

FOUNDRY

A MAGAZINE FROM ABB ROBOTICS

MAY 2007



Over 40 robots
get credit for
success at Mett in
Melbourne

> 10-12

Hi-tech engines
made jointly by
PSA Peugeot
Citroën and BMW

> 8-9

Perfect touch
with new machining
software from ABB

> 24

READY FOR CHINA

Müller-Weingarten's Jürgen
Lamparter delivers die casting cells
to Changan Suzuki > 4

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From the segment manager

> The automated processing of cast parts is gaining increased significance for foundries who want to remain competitive. Foundries need highly flexible post-processing solutions and function packages that give them value for their money. From clever venting of molds to efficient deburring and everything in between, this issue of *Foundry* magazine shows an array of companies that have come up with smart solutions that use robots to improve the production – including post-processing – of castings.

And ABB is playing its part in providing not just robots, but complete systems for dedicated processes, applications and products. We focus on giving the best value for end customers by constantly improving, in cooperation with our partners, our own products, function packages and systems.

For example, with a new technology for superimposition of force and position control, ABB has created the requirements for efficiently using robots in the processing field. Or ABB's Foundry Plus protection that allows robots to safely work in the most corrosive of environments.

I hope that you will be joining us at the world's leading trade show for the foundry industry, GIFA 2007 which is held June 12-16 in Düsseldorf, Germany. We will be showing some of our latest developments at stand No. 44, in Hall 17.

And later in the year, we are sponsoring our second ABB Global Alu-Motive Forum 2007, Nov. 29-30 in Basel, Switzerland.

Finally, I hope that this issue of *Foundry* magazine gives you ideas for how you can benefit from robotics. Happy reading!

Marthys Pirk

Segment Manager, Foundry
ABB Robotics
marthys.pirk@de.abb.com

Calendar

2007

111th Metalcasting Congress

Houston, Texas, US
May 15-18

National Manufacturing Week

Melbourne, Australia
May 22-25

GIFA

Düsseldorf, Germany
June 12-16

ABB Robotics Partnerdays

Västerås, Sweden
June 20-22

ASEAN

Kuala Lumpur, Malaysia
July 18-21

HI-Industrimessen 2007

Herning, Denmark
September 4-7

EMO

Hanover, Germany
September 17-22

Die Casting Asia 2007

Dongguan, Guangdong, China
September 19-22

Parts2Clean

Stuttgart, Germany
October 9-11

ABB Global Alu-Motive Event 2007

Basel, Switzerland
November 29-30



> ABB believes in the power of partnerships to provide foundries with the best possible solutions to the challenges they face in automation. For those integrators and automation experts who work consistently with ABB, there is a certified partner program. To find out more, see www.abb.com/robotics.

GIFA place to be in 2007

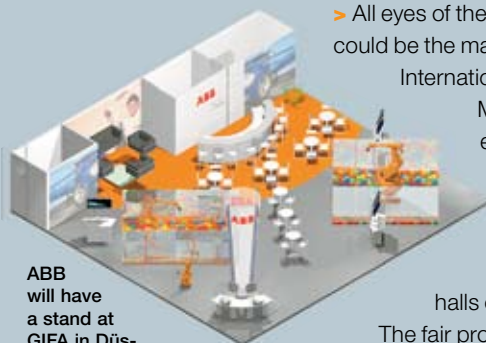


ABB will have a stand at GIFA in Düsseldorf, at No. 44 in Hall 17.

> All eyes of the foundry industry are looking to what could be the major event of the year – the International Foundry Trade Fair GIFA 2007.

More than 50,000 visitors are expected in Düsseldorf, Germany June 12-16, 2007 for the fair.

Manufacturers from 30-plus countries will present casting-related innovations in the exhibition halls on the River Rhine.

The fair provides a comprehensive overview of the rapid developments in the areas of materials and production engineering.

You can find ABB at stand No. 44 in Hall 17.

ABB will be showing a range of new as well as tried and true technologies and products at GIFA. New products include RobotWare Machining Force Control, a new technology that is a great improvement over current automated finishing of castings.

ABB also will be showing RobotWare DieCast, with its graphical interface for easy operation, TrueView, a new vision-guided robot system, as well as Foundry Prime, a revolutionary form of protection designed for robots for water jet cleaning.

In addition, ABB will show the new IRB 6620, a strong and fast versatile robot that is four robots in one. ABB will also introduce its new Remote Service, which provides operators with robot diagnostics wirelessly.

We look forward to seeing you there!

Claudia Berg
Marketing & Communication
ABB Robotics-Foundry

Don't miss the ABB Global Alu-Motive Automation Forum 2007!



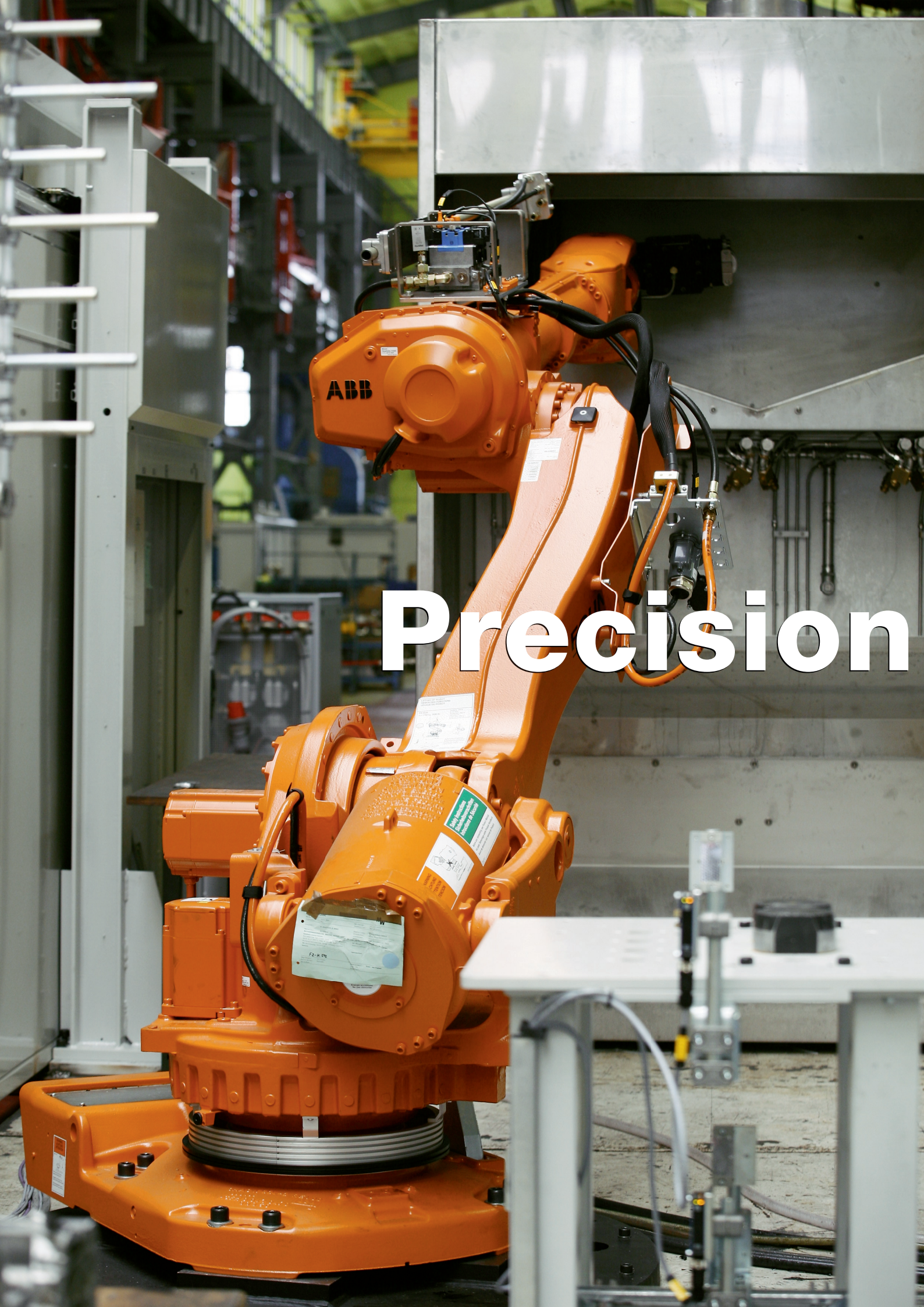
Join ABB in Basel, Switzerland, Nov. 29-30 2007
Meet the best minds in the foundry business for:

- Networking and business opportunities
- Platform for communicating your successes
- Latest trends and technology in the industry
- A chance to meet decision makers, end users, association representatives and key people in the industry

Sign up now! Contact Mathys.Pirk@de.abb.com

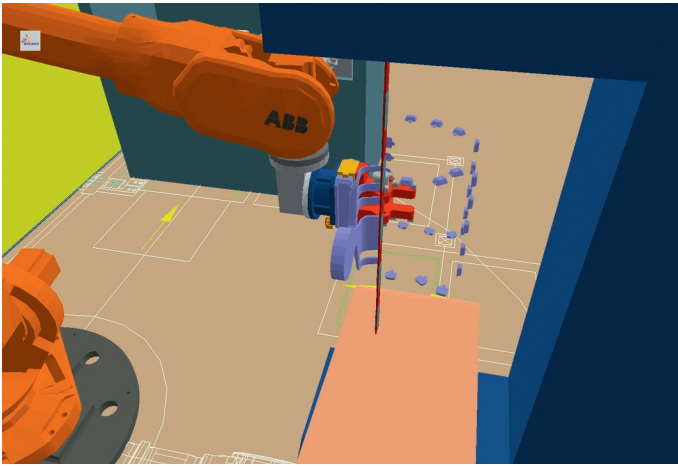


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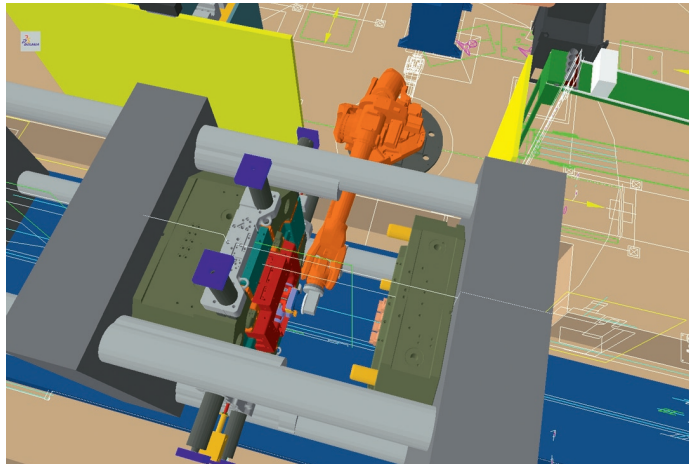


Precision

By Lois Hoyal
Photos Thomas Müller



At left, an IRB 6600 robot forms the heart of the die-casting cells built by Müller Weingarten for Changan Suzuki



Above left and right, cell simulations for the die casting.

Shipped to China

When auto manufacturer Changan Suzuki in Chongqing, China, needed die-casting cells for production of its engine blocks, it turned to Germany company Müller Weingarten for a smart solution.

> Müller Weingarten, one of the world's leading suppliers of metal-forming equipment for the automotive industry, has enjoyed a close working relationship with ABB for more than 10 years. The two companies have cooperated on several high-pressure die-casting projects, such as producing die-casting cells for DaimlerChrysler, as well as a number of press automation projects. The next stop is China.

Müller Weingarten has won an order for three completely automated die-casting cells for auto manufacturer Changan Suzuki, which is situated in Chongqing, in mid-eastern China. And ABB robots will play an important role in the project.

Müller Weingarten, which develops solutions for forming, forging and die casting a range of materials, is well positioned for the delivery of equipment to China. "We have imported more than 100 million euros worth of goods into China in the past year alone and have established a good business relationship with the country over the past 20 years," says Jürgen Lamparter, the director of the die-casting business unit at Müller Weingarten.



Markus Theiwes, head of project development at Müller Weingarten, has been a key player in the cell development.

The Changan Suzuki contract is for two Opticast 2500 die-casting machines, which are used in engine-block production, as well as for one Opticast 1750 machine and for gear boxes and clutch housings. The machines will come from Müller Weingarten's plant in Erfurt, Germany, which is the company's central production site for large-part machining, welding and in-house assembly, in addition to its role as a service base. Delivery is due to take place at the end of 2006, and production is expected to start at the Changan Suzuki plant in April 2007. Commissioning will include two weeks of training for four employees at the ABB training center in Shanghai.

Three ABB IRB 6600 robots in specially protected Foundry-Plus versions will be employed for the die-casting machines. The robots' work is straightforward: First, they extract the parts – engine blocks and transmissions, which are then passed through a component checker. The next step is for the robot to guide the component past a saw to remove surplus metal. "The robot moves the part past the saw, which



“We have imported more than 100 million euros worth of goods into China in the past year alone...”

Jürgen Lamparter



we have supplied, and it is cut into shape,” says Robert Klotzbücher, sales and project manager for August Mössner, which produces band saws for steel and other metals. “It is a fast, exact, cost-effective solution that doesn’t add to the cycle time. Previously this work was carried out manually.”

The final step of the automated process involves the robots placing the components in a cooling shower bath, developed by ABB.

The entire cycle time takes just 110 to 120 seconds. This pace will allow Changan Suzuki to produce 100,000 engine blocks per year with each 2,500-metric-ton machine. The use of Wollin Automatisierungstechnik spray equipment to lubricate the dies helps achieve the desired cycle times. “We have supplied special spray nozzles for the Changan Suzuki project,” says Günter Engelhorn, sales manager for Wollin. “Using these adapted spray heads can save as much as 50 percent cycle time.”

Using the new generation of robots also allows a high degree of flexibility, increased productivity and a high level of reproducibility. Furthermore, fewer man-hours are required. “Every robot spares a worker,” says Lamparter.

Müller Weingarten chose to work with ABB for a number of reasons, according to Lamparter. It welcomes the spare-part service support that ABB offers in China and it appreciates the experience Changan Suzuki has had working with ABB robots on site, and it values the long-term cooperation it has built with the company. “We chose ABB because it is a well-known, reliable partner, and we have previously worked well together on motor block casting projects,” says Lamparter. ☺

>FACTS

Müller Weingarten, Mössner and Wollin at a glance

- Müller Weingarten AG supplies cold-chamber die-casting machines, used for casting parts such as engine blocks and transmission housings, as well as for forming chassis and body components made from aluminum or magnesium alloys. Sales for 2005 were 403.3 million euros. Müller Weingarten has 2,360 employees.
- Mössner has more than 100 years of experience with sawing equipment. For the past 15 years has concentrated on the manufacturing of customer specific equipment, including providing both casting finishing lines and stand alone equipment.
- Wollin GmbH, founded in 1980 by Rudolf Wollin, is a leader in die-cast spraying technology, working in the automotive, heavy equipment, and consumer products casting business. The company has more than 75 employees, with business operations in Europe, Asia, and the Americas.



