downtime and stoppages by programming offline ahead of time.

> With automobiles and motorcycles as the main focus, Ryobi creates and produces aluminum die cast parts for about one hundred different types of vehicles. Ryobi currently has 25 ABB robots in operation in the Shizuoka factory. Within the realm of die casting, they have introduced a variety of robot systems. Among these systems, the cleaning system, the polishing line and the insert line present the most difficulties. The insert line deals with small items being placed accurately within a larger cage-like core of machinery. Whenever these applications are used it is vital that the repetition and tracking systems therein are precise.

"We decided to invest in RobotStudio because whenever we brought in new equipment and started to set it up we ran into different problems," says Ryusuke Izawa, Group Leader at the Engineering Section. "This caused long delays as we had to stop the production to be able to fix the problems. When we were teaching programming or any other aspect online, we had to cease production or even cease development, stop the machines, and then restart them to do all the relevant checks. This included thinking about where the problems had occurred, investigating the issues, and then talking through the key points to succeed. This took a considerable amount of time.

"With RobotStudio, we can examine and inspect items well in advance. We are now able to install proper equipment from the beginning and avoid complications and operation failures. RobotStudio can pinpoint any potential problem easily and ahead of time, which considerably reduces delays and eliminates production stoppages. This drastically reduces our costs."

Honda turned to Ryobi for the mass production of a new engine block for their motorcycles. The development period for this project was extremely short and they also dealt with a difficult product that had to be both mechanically sound and technically perfect in terms of die casting.

"…We used 3D drawings to thoroughly examine the design."

Ryusuke Izawa

"With RobotStudio we were able to look into what the production machinery that hadn't even been made yet would eventually look like," says Izawa. "We used 3D drawings to thoroughly examine the design. Even at this point no one could make a sure judgment as to whether we could mass-produce these items or not. But RobotStudio taught us what we as humans couldn't know - that such mass production was possible. The production of the engine blocks is running just fine at this very moment. This project wouldn't have been possible without RobotStudio and we wouldn't have gained

Hiroshi Urabe, Plant Manager at Ryobi Shizuoka plant, is very satisfied with the latest system programmed in RobotStudio.

Ryusuke Izawa learned how to use RobotStudio all by himself in one month. Offline programming has changed his work considerably.

Honda's trust for this project without being able to show the solution in RobotStudio."

With the realistic graphics in RobotStudio, Ryobi can create a complete image so that all of the project members can share and strive for the same solution.

Hiroshi Urabe, Plant Manager at the Ryobi Shizuoka plant, is very satisfied with the latest production of engine blocks to Nissan.

"We have managed to build up a conveyor tracking solution for the deburring of engine blocks for Nissan. Thanks to RobotStudio we can manage this unique solution. You can't find anything similar in the world," says Urabe.

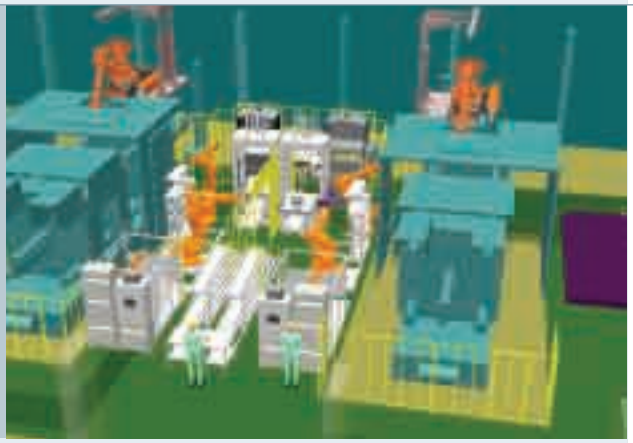
Izawa agrees. "Up until now we have had to abandon intricate designs in which there was a danger of complications occurring in very narrow spaces or danger of operation malfunctions," he says. "With RobotStudio we are now able to challenge ourselves and attempt the tricky designs of the very narrow spaces that we didn't know were possible before."