The die casting in a nutshell

- Chinese automaker Changan Suzuki has ordered three completely automated die-casting cells from Müller Weingarten: two Opticast 2500s and one Opticast 1750.
- Three ABB IRB 6600 robots in Foundry-Plus versions will be used for the die-casting cells.
- The total cycle time is 110 to 120 seconds.
- 100,000 engine blocks will be produced annually on each 2,500-metric-ton machine.
- Customer benefits include reduced manpower, higher productivity, increased reproducibility and flexibility.

Spray on

Robots improve productivity for die casting at Ching Ming Metal Manufacturing Ltd in China.

> China is a powerhouse when it comes to the foundry industry: Nearly 5 million tons of castings are produced yearly, most of them in the Yangtze Delta area. As globalization of the world economy accelerates, the global annual demand for castings is reaching approximately 80 million tons, and both international and national markets are increasing their demands for Chinese-made castings continuously.

Of course the rapid increase in casting production is not without its drawbacks – for example, higher energy and resource consumption, environmental pollution and poorly-paid labor forces. Add to this problems with out-of-date equipment and poor process automation capability, it's easy to see the challenges facing the industry.

But Chinese foundry Ching Ming Metal Manufacturing Ltd is ahead of the curve. With advanced die-casting machines, a high degree of automation and voluminous orders, Ching Ming has high requirements for its automation and stability of manufacturing. To help achieve this, it uses many die-casting robots from ABB for its production lines and processes.

Most of the 33 foundry-specific robots supplied by ABB to Ching Ming are used for spraying. The specialized modular standard spraying system used provides flexible spraying functions with a small nozzle and spraying amount, combined with easy control. “ABB’s industrial robots are famous for quality. In addition to excellent performance, ABB has organizations across China for technical, sales, engineering, service, etc.,” says Wang Weidong, marketing director for Ching Ming. “ABB also tailored a complete range of intelligent solutions for us, helping us focus on high-end customers and markets with high-tech and sophisticated products.”

To more effectively optimize the efficiency in release agent spraying of die casting, ABB developed a new solution: Spraying & Extraction MultiMove. The solution increases productivity by using one control system for two robots, one for extraction and the other for spraying release agent, and reduces the adaptation error between the two robots and minimizes interference between different equipment by using one program.

“ABB’s robotic automation system really helped us improve our competitiveness,” says Wang. Ching



>FACTS

About Ching Ming


Ching Ming Metal Manufacturing Ltd. is a Hong Kong-invested company and a subsidiary of Hong Kong Ching Ming Co., Ltd. Established in 1968, Ching Ming Metal Manufacturing and Ching Ming Aluminium Die Casting Mfy. Ltd. specialize in making and processing aluminum alloy, zinc alloy and magnesium alloy die castings as well as a variety of metal shaft work pieces for household appliances, electronics and automobile parts with sales throughout Europe and America.



“ABB’s robotic automation system really helped us improve our competitiveness,” says Wang Weidong, marketing director at Ching Ming. Wang left, stands with Yong Yu of ABB.

Ming has chosen to work with ABB because its robots’ high precision and performance, the high degree of protection its robots have for working in harsh environments, plus its easy-to-use software made for foundry, says Wang.

As a result, the robots and their solutions supplied by ABB, a long-term partner of Ching Ming, have allowed for flexible and high-speed processing with optimized efficiency, improved precision and quality, lower cost and less waste.

Industrial robots have unparalleled applicability for the weaknesses of the Chinese foundry industry, such as out-of-date equipment, low content of technology, unstable production and product by hand work, among other things, says Wang. “It is evident that robotics will be a solid foundation stone for the development of Chinese foundry industry,” he says. 



Joined together in progress

A cooperation between PSA Peugeot Citroën and BMW results in a new kind of car engine.

> In 2002, PSA Peugeot Citroën and the BMW Group made the unusual announcement that the two automotive giants would be cooperating on the development and production of a new family of small gasoline engines that would be used in the cars of both automakers.

The agreement meant a new range of high-technology small gasoline engines would be developed in large volumes and in competitive economic conditions. The stated aim of the cooperation was to divide the development costs and to combine the partners' abilities and means by bringing essential economies of scale to the success of the deal.

Some four years later, the joint project has long seen the benefits from access to different corporate cultures and industrial techniques.

Two basic principles have driven the agreement. Firstly, the project has a joint organization with a management committee with equal representation and powers and one project manager and joint project teams made up of both partners' engineers. The second principle is cost sharing. The idea was that from the beginning the costs would be 50-50 for development, and then in proportion to the volumes

reserved by each partner for industrial investments, engineering costs and the launch.

The Project Team put in charge of designing the engines, based in Munich within the Research and Development Department, was under the auspices of the BMW Group for the first part of the project. Now, the PSA Peugeot Citroën group has assumed leadership of the industrialization, production and buying process stages. In the long run the project hopes to produce in the region of 1 million units annually.

There will be two types of engines produced. One will be an atmospheric engine, equipped with variable lifting distribution and with a capacity of 1.6 l and a power of 85 kW/115 hp. The other will be a direct injection engine, turbo compressed, with a capacity of 1.6 l and a power of 105 kW/143 hp.

From 2006, vehicles from the lower and middle of the Peugeot and Citroën ranges are using the new engines. They will also equip future Mini models. Their power ranges from 55 kW/75 hp to 125 kW/170 hp and sets new standards both regarding performance and driving pleasure, as well as in lower consumption and carbon dioxide emissions.

By Michel Singer
Photos PSA Peugeot Citroën



The new range of engines being jointly produced by PSA Peugeot Citroën and BMW will include both atmospheric and direct injection engines. At left, the Pôle Métallurgie in Mulhouse. At right, the enw engine.

The Charleville foundry of PSA Peugeot Citroën completely modernized its Pôle Métallurgie in Mulhouse (PMM) production line to manufacture the engines – previously the PMM was dedicated to small parts. This line has been operational since November 2004. It will produce some 1,150 cylinder heads a day. Two new lines are to be set up – one at the end of 2005 and the other one at the end of 2007.

The PMM process is proving to be interesting from an economic point of view, with a 15 percent increase in production compared to a traditional shell process. The investment itself is 30 percent less than the replaced process and the ground area taken up by this process is 15 percent less than that necessary for the shell process.


The PMM has made many innovations in a number of areas, including in the production of cylinder crankcases, crankshafts and track rods for the new engines. For example, the crankcases are made with a new patented solution and the track rods are forged in duplicate, giving a 10 percent gain on the price per piece. Steel was chosen over cast iron for producing the crankshafts, for reasons of both bulk and cost. This choice has enabled first-rate feature and performance to be achieved for a price barely above that of a traditional gasoline engine crankshaft.

In total, this new workshop will bring cylinder head production to a level of over 25 percent compared to the highest ever in the factory's history, allowing the skills of the Charleville factory to be perpetuated and developed. In concrete terms, within the framework of the cooperation, 86 metric tons of metal will be cast every day, allowing one cylinder head to be produced every minute. Some 116 staff at the PMM workshop in Charleville will receive 6,300 hours of training in total.

In the cooperation project, quality management is paramount for both partners. Quality management

is therefore carried out based on common criteria in the BMW Group and PSA Peugeot Citroën, both for manufactured and bought parts.

The ambitious quality objectives of the project also benefited from past experience acquired in the development of other engine projects and particularly with the renewal of the “Carton Rouge” (red box) policy, which consists of only accepting retouches on the assembly line for a very small number of processes; anything more and the engine is systematically scrapped and none of the parts recovered.

The choice of this method resulted from the report that in the majority of cases of incidents with customers having problems, the offending engine had been retouched in the factory. This radical method has been tested successfully on DV engines, which is also confirmed by results among customers since it was launched in 2001. 

> FACTS

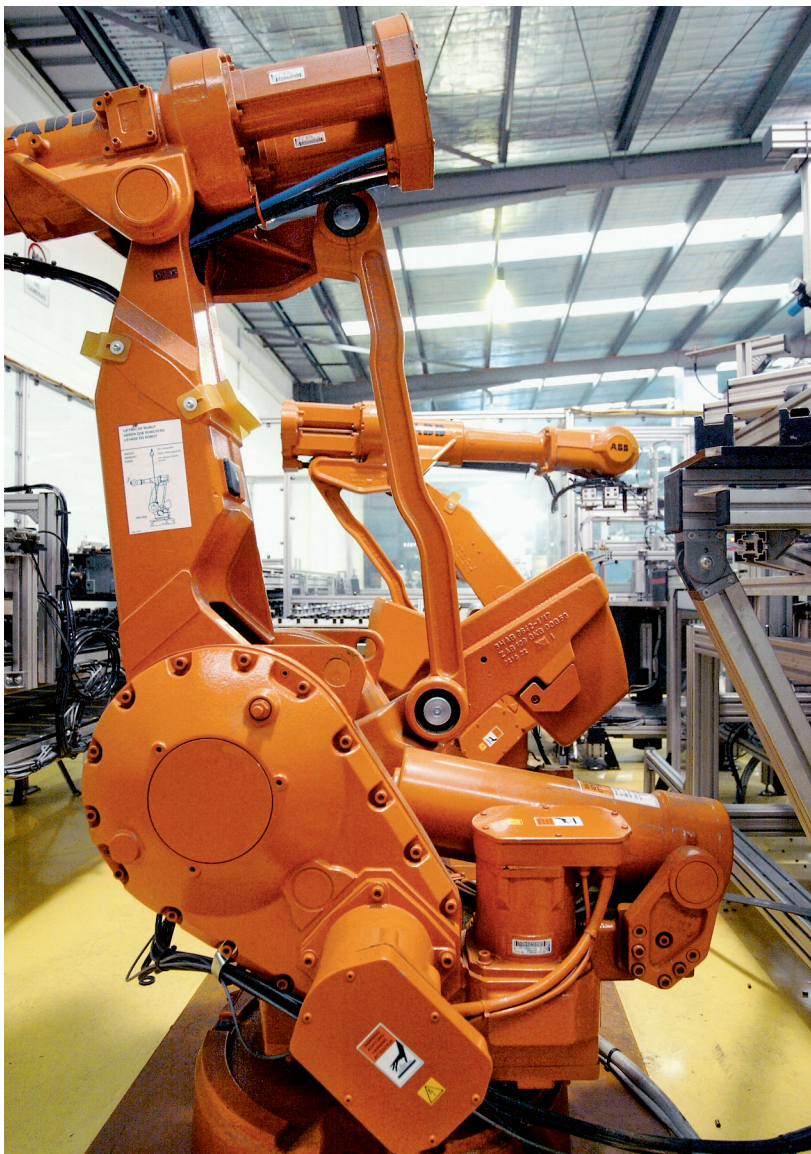
Pôle Métallurgie in Mulhouse at a glance

The Pôle Métallurgie in Mulhouse (PMM), set up on the Mulhouse site, produces platform two vehicles, for Peugeot 307 and Citroën C4 iP, and united the activities of the forge, foundry and equipment factories in September 2003. PMM is made up of three operational departments (Forge, Foundry and Equipment) and five support services (Quality, Administration, Production Coordination, Management and Industrial Synthesis).

The Forge department produces 70 percent of the steel forged parts (250 types) used in the group. These are highly technical parts which allow the endurance and security of engines, gearboxes, and transmission and drive-train elements. Various techniques are used: traditional stamping, semi-hot and cold forging, thermal processing and finishing of parts. The forge carries out daily production of over 400 metric tons delivered to the mechanical factories of PSA Peugeot Citroën.

All the way with automation

Australian manufacturer Mett turned to robots in 1991 to improve its production of automobile parts. It hasn't looked back since.



Mett has over 40 ABB robots, used for everything from machine tending to sawing, deburring, ladling, palletizing, gluing, assembly work and cleaning.

> When Werner Westphal, CEO of the Westphal Group, migrated from a small town in the north of Germany to Australia in 1959, he didn't know that some 10 years later he would be establishing companies that would become important suppliers to the automotive industry.

First came Hilton Tooling in 1969, a successful precision-tool making company. Then in 1983, Westphal made the decision to diversify into manufacturing. He had already developed a strong tool-making customer base in the heart of Melbourne's automotive industry with Hilton Tooling and had a small workforce of 18 people. It was this group that, with the support of Westphal's son Sven, took on the challenge of manufacturing, and so Mett Pty Ltd, a state-of-the-art manufacturing facility based in Melbourne, was founded.

Hilton Tooling's experience provided the company with engineering strength. But a new approach and a fresh way of thinking were the keys to Mett's success. With the new company every aspect of the manufacturing process was examined, says Sven Westphal, manager of manufacturing operations within the Westphal Group. "Quality is paramount, and the customer is always king when performance and delivery are to be measured," he says. With this motto, the management and staff knew it was important to "work smart, not work hard," and to use automation to its full capacity.

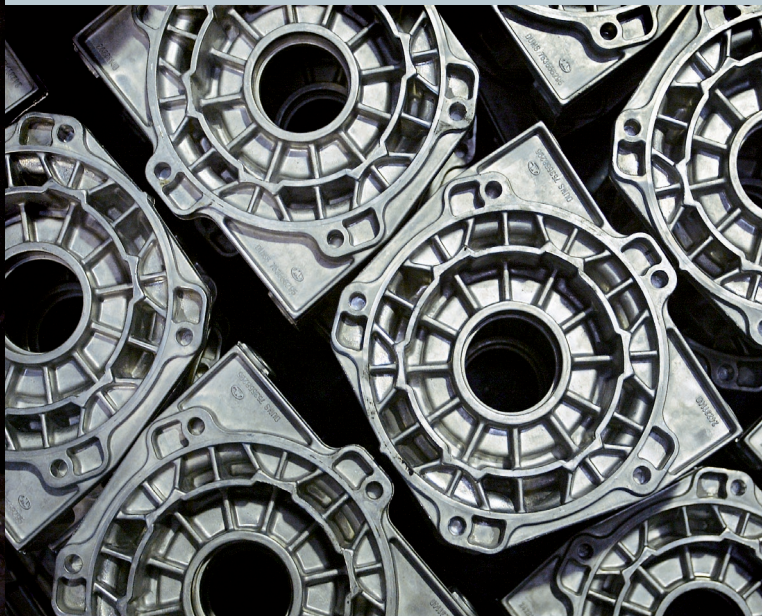
Automation played a strong part in Mett's development during the 1980s, but it was during Australia's recession in early 1991 that Mett invested in its first ABB robot cell. Sven Westphal says that Mett was so impressed with the capabilities of the ABB robotics as well as the user-friendly software, the local product support and the training offered that within 18 months it had invested in five installations and was

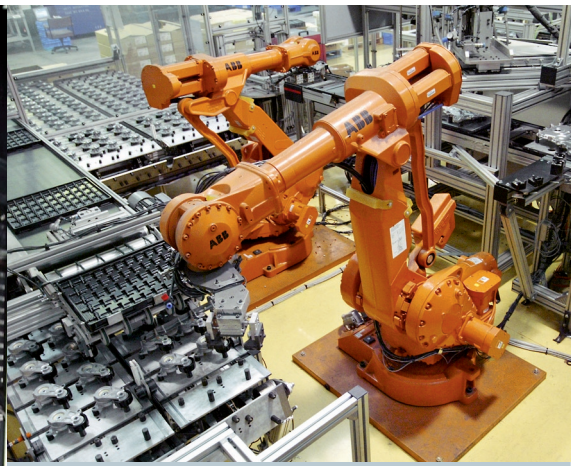
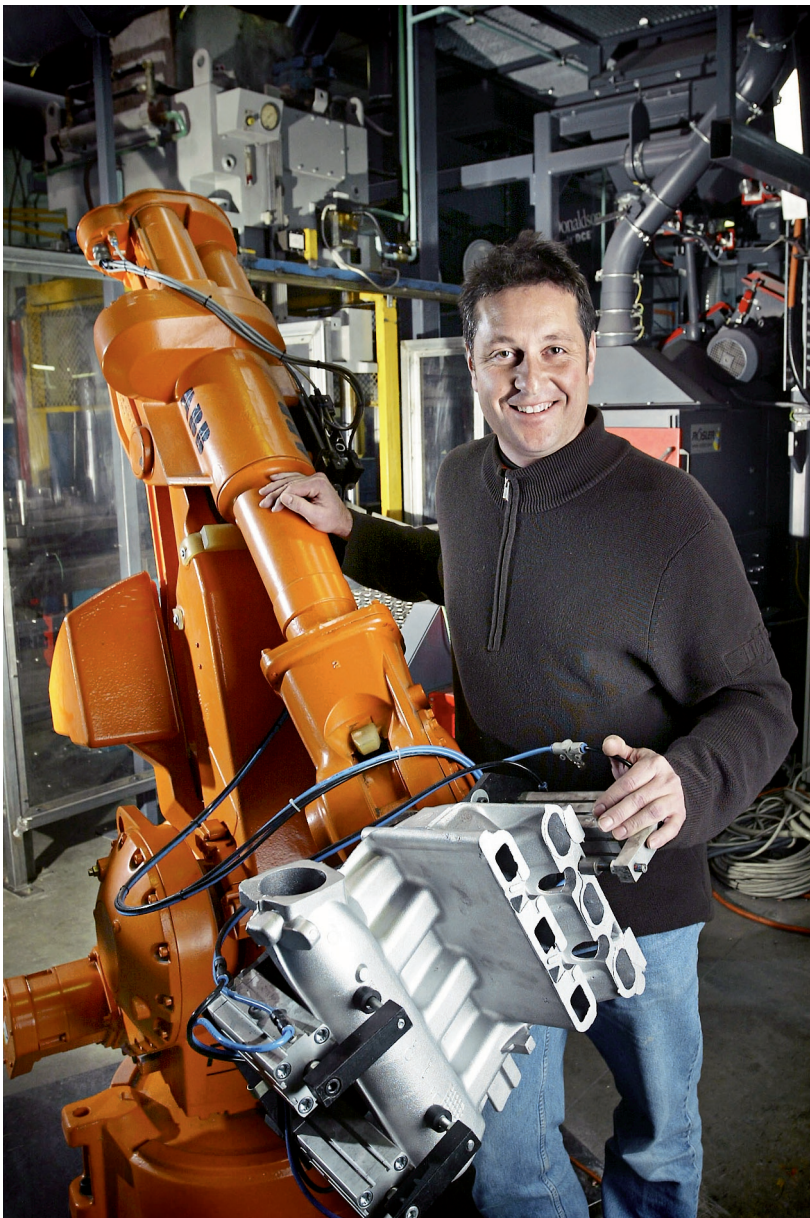


>FACTS

An award winner

Mett has achieved many outstanding accolades over the years. The company has won GM's worldwide "Supplier of the Year" on three occasions. "Winning such achievements requires dedication and support from key suppliers such as ABB," says Sven Westphal, manager of manufacturing operations for the Westphal Group. "Further, it is through our success that our partners achieve success and future ongoing business opportunities."





Why robots?

Mett has 40 robotic installations. These include a range of robots from ABB, including IRB 2400, IRB 4400, IRB 6400 and IRB 6600 robots. From these it has realized a number of benefits, including:

- Cost savings: The ROI for most robots is around 12 months.
- Ease of use: Offline programming makes it easy to change applications.
- High quality: Robots provide consistency in terms of quality.

“Quality is paramount, and the customer is always king when performance and delivery are to be measured.”

Sven Westphal

getting a return on that investment within 12 months for most of the robots.

Today the Westphal Group and Mett have diversified into many different but complementary aspects of manufacturing. “ABB is an important strategic partner to Mett’s continued success,” says Sven Westphal.

Sven Westphal explains that the company originally used robots for machine tending in the foundry. Today, he says, there is no limit as to what the company tries to achieve with ABB robot automation. The

list includes, in addition to machine tending, sawing, deburring, ladling, palletizing, gluing, assembly work and cleaning.

“Mett is innovative, and in many cases the company’s unique approach to robotic applications has made it a pathfinder in the world of robotic-supported manufacturing,” says Olivier Coquerel, ABB’s Australian robot automation accounts manager.

World globalization and shrinking local markets have forced Mett to shift into export markets. The company operates 24 hours a day, selling its products to Europe, Asia, North and South America as well as to the local industry in Australia. It produces 35,000 to 40,000 parts per day. Annually it uses 8,000 metric tons of aluminum and 2,500 metric tons of zinc.

The Westphal Group employs 350 people, a quarter of which are women. ABB robot automation enables Mett to tap into a wider potential pool of employees, says Sven Westphal. Currently Mett has more than 40 robot installations throughout a wide range of manufacturing sectors. The ABB robots used at Mett include IRB 2400s, IRB 4400s, IRB 6400s and IRB 6600s.

The future will be challenging, says Sven Westphal. But, he says, the Westphal Group’s strategy of diversity in manufacturing using ABB robot automation will strengthen opportunities of growth for Mett Pty Ltd in the world market. ☉

The right way to vent

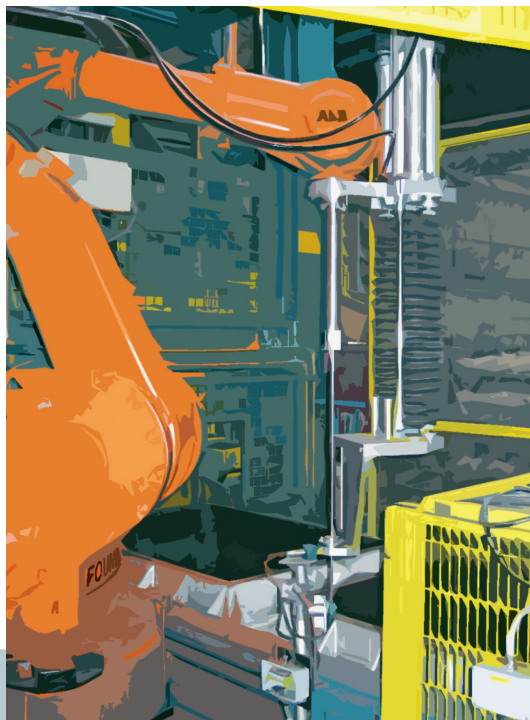
A new venting system gets rid of the need for building a vent into the mold.

By Martina Hess
Illustration based on a photo
from HWS

> Working with wet molds is a special application that requires special solutions. For example, wet molds require better ventilation than dry molds because it is necessary to drain off more casting gases due to the higher water content in the moist molding material. So air drains are cut into the compacted molding material by a molder using a blunt venting rod.

Heinrich Wagner Sinto Maschinenfabrik GmbH (HWS), based in Bad Laasphe in central Germany, has

Using an IRB 4400 robot to cut a vent into the model side of the wet mold, HWS avoids having to break the contour of the model with vents molded in.



>FACTS

Elegant solution

There are many advantages with the flexible robot solution for venting:

- Increased productivity and availability due to the use of robots in series production
- Reduced system complexity due to savings on application-specific cutting devices
- Time saved due to simple programming via a graphical user interface
- Optimized manufacturing process by avoiding manual setting errors
- Increased system efficiency with positional changes through online processing – no interruption to production
- Money saved on investment as one robot can be used both for the insertion of vents and the milling of pouring gates

come up with an innovative solution to the problem of venting. The company, which is part of the worldwide Sintokogio Group, is a market-leading manufacturer of molding systems, molding machines and associated system technology for producing high-compression molds for foundries.

The solution developed by HWS in conjunction with ABB uses a cutting head integrated in the robot, making it possible to insert vents into the mold on the model side in order to discharge the air located in the mold cavity during casting. Located next to the core insertion segment, the robot cuts the vents into the mold from above. As a result, vents no longer need to be molded, and a break in the model contour caused by cutting from the back of the mold is avoided.

The package includes an IRB 4400 robot along with a cutting head for short cycle times. Also included is not only technical safety integration of the robot into the molding system and an interface adaptation and data exchange, but installation, commissioning and training.

The robot automatically transfers the molding system data and integrates the coordinates into the robot program. This makes it possible to start all points on the mold surface and execute them precisely. The work cycle of the robot is approximately 2.5 seconds per hole.

The multi-axis robot is particularly suited for retrofitting in existing molding systems. Various application options are also available for venting: in the molding box separator at 90° to the upper molding box, from the model side in the core insertion segment or from the back of the mold after the rear separator of the upper molding box. A very diverse range of retrofitting concepts can be achieved thanks to the wide product range of ABB industrial robots available with payloads from 5 kg to 650 kg as well as floor, wall or overhead mounting of the manipulator.

The cutting device can be used to cut vent holes with a pin diameter of up to 10 mm in a cycle time of around 2.5 seconds. With larger hole diameters, the cycle time increases due to the slower cutting movement. Alternatively, it may be necessary to resort to a drill fitting or other solutions which can also be implemented using robots. ☉

A company with vision

Making sure that raw castings are without flaws early in the production process can save time and money later. All it takes is a good vision system.

> Francois Simard knows how maddening – and costly – it is for companies when they turn raw castings into finished products only to discover cracks or warps that render them useless. He also understands the premium companies place on having the best possible assembly-line optic inspection systems to detect part flaws early in the manufacturing process. That's why Simard, an engineer, entrepreneur and one of Canada's leading designers of machine vision solutions, is so excited about the prospects of RoboGauge, a 3D-based, automated measuring machine for industrial robots.

"It's simply the fastest and most precise automatic in-line metrology system in the world," says Simard, a design engineer, vice president and one of the half-dozen private investors in Orus 3D, the Montreal-area firm that makes the new machine. "Its features are designed to provide time- and money-saving solutions for the end user."

A set of tools that create or transform an ABB robot into a powerful in-line coordinated measuring machine (CMM), RoboGauge is designed to provide high-precision and real-time inspection of critical dimensions in 3D for optimal quality control in almost any manufacturing process and production line. One of two products being developed by Orus 3D, a year-old spin-off of Montreal-based Orus Integration, RoboGauge features a 3D laser scanning head, an RT-series vision controller and a Fly and ActiveFly 3D imaging library for the creation of grabbing sequences and automated inspections.

Mounted on the end of an ABB robot, RoboGauge scans parts and converts the data using proprietary optimized algorithms that produce a highly accurate and repeatable representation of the

surface to be scanned. A part-specific inspection scheme is then performed for quality control with a scan of up to 6 million points per second – light speed, compared with the few-points-per-second ability of CMM. Depending on the laser scanning head, a choice that is made in the design phase to meet each customer's needs – the accuracy of the RoboGauge system varies between 25 and 200 microns.

Although its principal application is as a metrology tool for the measurement of critical dimensions, RoboGauge can be set up to ensure the presence – or absence – of any part component in an assembly process. The system can also perform inspections and detect differences on the surfaces of products in any manufacturing process. That ensures, for example, that air bubbles or voids that result from the die-casting process are detected prior to the machining of parts.

"The most reliable way to find flaws," says Simard, "is to use a 3D system."

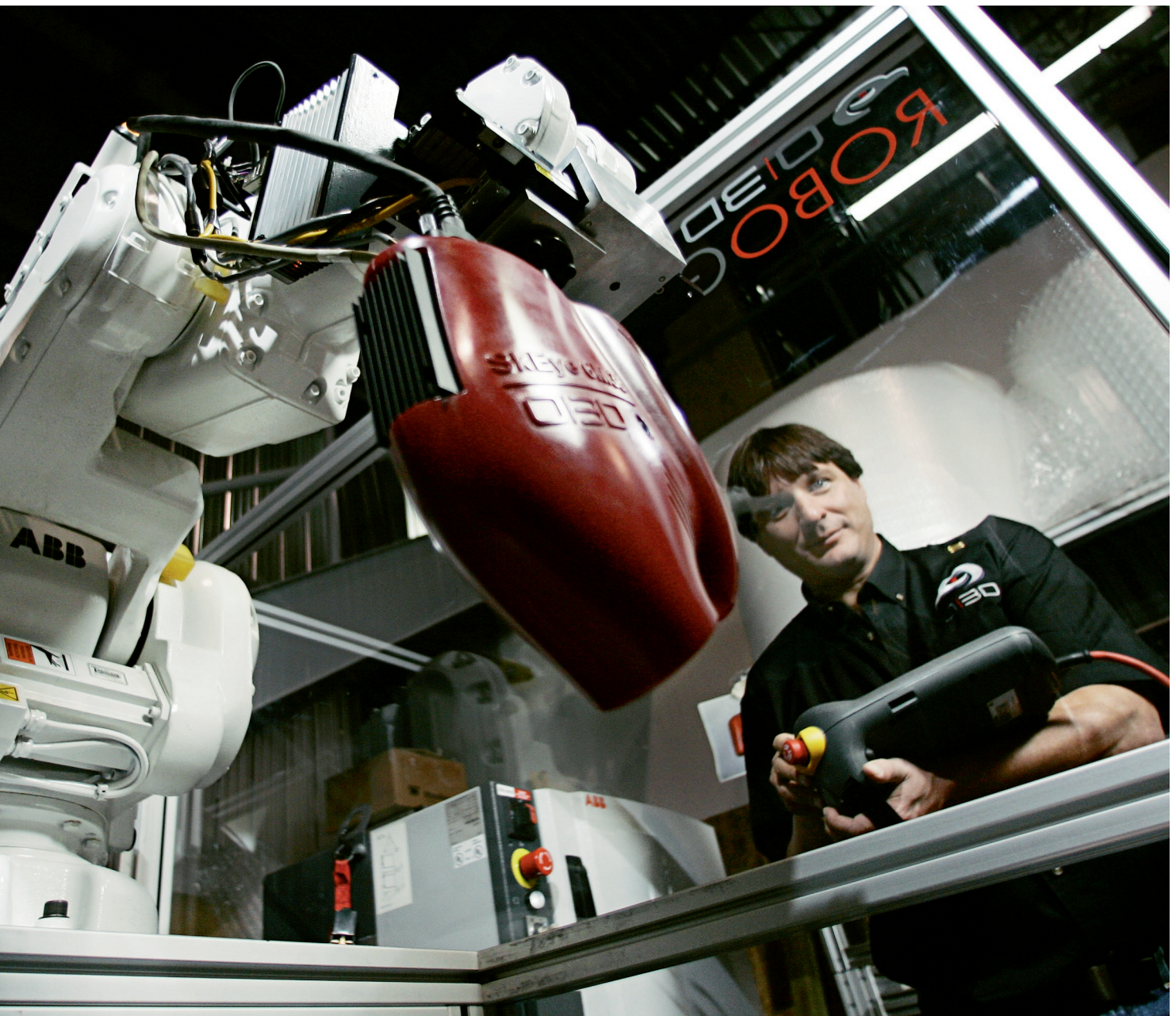
According to Stéphane Baldo, president of Orus 3D, it is the system's use of cutting-edge, 3D technology that sets RoboGauge apart from the competition.