RobotStudio greatly reduces programming time at the Ryobi Shizuoka plant. With offline programming they only make the final adjustments online. It is of great benefit as they are able to minimize the time that is actually spent on site. In addition, they can avoid unforeseen complications or robot malfunctions during the actual teaching exercises. Operations have greatly improved since the implementation of the software.

"For the future we are looking into introduction of RobotStudio in a variety of facilities. In this way we can successfully implement flawless machinery. In particular, we are thinking of fully integrating offline programming in our spray system," says Izawa. ⊙

Ryobi at a glance

Ryobi, a world leading die casting manufacturer situated at the foot of Mount Fuji in the Japanese city of Shizuoka, provides the automotive industry with lightweight, durable, and highly recyclable aluminum die castings. Among their customers are vehicle producers like Nissan and Honda.



A unique conveyor tracking solution for production of engine blocks for Nissan. Programmed offline in RobotStudio.

Report it digitally

With the introduction of WebWare, Swedish company ITB has changed from oily scraps of paper to online reports to document production.

ITB's plant in Unnaryd houses around 30 robots.

> Swedish company ITB specializes in processing die-cast aluminium components for the vehicle and electronics industries. The plant in Unnaryd now houses 30 or so robots, all linked to WebWare. Mikael Kjellström is a robotics engineer at ITB Teknik. "We use robots to control the machinery in production. They insert unprocessed components and then remove the finished components from the machines. We use WebWare primarily for generating reports. The reports allow us to localize any problems that arise on evening/night shifts. WebWare is also used for making backup copies of our robot programs," says Kjellström.

Björn Söderberg, CEO, launched ITB Teknik together with a partner 20 years ago. "Before we created WebWare, all backups used to be to diskette. All reporting on stoppages, etc. was handled manually. Evaluations were very subjective; operators often felt there was a lot wrong with a machine, but it was difficult to put your finger on the specific problem. One concern was that, because we operate around the clock, actually compiling the information was difficult and time-consuming."

Kjellström concurs: "Before the installation of WebWare we had to gather information from evening and night shifts by means of traditional production stoppage reports on paper. It was easy for reports to get lost in the plant, and they were often totally smeared with oil when I actually got them."

The reason for ITB Teknik investing in WebWare at the start of 2004 was that it was looking for a single tool to gather information from all the machines. The company previ-

"WebWare allows us to follow up on production simply, to see when stoppages have occurred."

Björn Söderberg, CEO, ITB

ously employed several different manual systems where operators had to fill in stoppage reports, etc. They wanted to automate the process and gather all data in one system.

"WebWare is an excellent tool for following up on productivity. The software records the various operations performed by the robot as it inserts components into the machine and picks components from the pallet. WebWare allows us to follow up on production simply, to see when stoppages have occurred," says Söderberg.

"Since installing WebWare we have eliminated all use of paper and can also attend to problems immediately, as we can see any that have arisen during the night straight away next morning and can take care of them directly," says Kjellström.

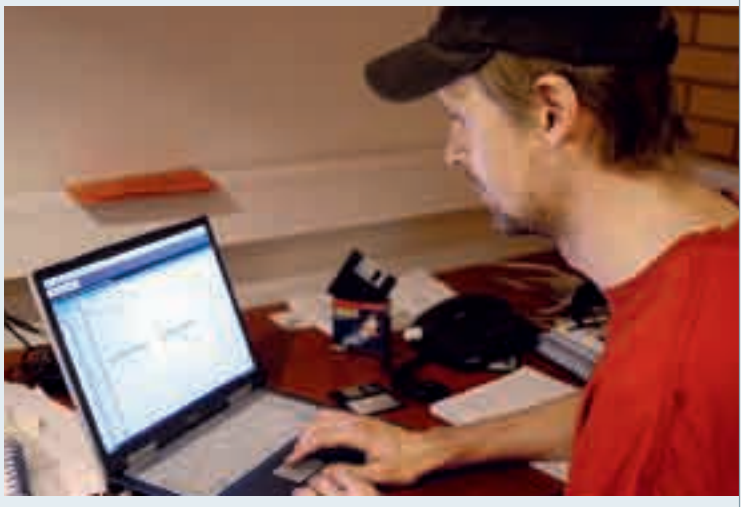
Söderberg asserts that since ITB Teknik integrated WebWare into its production system the quality level of the entire production process has substantially improved. With WebWare's help, workers can spot deficiencies in handling and trace mechanical problems. This in turn has lead to increased productivity thanks to the fact that problems are detected much earlier and can be put right quicker.