"It's the big difference between our system and normal systems like CMM," he says. "You don't need a qualified operator because it's automatic, and inspection time is hundreds of times faster than 2D or other systems. Depending on the industry and the application, our system can save a company millions through reductions in production time and costs." He adds that the increased productivity and guaranteed quality control that can be achieved from RoboGauge's flexible design is best suited for the automotive, aeronautic and military industries.

Developed by a half-dozen engineers and pro-



Inspection time is hundreds of times faster than 2D or other systems, says Orus 3D CEO Stéphane Baldo of the company's vision system.



>FACTS

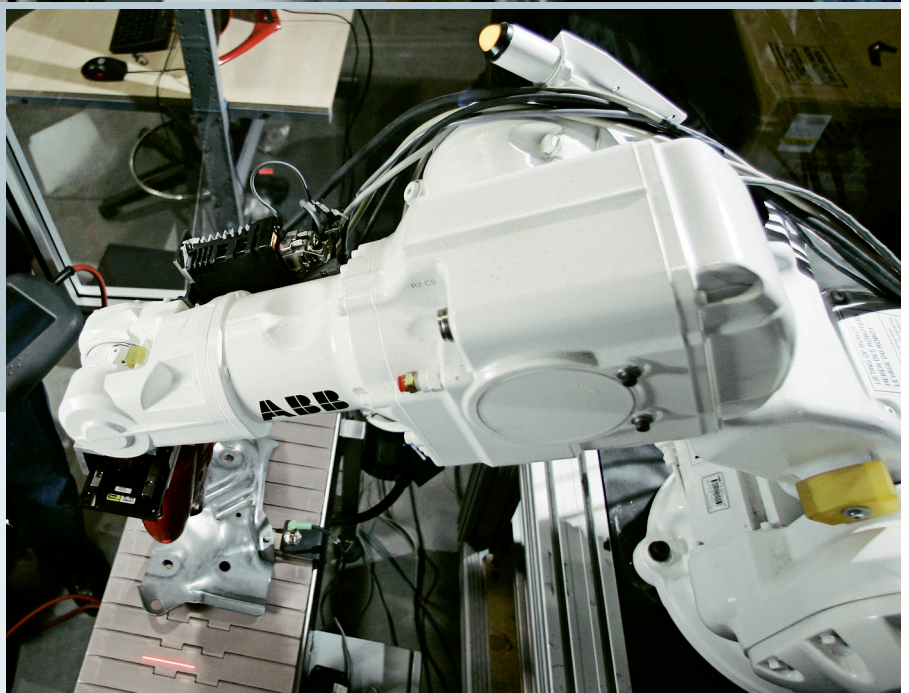
Smart choice

Orus 3D chooses to work with ABB robots for several reasons:

- Excellent rigidity/repeatability of ABB robots
- Flexibility offered by the IRC5 controller/ RAPID programming language
- ABB's experience as a worldwide leader in foundry robots

About Orus 3D Inc.

Company founded:
 2000 – Orus Integration Inc
 2005 – Orus 3D Inc.
 Employees: 15
 Revenues: approximately
 2 million Canadian dollars





>FACTS

Better vision, better products

The benefits of using RoboGauge as an in-line coordinated measuring machine (CMM):

- Completely automated (does not require a qualified technician to operate the system)
- Completely flexible and re-programmable
- Eliminates the need for costly part-specific mechanical fixtures that can cost more than 10,000 Canadian dollars each and need to be recalibrated every year
- Teaching of scan sequence takes a few minutes, compared with several hours with traditional CMM
- Scan sequence (run time): 6 million 3D points per second (as much as 100 times faster than other scanners)
- Scans and inspects every part in-line, so defects are caught early in the process, reducing waste

grammers, including Simard and Baldo, who work in the workshop, laboratory and offices that Orus 3D shares with its sister company in an industrial park in the town of Boisbriand, just north of Montreal, RoboGauge is now in the beta-development phase. The first prototypes are currently being used by two potential customers, one in the automotive industry and the other in the aeronautics field, where they are generating critical performance-related comment and feedback.

Throughout the various stages of the system's development, validation and demonstration, Orus 3D has chosen to mount RoboGauge on ABB controllers and robots. "The reason is simple," explains Baldo. "The repeatability and dependability of ABB's robots helps to guarantee the accuracy we need." That is music to the ears of ABB officials in Canada. "Our business model is to work with integrators who have a niche market and who know their customers," says Pierre Lavallée, ABB's sales representative for Quebec. "End users don't buy robots, they buy systems and solutions that add value and are a good channel for our products."

Once the technological challenges have been overcome related to installing highly accurate, robust scanning heads and intuitive software on an ABB

robot, Orus 3D will begin filling the orders that are already rolling in through a deal it signed recently with distributors in Canada, the United States and Europe. "Our mission is to design and develop the best 3D vision systems for manufacturers around the world," says Baldo. "Our goal is an international company." 📍



An easier finish

Orni eliminates manual cleaning for iron and steel parts in Spain.

By Gorka Sudupe
Illustrations
based on photos from Orni

> Things have changed little for many foundries, who still continue doing things the old-fashioned way when it comes to cutting and deburring of iron and steel parts. The problem is that when these applications are done manually, they often mean that the quality of the parts is not consistent, and a high number end up being rejected. What adds to the problem is the difficulty in finding the specialized workforce necessary for such a hard and dangerous environment.

To help solve this problem, the Spanish company Orni S.L. has been developing and manufacturing deburring cells with ABB robots for the past 20 years. The cells help to minimize these problems by implementing standard solutions that are customized to the specific needs of each customer.

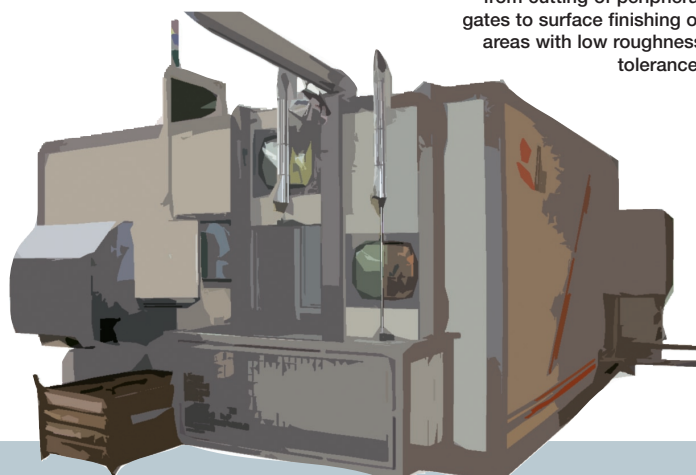
The deburring cells are manually fed and they provide a small buffer for giving some autonomy to the operator. The robot then takes over, handling the parts with different tools of the cell. The operations that can be done are: cutting of peripheral gates, fine-tuning of contours and partition lines, elimination of fillings using special mills and also surface finishing of different areas with low roughness tolerance.

One customer is Arbastu S.L., whose main activity is deburring of foundry parts. Arbastu has several cells manufactured by Orni in its workshop. Andoni Azula, production manager at Arbastu, says that thanks to automation, the company has been able to reduce costs and to satisfy the needs of its customers. All these achievements are due to the flexibility and reliability of ABB robots and the experience of Orni

in choosing the most appropriate tools that combine outstanding finishing quality and a long lifetime. This last factor is extremely important since it means a direct reduction in the cost per part.

On top of that, the operators don't have to work with deburring tools, improving their work conditions and security. ☺

Cells from Orni with ABB robots can handle a range of deburring applications, from cutting of peripheral gates to surface finishing of areas with low roughness tolerance.



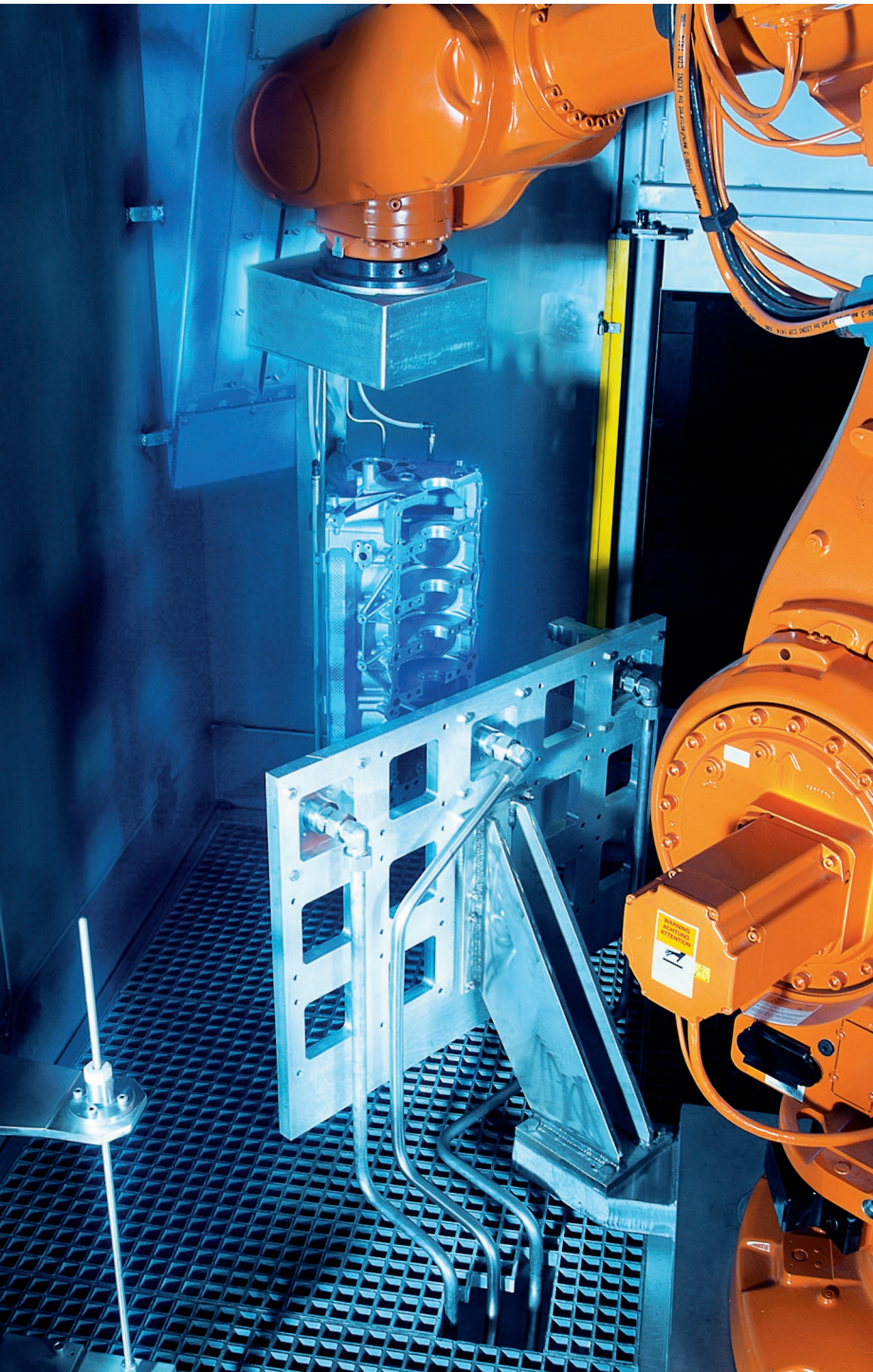
> FACTS

Benefits

Orni deburring cells have given Arbastu several important benefits:

- Reduced cost per part
- Fewer rejected parts
- Safer and more pleasant working conditions

Make it good, make it clean



BMW teams up with Dürr Eco-clean for a new approach to cleaning engine parts.

> The automobile industry has long relied on transfer stations that guarantee the efficient and timely processing and cleaning of identical work pieces. When pieces are less than clean, they won't operate to their fullest. The demands in terms of quality for this stage of production have been constantly increasing in the last few years. Even the tiniest chip which might be left behind after the mechanical production process, or any trace of oil or dirt, would detract from the quality of the engines.

But in order to clean and process parts effectively, stations require very finely tuned elements that traditionally have been relatively inflexible and difficult to adapt to different parts. To alleviate this problem, a new kind of cleaning module, the 47W FRC from Dürr EcoClean, has been developed in cooperation with ABB. Based on an idea from BMW, the new transfer station has been more flexible than older systems.

The new cleaning module, which has a robot fully integrated in the container, has made possible the efficient cleaning of a variety of engine parts with different types of processes. The technology combines tried and trusted cleaning processes with the flexibility of a fully-integrated Foundry Prime IRB 6600 robot in one treatment module (see story on Foundry Prime, p. 23).

The engine parts go through each stage of the cleaning process automatically, from pre-cleaning to drying. The baths and high-pressure nozzles were designed for one engine part type, with each of the nozzles is aimed precisely at one point. This means each part is optimally cleaned, but the system has to be adjusted for each separate part. The transfer stations must be able to conform to every change, from the slightest adjustment of an oil channel to the production of completely new engines.

The cleaning operation and the expense of conversion or adaptation have changed considerably with the new modular cleaning systems. At the heart

of each module is a Foundry Prime IRB 6600 robot which easily tolerates heat, moisture and dirt without a cumbersome protective shell. A layer of clear varnish prevents the paint from being washed off the robot or pigment from the paint dissolving. In addition, the engines as well as the cavities housing the robot's control units are protected by compressed air to prevent steam from getting in.


The robot forms the handling and processing system of the Dürr Ecoclean 47W FRC. It picks up individual or palletized work pieces and carries them into the multi-function container to undergo the various cleaning processes, including the injection flood wash, high-pressure deburring and drying.

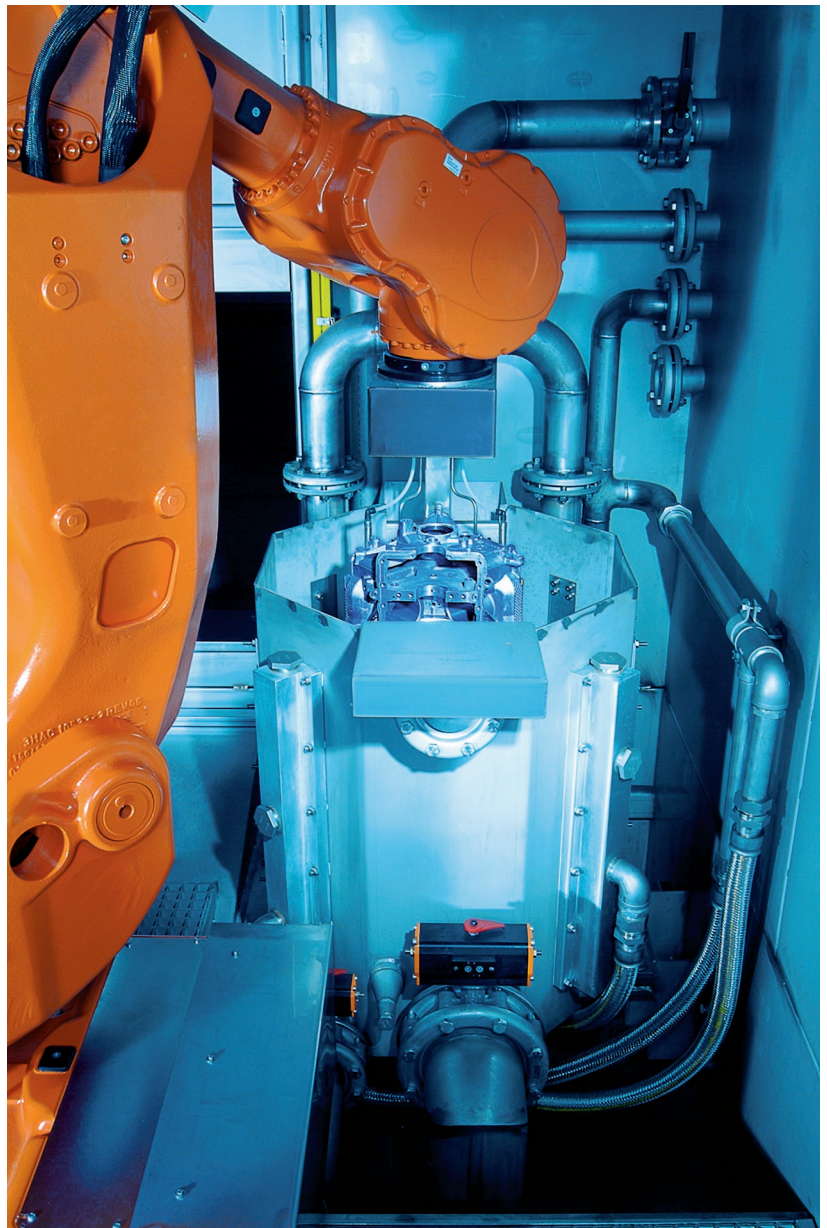
When alterations are made on cylinder heads and crankcases, even if their size changes, the positions of the cleaning nozzles remain unchanged. The robot's IRC controller simply needs to be programmed to conform to the new geometry, which can be done by an easy-to-use touch panel. It should be possible to clean parts from a variety of different engines one after the other in one module, from a 12-cylinder petrol engine to a four-cylinder diesel, although the flexibility of the new modules has not been stretched that far yet.

The development of the new robot cell was a joint project conducted by ABB Robotics, Dürr Ecoclean and the facilities planning department of the BMW Group. An initial test machine was delivered in May 2005 and adapted over the summer. By the end of 2005 the new transfer stations for cleaning had been installed in all three of the BMW group's engine production plants, in Munich, Steyr and Hams Hall.

The new cleaning modules are expected to quickly recoup their return on investment because of their greater flexibility. They have also now become the standard for the BMW group. This means that eventually each of the company's production plants will be equipped with these modules when the existing transfer stations reach the end of their useful lives or it becomes too expensive to re-equip them for new engine parts.

The first Ecoclean 47W FRC cleaning modules went into operation in the BMW engine works in Munich and Steyr in the spring of 2006. The number of modules needed in each plant now depends on the quantity of engines produced instead of on the number of different types of engine. This optimizes the production flow, as the robots can be quickly reprogrammed if the demand for one particular engine model increases.

You can read more about Dürr Eco-Clean at www.durr.com. 

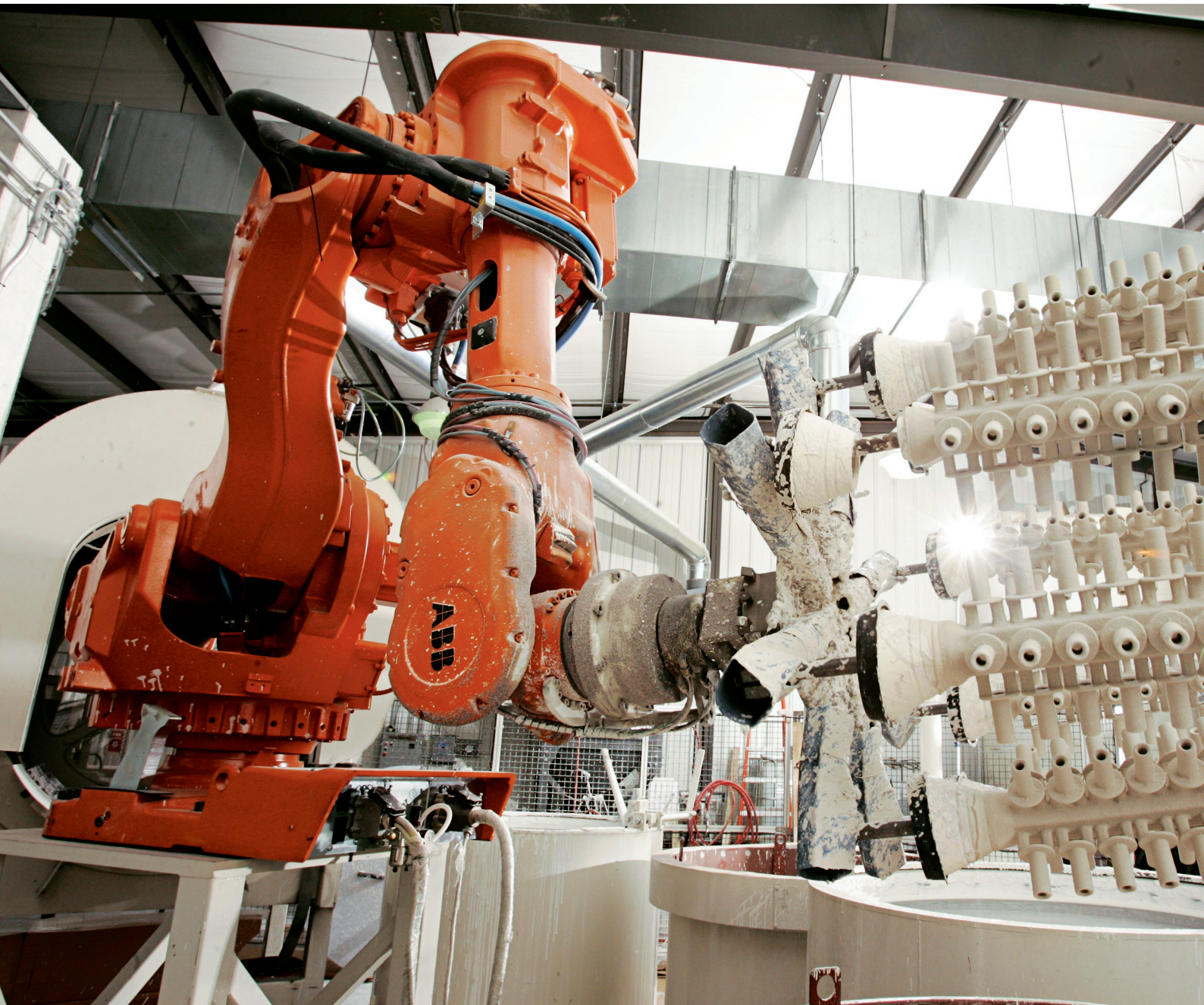


The Ecoclean 47W frc cleaning modules with Foundry Prime IRB 6600 robots handle injection flood wash, high-pressure deburring and drying.

> FACTS

No casing needed

ABB became involved in the project because it produces robots, such as the Foundry Prime IRB 6600 used in the 47W FRC, that can operate in a tough environment of this sort without a protective casing. Casings not only impede a robot's movement, they also wear out after a few months and have to be replaced. The additional costs involved in modifying the robot pay for themselves the first time a casing would be replaced.



Shelled to perfection

U.S.-based Franklin Bronze turned to automation to answer its needs for more capacity and volume from its investment casting. The results have been not just greater efficiency, but also higher-quality products and a cleaner work environment.

“We’re increasing our molds per day by 30 to 40 percent with the same amount of people.”

Kevin Weaver



> When Franklin Bronze and Alloy Inc. first opened for business in Franklin, Pennsylvania, in 1878, automobiles had yet to be invented, let alone robots.

More than a century later, the foundry – one of the oldest continually operating facilities of its kind in Pennsylvania – has rocketed into a new era with the addition of a state-of-the-art shelling system that was installed in 2005 by Shell-O-Matic Inc. of Montreal, Canada. The centerpiece of the system is ABB’s IRB 6600 robot, which has exponentially increased the foundry’s capacity while simultaneously improving the uniformity of the shells it creates.

“We were making good parts on this system from Day One,” says Kevin Weaver, who manages the Shell-O-Matic system for Franklin Bronze. “We weren’t expecting that.”

The investment casting facility produces ceramic shells to create parts for a multitude of industries ranging from automobiles to door hardware and industrial valves. Among its biggest product lines is a part that is used in conjunction with molds for creating glass bottles. In this area, Franklin Bronze is an industry leader, supplying most U.S. manufacturers as well as clients in 15 to 20 other countries.

Shells begin with wax patterns, which are injected to a high tolerance, measured down to 1/500th of an inch. Up to seven coatings, including colloidal slurry and a thin layer of sand, are applied to the shells before they are hung on industrial-sized racks to dry for specified amounts of time.

When done by hand, the dipping process can be both fatiguing and cumbersome. Six employees produce about 100 molds a day, standing for long hours over a vat of slurry or sand, allowing the coatings to drip off before hanging them on a rack.

“To remain competitive in the industry, we needed more capacity, more volume,” says Franklin Bronze President Robert Barber.

In 2005, the foundry invited suppliers to submit proposals for an automated solution. Among the bidders was Shell-O-Matic, a longtime partner that supplies the investment casting industry with both stand-alone equipment and totally integrated systems.

“They knew we were a reliable partner, and our price was right,” says Shell-O-Matic President George Muri. “I think we gave them exactly what they were looking for, formulated in a way that addressed their needs.”

In July 2005, Shell-O-Matic installed a complete shelling system, including the robot, slurry tanks, fluidized beds and a rainfall sander with automatic sand feeding. Four compact conveyors are used to dry the molds from each coat.

A supervisory computer with a barcode reader tracks parts as workers load them onto the conveyor. The computer determines which dipping program the robot will follow for a certain part. Once dipped, the mold is then routed through the drying process by the computer. The robot lifts the hanger on which the molds are attached and steers it through the room’s controlled climate according to the parts’ drying schedule. As a finished mold exits the system, a report is automatically printed out with the manufacturing details for that shell. Workers manually unload the finished pieces from the conveyor.

Under the new system, three workers make approximately 200 molds every day, compared with the six workers who produce half that amount in a section of the foundry that still dips by hand. Prior to the installation of the new robotic system, Franklin Bronze’s maximum capacity was 140 molds per day, using nine workers. Today, its maximum capacity is up to 400 molds per day with six people, although it has yet to reach that point. Man-hours have been reduced from 56 hours a day to 32.

In addition to the increased production, the qual-



ity of the shells is better, because the machine dips them the same way every time. The Shell-O-Matic system can also hang more shells up to dry – up to 250 pounds. This contributes to the increased capacity.

“It has great ease of programming,” Barber says, “and the reliability of the ABB robot is excellent.”

In a neighboring room, where employees still dip shells manually, a refurbished Shell-O-Matic 5-axis machine helps with some dipping and hanging, although its technology dates back to the 1980s. Barber says the company plans to upgrade to a second IRB 6600 by mid-2007.

In the new room, Weaver explains, “there’s not as much slop. When the guys are dipping manually, it gets a lot messier.”

Workers appreciate the impact the shelling system has had on improving their quality of life in the workplace. Not only is the environment cleaner, but the job is also less physically fatiguing.

“It’s much easier for the workers to use the robotic system,” Weaver says. “Each coat you put on gets a little heavier.”

Today, employees have a less-hecktic workday. The tasks are easier, and the job is generally less stressful.

“Any time you’re working with a labor force, it’s better to streamline things as much as possible,” says Weaver.

The system, which cost approximately 250,000 u.s. dollars, is expected to pay for itself within 2½ years of the November 2005 production startup, Barber says.

>FACTS

At a Glance: Shell-O-Matic Inc.

Founded: 1978

Location: Montreal, Quebec

Production details: Designs and manufactures specialized equipment for wax pattern and ceramic shell production in the investment casting industry. Solutions include both stand-alone machines and totally integrated systems.

At a Glance: Franklin Bronze and Alloy Inc.

Founded: 1878

Location: Franklin, Pennsylvania.

Number of employees: 100 total, 85 in the investment casting plant.

Production details: Manufactures precision castings in brass, bronze, aluminum, stainless steel and nickel-based alloys ranging in size from a few ounces to 15 pounds for the investment casting industry. The company manufactures 250 shells per day, with a capacity of 400 shells per day.

Choosing automation

Benefits for Franklin Bronze of Shell-O-Matic’s automated shelling system with the IRB 6600 robot from ABB include:

- Reduction of man-hours from 56 per day to 32 per day
- Increase of mold production from 140 per day to 200 per day
- Improvement of shell quality due to uniform dipping
- Return on investment of 2.5 years
- Cleaner environment for workers, including reduction of physical stress.



Ceramic shells for making bottles are dipped by an IRB 6600 robot. The uniform dipping makes for higher quality shells.

The return on investment “is very good,” says Weaver. “We’re increasing our molds per day by 30 to 40 percent with the same amount of people, and there is still a lot of capacity left.”

Shell-O-Matic provided startup and training and spent time at Franklin Bronze to fine-tune the system, and glitches were minimal.