"WebWare is an easy-to-handle tool thanks to its simple interface. By pressing just a few buttons I can generate new production reports or make a backup of a robot program," says Kjellström. ITB Teknik's customers are primarily within the automobile and electronics industries. Customers look very positively on the fact that, thanks to WebWare, the company now boasts traceability in its machinery around the clock. They see improved management of quality issues and production follow-up since the installation of WebWare.

"I believe that WebWare has a lot more potential that we have not yet exploited and I am fully convinced that we will derive even greater benefit from this software in the future. We plan to use WebWare to an even greater extent, to measure increases in productivity, changes in the process and similar issues. The interesting thing is when employees discover what you can use the software for and develop different methods to improve productivity and quality. It inspires the whole company," says Söderberg.

One example of this is plans to introduce a live update large-screen monitor with WebWare online in the break room. This will allow everyone to see what is happening and not happening and the actual statistics for each shift.

"New tools like WebWare are helping us to survive in the tough competitive situation that currently prevails within the manufacturing industry," says Söderberg. ⊙



Every morning Mikael Kjellström receives an updated WebWare report from production regarding the previous evening/night shift.

ITB at a glance

ITB was founded in 1986 in a 400m2 workshop. The business concept involved processing castings from foundries prior to delivery to the end customer. Over the years ITB Teknik in Unnaryd has expanded, and now boasts a 4900m2 workshop and a large number of CNC-controlled machines and robots.

The marking system operates at temperatures up to 800º centigrade.

By Chris Miles
Photos ABB

Mark of quality

Robots take on the difficult task of marking steel beams with special identification numbers.

> The Teesside Beam Mill at Lackenby, Redcar in the United Kingdom, has been the subject of considerable investment by London-based metal manufacturer Corus. One of the most efficient structural section rolling mills anywhere in the world, it produces some 750,000 tons of beams per annum.

The mill manufactures a vast range of products for the worldwide construction industry and is at the forefront of product development. Recent innovations include asymmetric beams (ASB) for use in Slimdek systems, parallel flange channels, air box channels and heavy 'Jumbo' sections.

The manufacturing process is totally automated, with no manual intervention at any stage.

Each product carries a unique, primary identifier code that details all its technical and manufacturing information. This information is used for internal tracking and traceability throughout the life of the product.

Character marking of any kind presents a significant problem due to the harsh environment of the beam manufacturing process. Finding an effective method of marking the product has, until the robot-based solution, proven difficult. Previously, Corus used manual chalk marking, manual hard stamping, automated labelling, and automated aluminum paint stencilling.

Reviewing its requirements, Corus drew up a specification for the new marking system. The specification required that the system had to have an extremely short cycle time, a compact footprint, an entirely automated operation, reliability, robustness, and an easy-to-apply marking medium. At the same time, the system would need to fall in line with the Corus mantra, "keep people away from the process,"

and safety had to underpin every aspect of every installation.

The key production requirement is a very short cycle time, as any delay in the automated process has a domino effect in terms of productivity. Additionally, heat is slow to dissipate from the product, which makes the application of paint difficult – while the scaly surface of the product is also not conducive to marking.

The mill's manufacturing manager for development, Chris Hamlett, enlisted the expertise of Hartlepool-based marking and tracking technology company Numtec Magnemag to devise a more efficient method of product identification, as Numtec had previous experience in labelling and paint-spraying solutions within the mill.

Numtec Magnemag suggested an ABB robot-based solution following its application experience in steel plants in South Wales and in mainland Europe, incorporating a high temperature spray marking system capable of operating in temperatures of 800º C.