“All in all, we had no major surprises,” says Shell-O-Matic’s Muri. “It worked fairly well, and I believe they’re quite pleased with the results.”

“The robot itself has pretty much performed flawlessly,” says Weaver. “Nothing’s fazed it; it just keeps moving.” ☉

The toughest protection around

Foundry Prime protection enables the unique combination of tried and true cleaning processes with the flexibility of a complete integrated 6-axis robot in one production unit. No additional protection covers, foils or shields are necessary.

> Robots working in foundries face an environment that is one of the toughest of any industry. The cleaning of casting parts with pressurized warm water can be hard on robots. Traditionally, to guard against these harsh conditions, robots have required special restrictive coverings. However, ABB has taken robotics a substantial step forward with its new unique solution: Foundry Prime protection, an innovation that revolutionizes high-pressure water jet cleaning of production parts by robots. It is the first protective system available worldwide that effectively protects against heat, wet and dirt without a complex protective covering.

Robots with Foundry Prime have a three-layer epoxy painting developed especially for extreme environments. The robot itself consists of anti-corrosive parts and works with pressurized motors purpose-built to prevent permeation of humidity. Even the electronics are protected against wetness.

Robots protected with Foundry Prime can withstand the 100-percent humidity and water vapor of a typical waterjet cleaning application and are ensured of a long life cycle in the aggressive environment of a cleaning cell. Robots with Foundry Prime protection can operate in a waterjet cleaning application at moderate speed with a cleaning bath temperature of up to 60 degrees Celsius.

Foundry Prime enables a brand new production concept whereby different parts can be cleaned by a cell-integrated robot. The idea is as ingenious as it is efficient: Since it no longer requires a cumbersome protective covering, the Foundry Prime robot is as flexible as any standard robot. This flexibility simplifies programming and enables the construction of significantly smaller production cells.

High-pressure treatments can be carried out in different applications. For example, high-pressure waterjet cleaning can be used



Foundry Prime protects the robot so that it needs no additional covering for tough jobs such as water jet cleaning.



> FACTS

Foundry Prime provides:

- 100-percent humidity-resistant under a typical water jet cleaning application with a cleaning bath temperature up to 60 degrees Celsius
- Perfect protection without an additional cumbersome covering
- Durability that means lower costs for maintenance and service
- Optimal cleaning possible due to increased flexibility of the robot
- Cleaning of very different parts in only one cell

for removing cooling and cutting oils after machine tool operation as well as for chip and flash removal after machining.

In case of part changes, only the programming of the robot control has to be adjusted to the modified geometry of the workpiece. This means different parts can be cleaned in any order by only one robot in the same cell. Process optimizations and adjustments are then finished in the shortest time and with least effort. ☺

Perfect touch means a better product

New Function Package Force Control Machining system helps robots lower costs and raise surface quality.

> Traditionally, the foundry finishing process has been not only extremely labor-intensive, but the quality of the finished product has been inconsistent. This is because casts have been ground, deburred and polished by hand. Until now, robots used for this task have been position-controlled, moving according to defined positions and speeds. If the robot can not reach the end of the part it is machining due to the roughness of the material surface, then the robot's servo will increase power until maximum torque, causing the robot to collide with the excess material along the way. As a result the robot stops; the tool breaks; or the work piece gets damaged.

To limit such damage, conventional cast-cleaning robots typically run at a slower pace, limiting productivity. Furthermore, the programming itself is very complex and time-consuming. But improved automated grinding and finishing of castings are now possible with the launch of the new Function Package Force Control Machining for use with ABB's robot control system.

At the heart of the Function Package Force Control Machining system are two advanced software features. The first, FC

Pressure, lets robots grind, polish or buff castings while maintaining a constant pressure between the tool and the work surface. The second software feature, FC Speed Change, enables a robot to debur or deflash surfaces of castings at a consistent speed, slowing down when encountering excessive burr.

"The new Function Package Force Control Machining removes the bottleneck and greatly increases process efficiency, saving time, raising overall consistency and boosting end-product quality," says Andreas Eriksson, product manager foundry, ABB Robotics. "One of the last real barriers to productivity improvement in this sector has been lifted."

FC Pressure software is aimed at processes demanding a high-quality surface finish. It allows the robot to effectively "feel" its surroundings and follow the casting surface, changing its position to apply a constant pressure on the surface, even if the exact position of the surface is not known. As there is consistent contact, debris such as a burr is removed to the same depth.

The result is improved surface finish; ability to handle variations in castings; min-

imum risk of damage to the casting surface; and predictable tool wear. Since pressure is obtained by moving the robot path, this function is more suited for polishing, grinding and cleaning, where a surface needs to be even and smooth.

In processes where path accuracy is important and where the finished result must comply with specific dimensions, FC Speed Change is recommended. With FC Speed Change, the robot is position-controlled and follows a programmed path that maintains a constant material removal rate. It operates at the maximum process speed and automatically slows down the robot when the machining forces are too high to minimize changed dimensions due to deflections of the robot arm and avoid subsequent damage to the part or tool due to stress and heat.

This results in shorter cycle times; ability to handle variations in castings; minimum risk of damage to the castings; and predictable tool wear. "Foundry cleaning operations are now much simpler, enabling finished castings to be produced better, faster and cheaper," says Eriksson. ☉

Contact Martin.Muehlgrabner@de.abb.com for more information

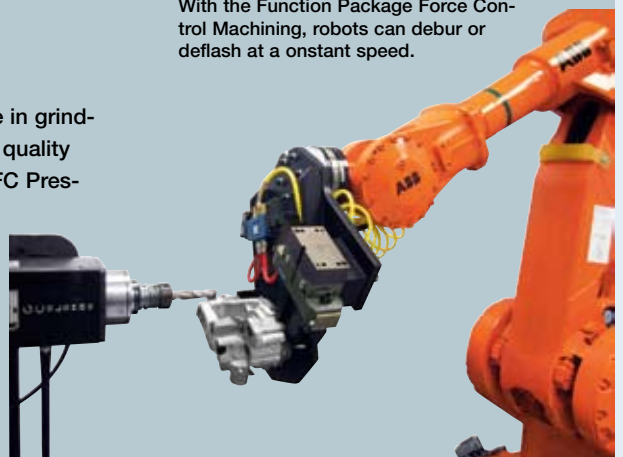
> FACTS

Best in control

The new Function Package Force Control Machining provides:

- Improved process results and quality - secure controlled contact force in grinding (FC Pressure) applications gives improved and consistent product quality
- Reduced programming time - 80 percent faster to program grinding (FC Pressure) applications by allowing the robot to "feel" the surface
- Shorter cycle time - 20 percent faster deburring applications as the robot adapts to surface defects
- Longer tool life - up to 20 percent longer tool life as there is consistent wear by avoiding tool and work piece collisions
- Coming soon: Programming time to be reduced from one week to one day

With the Function Package Force Control Machining, robots can debur or deflash at a constant speed.



Seeing in 3D

The new TrueView vision system from ABB uses 3D vision to place parts in applications that could only be done manually before.

> Until recently, it wasn't feasible to automate the sensitive task of engine decking because systems were unable to handle parts that were not in exactly the same position each time. Parts could be put in place by fixtures, by positioners or by precision dunnage – custom-designed and fabricated protective packaging – so that they would be in the perfect position to be assembled. However, these tailor-made solutions are not only complicated, they are expensive. Past attempts with 2D-vision systems to guide the robot have also not worked because they failed to detect when pieces tilted of parts in 3D space.

The only practical alternative has been manual removal and decking, which posed serious safety and efficiency issues. Injuries could be high, parts were easily contaminated or damaged, and capital and maintenance costs were high.

A truly flexible, fixture-less system has now been developed to perform the head decking operation that utilizes ABB's new TrueView vision guided robotic solution. The engine heads arrive at the head decking station inside semi-constrained dunnages. The 3D position and orientation of each part in the dunnage is unknown and can vary considerably. Each head must be intercepted using a four-pronged robotic end-effector, grasped and transported to the location of the engine block and accurately placed over the corresponding mating surface. The mating has to take place with an accuracy and repeatability of $\pm 0.20\text{mm}$.

A single compact video camera is housed in an enclosure and integrated into the robotic end-effector. Specialized high durability lighting units are also provided to properly illuminate the scene of interest.

> FACTS

Key features

- True Single Camera 3D capability (patented SC3D technology)
- Autocal3D feature automatically performs camera-robot calibration in under five minutes
- AutoTrain feature eliminates the need for part CAD models or manual measurement
- Completely-off-the-shelf compliant, reducing initial cost and complexity while increasing reliability and maintainability



Before each pick-and-place cycle, the robot positions the camera over the bin containing the engine heads. The vision guidance system captures a single image and performs its analysis. The end result is the complete 3D position (x, y, z) and orientation (roll, pitch and yaw angles) of the part.

The 3D position data for each part is transmitted to the ABB robot controller via Ethernet. The robot controller uses the information to adjust its entire path to match the location of the given engine head. The robot then proceeds to intercept and grasp the part out of the bin and transfer and position it on the engine block with a high degree of precision.

In extreme cases when the part is heavily tilted to one side, the vision guidance system can perform two measurements – coarse then fine – to achieve higher accuracy and reliability. This decision is made automatically by the vision guidance software running under the eVisionFactory software platform.

True View combines ABB robots, off-the-shelf hardware and an eVisionFactory software platform into a fully integrated package. It eliminates the installation challenges involved when attempting to combine disparate hardware, software and integration practices into a functional system. And the system is ideal not just for a variety of decking applications, but also for foundry applications such as 3D location and transfer of rough castings from a hanging conveyor into a de-gating machine.

Using a robot-mounted single camera and variable lighting package, TrueView is capable of full 6 degree-of-freedom 3D vision guidance. The robot is programmed to position the camera and adjust the lighting to an optimal image capture location. The eVF software processes the image and sends the appropriate path adjustment to the robot via Ethernet. This unique approach to vision guidance allows for automatic calibration and part training – which in turn shorten solution development and integration lead times. 🌀

IRC5 filter option protection

> Foundries are one of the toughest environments around, so it's no surprise that robot controller fans and heat sinks can easily get clogged with moist dust. To help prevent this from becoming a problem, ABB has a new Filter Option to protect the con-

troller. The filter, mounted at the rear side of the cabinet, can be complemented after installation with a filter mat.

Customer will benefit from lower maintenance costs – instead of cleaning fans and air channels, only filter will need

to be replaced. The robot controller will ultimately run for longer periods without maintenance and unplanned stops. Prototypes have successfully been tested for heat, vibration and flow. 🌀

Building easy-to-use applications

With help from Robot Application Builder software, Acheson provides Volkswagen with a cutting edge lubrication system that is not only efficient, but easy to use.

> VW Poznan is Volkswagen's Polish facility assembling cars, primarily for the local market, and Transporter vans for export. The site includes a state-of-the-art light alloy pressure diecasting foundry producing engine components.

When Volkswagen committed to foundry investment in Poznan it conceived of a facility that would utilize the latest technology to achieve the repeatable, consistent and controllable process required to produce the highest quality automotive castings.

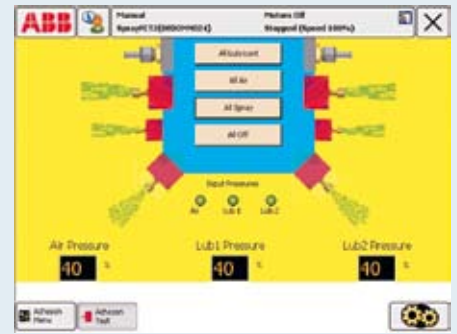
Volkswagen turned to Acheson for die lubrication technology that would provide the required degree of process control; Acheson in turn looked to ABB as its partner in the project. Acheson and ABB have a long history of cooperative development in the foundry field, having developed the first fully-integrated robotic die spray equipment together; RoboSpray was delivered to its first customer, Almec in Italy, in 1996. Since then Acheson has sold more than 170 ABB robot-based systems for die lubrication into the forging and pressure diecasting industries to customers in Europe, North America, South America and Asia.

For Volkswagen the combination of ABB's knowledge and experience of robot

applications and Acheson's process lubrication know-how led to the installation of the high-tech, water-free, environmentally-friendly die management technology called Deltacast Liquid Powder. This system consists of the Acheson designed and patented spray tool linked to a "Plug & Go" closed lubrication system for supplying the specially designed water-free die lubricant, coupled with an ABB robot equipped with the latest electronic and hydropneumatic control.

By adopting By adopting the Deltacast Liquid Powder technology combining robot and the specially designed process chemical that allows for the lubricating film to be formed independent of die temperature – and therefore across a wide temperature range – Volkswagen achieved its process control objectives and has additionally been able to significantly reduce the porosity of castings and extend the life of its dies.

Acheson's support for the customer started well before installation and training in the implementation phase of the project. By utilizing ABB's Robot Application Builder software and building on the previous decade of combined experience of providing fully integrated robot-based systems, the



Robot Application Builder and Acheson's die lubrication technology are user-friendly

interface between lubrication equipment and Volkswagen's foundry personnel was made as user-friendly as possible.

"ABB's Robot Application Builder software was the vital ingredient allowing us to integrate the Acheson application software with the ABB control to the extent that it appears as one seamless programming system to the customer," says Dieter Themm, business director of Acheson's equipment division. "We focused on delivering maximum user-friendliness while maintaining full functionality to ensure that our customer can take advantage of all of the process control features that the Deltacast Liquid Powder system offers." The fully integrated software allows for all of the Acheson spray control functions to be easily accessed by Volkswagen's operators. ☺

Easy programming with RobotWare DieCast

> A key tool for enhancing robot operation and production, RobotWare DieCast is a software product for easy programming and operation of ABB robots, dedicated to machine tending and post processing. It incorporates important features such as safe home run, user authorization, remote control, hot edit, production statistics, and event log; while providing an easy-to-use,



standardized and structured method of programming for machine tending operations.

RobotWare DieCast is exceptionally easy to set-up, requiring very little prior knowledge of programming. Using the software's seven-step, programming wizard in combination with the IRC5 FlexPendant control and its color symbol-based, key-stroke operation, one can swiftly create sophisticated machine tending programs.

Experienced robot programmers can use the software's RAPID program to create and modify individual stations and grippers. .

Customized production cycles are initiated with a single keystroke in the production window of the FlexPendant screen. Robot movements are displayed in real time on the screen and colour icons display the status of each respective robot station.

In the event of a problem occurring at an individual station, RobotWare DieCast can allow the robot to continue production around the problem station. ☺

Order the RobotWare DieCast Interactive Tour via mail: Claudia.Berg@se.abb.com

Automotive parts
at Alteams-Stilexo
in Sweden.

Small parts, big business



Aluminum components for automotive lighting systems are picked and placed by robots.

To compete globally as a specialist component manufacturer, it takes the right combination of skill, automation and foresight.

> You could easily drive past the Swedish town of Skillingaryd and not realize it. Traveling south on the E4 highway from Jonköping to Gothenburg, there is only one sign to announce its presence. Blink, and you miss it.