Hot paint spraying was recommended over etching and other systems because of the minimal cycle time required to apply the medium, thus preventing the production hold-ups feared by Corus – while ABB Foundry Plus robots were recommended due to their excellent reliability in harsh environments, their speed, accuracy, and compact footprint.

The robot-based systems, with two IRB 6400 Foundry Plus robots, were installed during the mill's planned summer shutdown of 2003. They are located at an optimum point in the product manufacturing – within each of the two cooling banks, after the hot saw process.

Control interlocks are incorporated to signal a halt to each product on its journey to the cooling banks, and while the product is stationary, the independently operated robots are signalled to power-up, carry out the marking operation, and return to their respective stowages. Robot cycle time is just six seconds.

To ensure maximum availability, Corus has an annual service contract with ABB Manufacturing Automation UK, which includes calibration and maintenance servicing as well as emergency call-out.

Steve Bowman, manufacturing engineer for finishing, who has been responsible for the serviceability of the installation, has been impressed both with the IRB 6400 robots and with the back up from ABB.

"Though there is no requirement for any intervention with the robots' routine operation, me and four other mill engineers carried out the ABB programmer's course so that we have the ability to manually operate the robot in exceptional or emergency situations," says Bowman. "Fortunately no such situation has arisen, or is likely to, as serviceability is excellent. In addition, all of the Corus Group attendees at ABB's Customer Service Centre, Milton Keynes, were impressed by the facilities and rated the course one of the best in the business."

Summing up the performance of the installation over the past two years, Chris Hamlett says: "Many people were skeptical about how effective a robot-based system was likely to be in such a harsh environment as the Teesside Beam Mill. I can categorically say that we have been impressed with the safety of the Numtec Magnemag/ABB system; its availability - currently running at above 99.9 per cent; and its productivity.

"Due to the success of the IRB 6400 systems, during the planned summer shutdown in 2005 two more ABB robot-based systems will be installed, in this case IRB 6600s, which will be located downstream of the current machines. These will fulfil automatic labelling operations, to add commercial information and customer logos to the relevant products." ⊙

(a version of this article appeared in the October 2005 issue of Steel Times International*.)*

Robots spray identification marking on steel beams in Teesside.

>FACTS

Why robots?

Marking steel beams with robots has its advantages:

- **Employees no longer face health and safety risks**
- **Foundry Plus Robots easily handle tough conditions**
- **Service contract means significantly reduced downtime**
- **Training for employees using the robots**
- **Cycle times of 6 seconds means extreme efficiency**

An IRB 140 robot picks up a filter from the stack.

Smarter setting

By XXX
Photos Robotec

Filters are still usually set in casting moulds manually. But this could change with the recent development of a robot-based filter setter.

> In moulding plants, casting filters are still largely set by hand. A primary reason for this is the packaging in which the filters arrive. To date, automated filter setting solutions have always failed because the filters need to be correctly positioned before they are set. A manual operation is required to transfer the filters from the package into the centering mechanism or the magazine of a filter setter, resulting in additional costs.

Robotec Engineering GmbH, a German-based company that offers turnkey specialized foundry installations, has developed a versatile filter setter to overcome this problem. "Our filter setter takes Foseco Sedex filters directly from the stack in the package and places them in a mould. But the setter can be adapted for use with other filters," says Heinz Nitsch, one of Robotec Engineering's two managing directors. The filter setter is based on a pilot installation developed by Robotec in 2004 for the Georg Fischer iron foundry of Singen, Germany. "This led to a product that we now sell as a standard installation," he says.

The filter setter consists of two ABB IRB 140 robots, which share the work of setting the filters. One robot takes the filters from the stack on the pallet; the other places them precisely in the moulding line. The stacks are carried to the installation by a conveyor belt. First, a worker cuts off the lid of the box in which the filters are packed, turns the box upside down and lifts it off the stack. This worker is then free for other tasks, and the installation sets the filters totally independently.