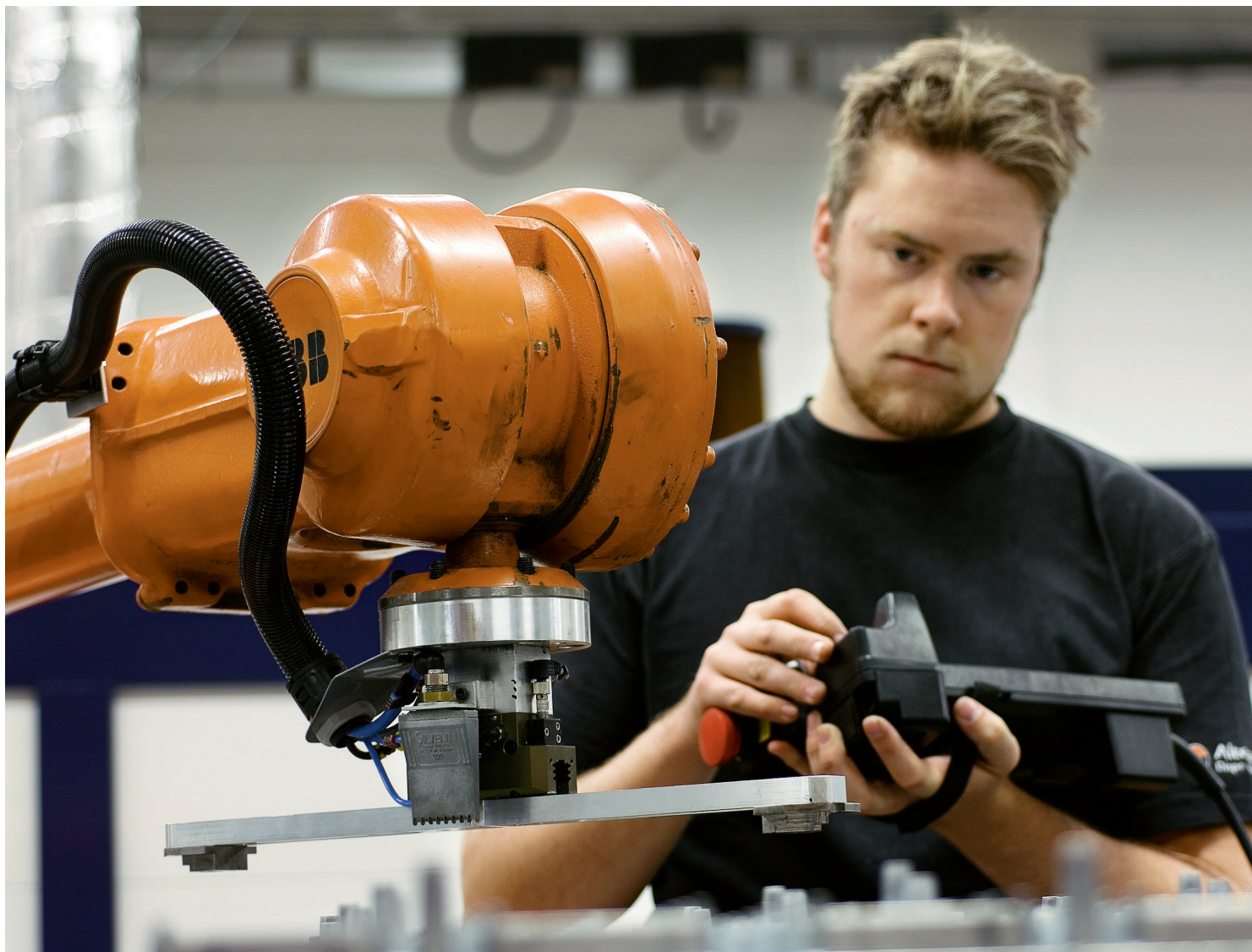
Per Jansson, vice managing director for Alteams-Stilexo AB, is hoping that nobody misses what his Skillingaryd-based company has to offer in terms of global competitiveness, however. He has helped build the once-family-run furniture fittings business into a state-of-the-art producer of aluminum alloy die castings serving the automotive and telecommunications industries. Today, Alteams-Stilexo is part of the Alteams Group of Finland, but much of the technology that gives the company its competitive edge has been sourced from ABB and automation development partner SVIA.

The business originally started as Jansson and Johansson, a local trading company that bought and

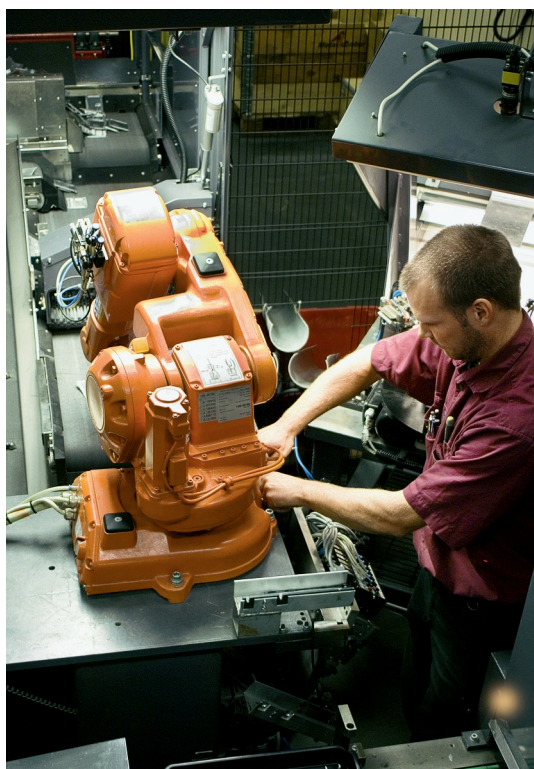
sold materials for making stands for televisions and racks for holding hi-fi equipment. The company later changed its name and its focus, changing its name to “Stilexo” – part of the company name derives from *stil* (Swedish for *style*) and *exo* (short for *export*). Jansson, son of one of the founders, still remembers when, in 1978, the company got its first two die-casting machines, allowing it to produce more intricate parts for its products than the straight steel tubes it had been making, which were simply cut and welded. He was just 8 years old.

Jansson started working for Stilexo when he was 18, by which time the company had begun to look for different markets and products that required added value and a higher technical content. The company began producing automotive components, such as electronic component casings for airbag units.

With the change to more advanced products, the company’s capabilities also changed. Previously, cast-



Cycle times for handling the aluminum components can be as little as 5 seconds.



Changeover times for new parts often take only a couple of minutes with the Multiflex system.

ing and deburring of components was done manually. Today, these processes are fully automated, along with machining, plating, moulding, testing, quality assessment and some assembly work (the company also has an operation in China to manufacture high-quality dispense gaskets for the telecommunications industry). The production sites at Skillingaryd feature nine die-casting cells, each with three robots – a mix of 6-axis IRB 4400s and smaller IRB 140s for picking, placing, loading and deburring tasks. “One of the big advantages with robots is that they allow for continuous production within a hot environment,” says Jansson. The molten metal used in the casting process reaches temperatures of around 700 degrees Celsius.

The involvement with SVIA began with a single product project, to supply an order from the automotive industry that needed to be produced in very high volumes to high-quality tolerances. The big advantage with SVIA, Jansson recalls, was its offering of a combination of vision technology and robots. A key offering where these technologies are united is SVIA’s Multiflex product, a standardized system for automatic feeding of unsorted parts using a robot and a vision system.

>FACTS

Why robots?

Stilexo can point to a number of reasons why it makes sense to use the IRB 4400 and IRB 140 robots it uses for picking, placing, loading and deburring of aluminum parts for the telecommunications industry.

- Short cycle times of only 5 seconds
- Tough robots can handle difficult environment with intense heat
- Vision inspection of 100 percent means little need for follow-up time on checking parts
- Industry production requirements are met that wouldn't be possible without the system

Alteams-Stilexo AB

- Specialist foundry for the production of aluminum alloy die castings
- Based in Skillingaryd, in Southern Sweden
- 130 employees
- 2005 revenues of 220 million Swedish kronor
- Part of the Finnish Alteams Group.

SVIA – Svensk Industriautomation AB

- Leading company in the design and development of automation solutions for component handling
- Based in Jönköping, in Southern Sweden
- 30 employees
- 2005 turnover of 45 million Swedish kronor
- Company partnered with ABB.



Some 30,000 PCB housing boxes for automotive lighting systems are produced each week at Stilexo.



“Multiflex is a simple concept, but an amazingly capable system,” explains Peter Karlsson, SVIA’s marketing and sales manager. Manufactured components are unloaded onto a series of belts, which are driven at different speeds in order to separate the parts. The final belt passes under a vision camera, which “talks back” to the robot, so the robot can pick the part. Using this system, all parts can be gauged and quality-checked automatically before being individually coded and sent for packing in customer-specific packages. Even rejected parts are coded individually, so that line managers can identify exactly why they were rejected. Karlsson also points out the system’s ability to change rapidly between parts – usually within a few minutes.

Multiflex systems are present on a number of Alteams-Stilexo’s production lines, including the manufacturing of PCB housing boxes destined for automotive lighting systems. “We produce this cast-

ing with eight cavities and 12 dimensions,” says Jansson. “That would have meant an enormous amount of follow-up in statistical process control. That’s why we went for this solution. We built in 100 percent inspection of these parts with vision technology and the gauge.” The technology allows for a cycle time of five seconds per item; some 30,000 pairs of castings for the boxes are produced each week.

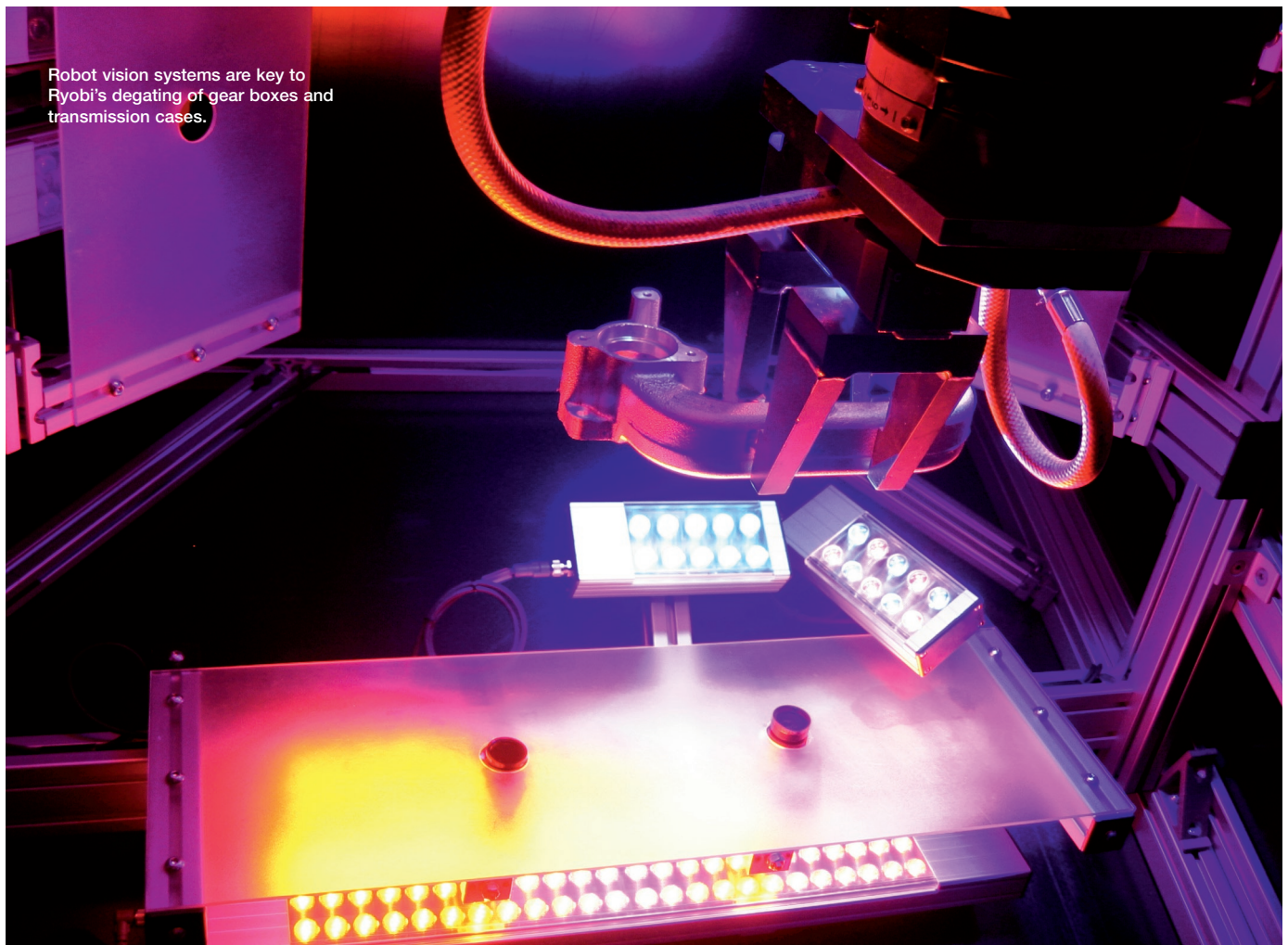
“It simply would not have been possible – in this part of the world, anyway – to match industry production requirements and our business needs without using this kind of technology,” says Jansson. “We needed something like this in order to make the part efficiently and to ensure the survival of the business in this location.”

After all, Jansson was born and brought up in the Skillingaryd area. And he wants to make sure that it stays on the map. ☺



Per Jansson

“We built in 100 percent inspection of these parts with vision technology...”



Robot vision systems are key to Ryobi's degating of gear boxes and transmission cases.

Let equipment take the risks

U.S.-based Ryobi Die Casting finds that automation means more flexibility, better quality castings, less waste, fewer shifts and better safety.

> “With the future looking like more variations of products with smaller lot sizes, it makes logical sense to utilize the automation technologies that are available today,” says Tom Johnson, President of Ryobi Die Casting.

Ryobi, located in Shelbyville Indiana, is one of the largest independent die casters in the world with 2004 sales totalling 161 million U.S. dollars. With 42 die-casting machines ranging from 500 tons up to 3500 tons, the company supplies various parts,

including cylinder blocks and transmission cases to the automotive industry.

Ryobi has been witness to the evolving industry over the past 20 years. What started as a small subsidiary of Japanese die caster Ryobi Ltd. with 50 employees, has grown to become one of North America's top-producing die-cast plants and employs 600 workers. With a workforce this large some might wonder if automation might one day drastically reduce the plant's workforce.

“A common misconception is that automation is putting people out of work,” Johnson remarks. “Automating our processes allows us to be more competitive so that our business continues to thrive and grow. As business expands, we need more people with

By Rachel Caldwell
Photos Rimrock

the skills automation calls for, and rely on our equipment to take the safety risks and get the job done efficiently and accurately.”