When one stack of filters is finished, the conveyor belt moves the next one into the installation. There, the first IRB 140 searches for

the stack with special sensors and measures its position on the belt. When the robot has measured the exact position, it begins to remove the filters from the stack. It always takes two filters, which it searches for with the same sensors. Each filter is picked up from above by a vacuum suction nozzle powered by a suction unit. Precise positioning of the parts is not required, since the sensors find them, and the pick-up by the suction nozzles is not a precision operation.

To ensure that the filters can be set accurately in the moulding line, the pick-up robot places them in a centering station. This consists of several stackers, which, in addition to centering, also have a buffering function. The buffer decouples the pick-up robot from the setting robot, giving the pick-up robot time to feed in a new stack via the conveyor belt without slowing down the setting robot.

Besides feeding in fresh stacks of filters, the pick-up robot needs additional time to remove the paper interlays on the filter stack. When a layer has been completely cleared, the IRB 140 uses its suction nozzle to pick up the paper, remove it from the stack and dispose of it in a bin.

The centering station stacks two layers, each of six filters, one above the other. A pneumatic mechanism pushes the filters in the bottom layer to a mechanical stop and hands them over to the setting robot in a defined position. The setting robot takes the filters from the station one by one, and the filter is pressed pneumatically into the defined position until it can be securely gripped.

The centering station then opens and the IRB 140 passes the filter in its gripper across a suction device that removes dust from the filter. The robot then places the filter in the molding plant.

The depositing points are stored in the robot as freely defined coordinates. All setting points are based on a reference point, so the robot only needs to be taught this point at the commissioning stage. The coordinates are stored in a file for each type. When the time comes for a change of type, all the associated coordinates are loaded from the file.

The robots are controlled with ABB's latest generation of IRC5 controllers. "Optimization of the installation is highly flexible with the IRC5," says Heinz Nitsch. Robotec Engineering developed the specific software for this application. According to Nitsch, the IRC5 is the ideal controller for the filter setter. "Thanks to the MultiMove function, the robots can both be operated with one controller," he says. "This saves space. The entire control system for the peripherals can be integrated into the IRC5. The FlexPendant unit completely replaces a controller PC. In addition, the controller contains the full range of setting points for the necessary functions."

Placing filters on the conveyer is the only manual part of the operation.

"Optimization of the installation is highly flexible with the IRC 5."

Heinz Nitsch

The Virtual IRC5 software tool is used to test the application. "The complete application was first tested and debugged using Virtual IRC5, before being transferred to the controller," says Nitsch.

The entire installation is mounted on rollers and can be moved away from the moulding plant at any time. Thanks to this flexibility, the installation can be deployed for any application involving moulding filters and moulding lines, even with horizontal box segmenting.

Besides the savings in labor costs, Nitsch mentions a further point in favor of the new method: "The sensor measurement function also provides us with a quality check, telling us whether a filter has in fact been set and, if so, whether it was correctly set."

Nitsch's assessment of the product's chances on the market are positive: "In foundries all over the world, filters often need to be set at rapid rates and in large numbers, so the filter setter has the potential to become a standard product. Our patented method and ABB's robots and robot controllers offer the flexibility needed to satisfy all demands." ⊙

>FACTS

Robotec Engineering – a success story from Baden

Robotec Engineering GmbH of Bad Säckingen (South Baden), Germany, supplies automation solutions for a variety of industrial sectors. Chief among these are foundries, processing and installation engineering. At the beginning of this year, the company, which was established in 1999, won the 2005 Waldshut County Business Startup Award.

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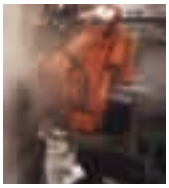

ABB robots have always been a key piece in winning foundry automation strategies. From the beginnings of automation to today's agile, advanced operations, our experts have helped topple some of foundry's biggest challenges, from upstream to downstream applications.

ABB is a leader in innovation, productivity increases and levels of quality never imagined before. All backed by the financial commitment, global business & service expertise and a comprehensive network of best-in-class partners to sustain your success through many future competitions. To learn how ABB is uniquely positioned to make the next impressive move in foundry, **visit us at www.abb.com/robotics.**

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