In fact, automating their cells with ABB robots has done just that for Ryobi. Several years ago, company officials had the foresight to see the return on investment for automating the casting finishing process.

In 2005 the plant installed a finishing cell to deflash gearboxes and transmission cases. Two robots begin by loading and unloading castings into two trim presses. The castings are presented to the robots on belt conveyors, and each robot uses a vision system to locate the parts prior to placing them in the trim presses. The castings are then placed on a conveyor that moves them to one of three finishing robots – each having a dual end of arm tool.

It is here that the robots equipped with two cameras each again utilize vision technology to identify and locate the castings, determine the die number that produced the castings, and then move the castings to the finishing tool. This state-of-the-art vision system allows the same automated cell to finish two different casting types each with up to nine different die numbers. Once the castings are deflashed, they are placed on the conveyor and moved to a shotblast that is then unloaded by the final robot, which dumps the shot and places the castings on an exit conveyor. This robot is also equipped with vision so that it can locate and identify the part. The parts are then moved to a leak test station where Ryobi staff members check for any leakage.

Due to the increased productivity, quality and consistency realized by this cell, Ryobi has since installed three additional deflashing systems. Since production did not start at full capacity for most of the follow-on cells, the initial layout only had one deburr robot with the ability to add future robots as production increased.

Says Ryobi's Maintenance Supervisor, Dave Bentley: “It's fascinating to watch the technology change and evolve. I've been here 12 years, and every time I think I've learned something, something new comes along – like the vision.”

The days of producing the same product over an extended period of time have passed. Today, product life cycles are typically very short. Even within a one year period, there can be minor modifications that are needed very quickly to maintain a market share. In Ryobi's case, “The key to providing effective solutions is to create, design and integrate flexible automation technologies that our customers can easily apply to improve their production processes,” says Tom DeJong, CEO of Rimrock Corporation in Columbus, Ohio, the company providing Ryobi's robotic solutions and a leading supplier of automated capital equipment for the die-cast industry, ranging from robotic part finishing and material handling to robotic spray and ladling. “We understand that modern die casters face unique challenges on a daily basis. Due to the competitive nature of the industry today, automation solutions need to be easily modified and

>FACTS

About Ryobi Die Casting

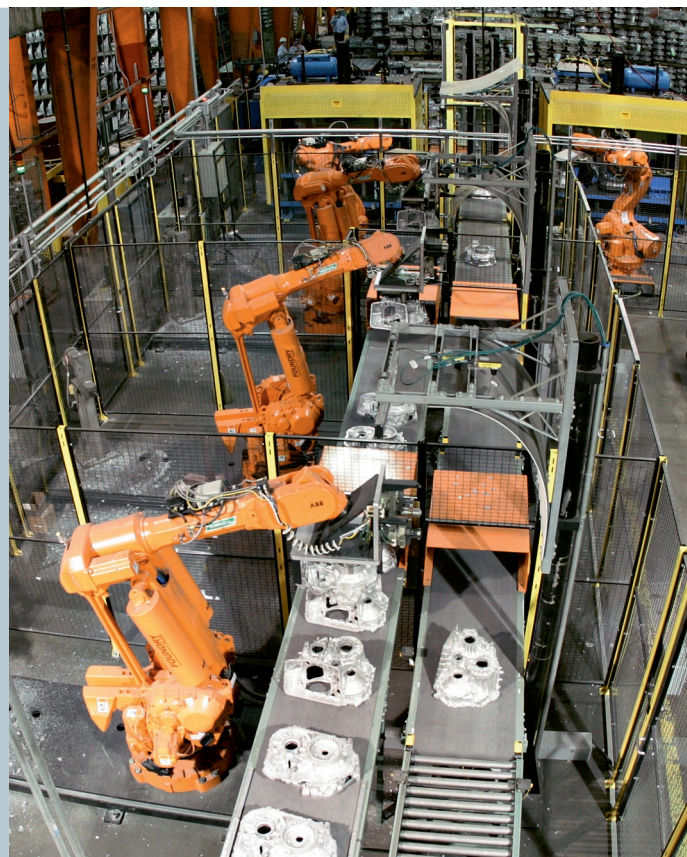
- Located in Shelbyville, Indiana in the U.S.; subsidiary of Japan-based Ryobi Ltd.
- 600 employees
- Sales of USD 161 million (2004)
- 42 die casting machines

About Rimrock Corporation

- Located in Columbus, Ohio in the U.S.
- 103 employees
- Specializes in automated capital equipment for the die cast and foundry industries, ranging from automate part finishing and material handling to spray and ladling



“The key to providing effective solutions is to create, design and integrate flexible automation technologies that our customers can easily apply to improve their production processes,” says Tom DeJong, CEO of Rimrock Corporation



Work goes on in the finishing cell with two twin presses, six robots, a large conveyor and shotblast.

decidedly flexible to allow our customers to customize the equipment on a case-by-case basis,” DeJong says.

For instance, if Ryobi would be forced to finish different parts of the same basic size, the plant would simply have to change the end of arm tooling and reprogram the cell. This ultimately will increase the plant's payback, and the return on investment will begin to build exponentially.

Finishing isn't the only area that can easily become integrated with today's automated technology. Spray and extraction robots are also becoming a necessity for today's die casters. With these tools in place, cycle times are decreased and the cooling time is consistent, resulting in less scrap. Die casters also have to determine what producing quality products is worth to their customers. For instance, a car manufacturer for which Ryobi produces castings is a USD 9 million per year customer. With the quality of the castings worth one percent in cost reduction, this particular customer is realizing an annual savings of USD 90,000 through the reduction or even elimination of the number of bad castings that have been machined. This is certainly a good argument for repeated business with Ryobi.

Finally, quality and cost may be the most visible elements driving automation today, but safety is a key issue. Workers' compensation claims go down with automation and in Ryobi's case, this is largely due to the fact that hand filing at the Shelbyville plant has been reduced by approximately 85 to 90 percent. ☉

Salvation by simulation

Italian integrator Evolut uses computer simulation to save time – and money – in the deburring process.

> Since the early 1990s, the Italian company Evolut has been in the business of integrating robotic cells for the foundry industry. Based in Brescia, Evolut works hand in hand with robot supplier ABB to provide cutting-edge solutions for a wide range of applications.

Evolut has constructed robotic systems for some of the most diverse kinds of control, such as machine tools, transfers, presses – both in the hot-pressing of metals and pressure die-casting machines. It also has robotic systems for deburring cells, polishing cells, plus robotic assembly machines, and handling and palletization cells.

The company has recently come out with new simulation software for the deburring process. “Working with three-dimensional software such as CAD, the new software for moving and handling the robot in 3D allows Evolut’s design engineers to perform a feasibility study,” says Giordano Lancelotti of Evolut. “Plus a more accurate study of the machine dimensions, and to assess beforehand the individual points not accessible to the robot. Plant installation times can then be reduced, saving time and money.”

The highly sophisticated simulation software allows programming technicians to conduct a simulation of real-time plant function and off-line programming. “This permits a kind of virtual design and planning, an indispensable transitional stage on the way to guaranteeing specific, ideal results when developing a robotized cell,” says Lancelotti.

Where the cell does not yet exist, the simulation software provides a controller on the structure interior similar to that of the robot, which generates the work program on the basis of the cell’s three-dimensional design – all graphically – telling the robot in simple terms which trajectories to follow and which points to access. “Since it does not tie up the robot, unlike the classic self-learning programming sys-

tem, this program will certainly make for great time savings, particularly when programming complex routes,” says Lancelotti.

One application of this software has been adapted to the deburring cell for cast-iron castings. High transportation costs, the ongoing need for quality control and, more particularly, the shortage of staff to carry out what is very dull, hard work, have driven foundries to seek an effective and able-bodied substitute for man: a robot.

Evolut is one of the first companies to have constructed a robotized plant for a major commission manufacturer from the Italian Midlands that is dedicated to the cast-iron deburring process.

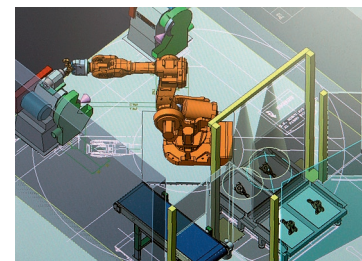
In a nutshell, this plant is made up of a vision system which recognizes the location and orientation of the workpiece in a simple position on a revolving table. The robot picks up the piece and travels over to the special machines that perform cutting of the feeder head, then the external and internal deburring of the pieces.

“The distinctive feature is that the machines are designed in such a way as to resist the robot’s dynamic thrust forces during the deburring process so as to avoid problems of vibration and excess strain that might prove detrimental to the actual process,” says Lancelotti.

The machines are hinged on a rotating axis and held in place with electro-pneumatic cylinders that self-compensate for the thrust. Another special feature is that the process uses diamond wheels, which offer a longer-lasting tool, low emission of powders during the process and a high degree of finish, among other advantages.

“Apart from making the loading system simple, flexible and avoiding the use of special workpiece support systems, the vision system used for the workpiece feed is used in detecting the amount of burr or flash to remove from pieces,” says Lancelotti. ☉

Simulation of the deburring saves time and money.



>FACTS

Evolut at a glance

- An independent company since 1991
- 66 employees
- 12.5 million euro turnover in 2006 – a 10 percent increase in sales over 2005
- 1,100 installations in Western and Eastern Europe and North America
- Strategic Partner to ABB



At your service

Evolut's aftersales service is key to the company's success. Two years ago, Evolut opened a customer service department with dedicated technicians who guarantee on-site repair times within 24 hours. The company is capable of guaranteeing in-plant repairs within its daily eight working hours and, wherever possible, remote assistance, exploiting modern computer technologies such as the Internet and e-mail.

An e-learning system is already in the beta phase at some pilot clients. The system allows the user to tackle some problems of medium difficulty by consulting the Evolut site, where photographic sequences and film clips guide the operator through "operative procedures" on the robotized installation.

A deburring cell for carrier counterweights doing its job, at left.

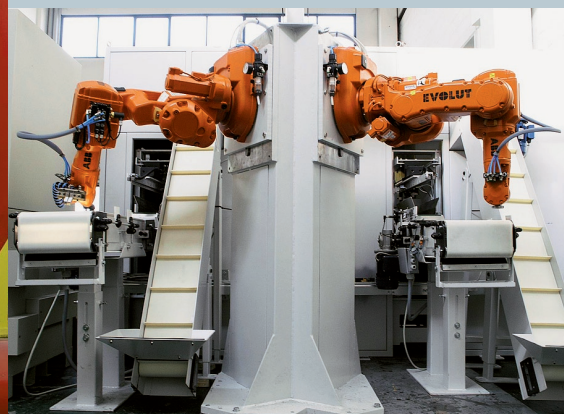
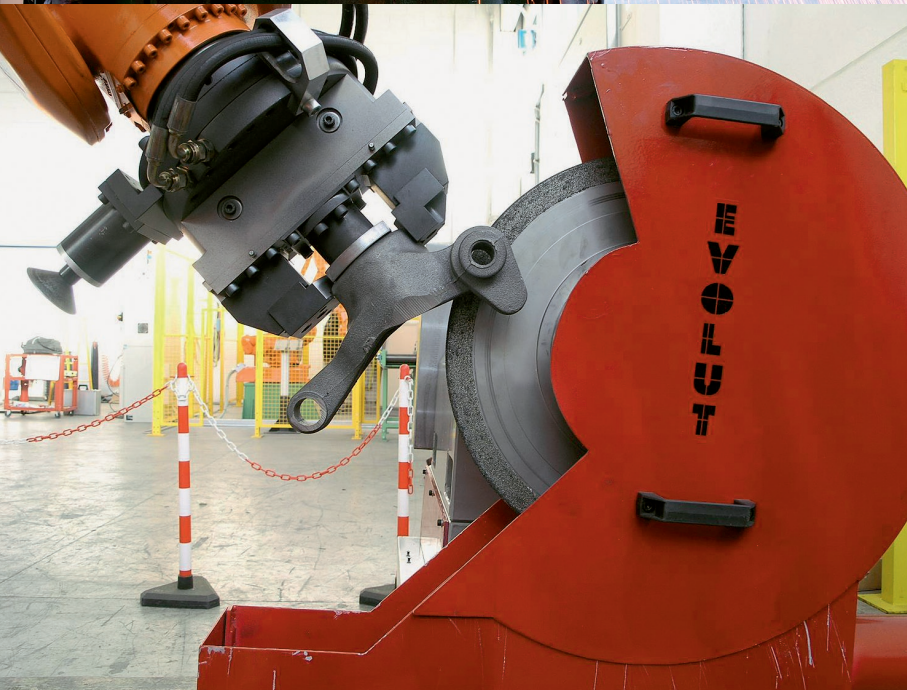
Lathe service cell with pallet feeding and vision system, below.



Feeding and uploading system of a deburring cell, right.



At left, a deburring unit with diamond-coated wheel. Below, a welding machine service cell with robots.



Service goes to new levels

Offering flexible service agreements at a local level is vital for ABB Robotics, which has service people in 40 countries.

> Much has changed in the service world since Jo Pauwels started at ABB some 25 years ago. The Robotics Services Business Unit Manager says that service today focuses much more on avoiding rather than fixing problems.

“If something went wrong in the past, we relied on the service engineer and that individual’s personal knowledge to repair equipment and get it up and running again,” he says. “With today’s focus on maintenance and diagnostic services, repairs are more accurate and can be made in minutes or hours, rather than in days.”

ABB’s service vision and strategy reflects these changing needs for those in the business. “We provide service for the entire life cycle of our robots on a global scale, wherever our robots are installed,” says Pauwels. “Our vision is to be the reason why

customers continue to buy from ABB.” The strategy for meeting the vision relies on offering a range of services, from the basics of delivering spare parts and providing field services and training all the way to total outsourcing wherein ABB takes responsibility for the performance of an installation.

Another service trend is that many companies are running their equipment longer and at a higher utilization than in the past. In order to crank out more of the capital invested, many companies are running two or three shifts on their equipment instead of one.

Pauwels says that, with this longer, more intensive use, customers are looking for more added-value services and advice in areas such as productivity. “Twenty years ago we talked to the maintenance staff about the type of oil used in a gearbox,” he says. “Now we are talking to plant managers about how to improve productivity.”

>FACTS

Facts on ABB Robotics Service

- ABB Robotics employees some 1,400 dedicated service employees around the world.
- There are 25 service units covering 40 countries around the world.

Facts on ABB Robotics Field Services

- Service is available 24 hours a day, 365 days a year.
- Remote technology enables remote services such as assistance and diagnostics.
- Installation, commissioning and programming support is available.
- Service agreements are increasingly popular, ranging from Warranty packages, Response packages and Maintenance packages to total robot management, with ABB guaranteeing performance and availability throughout the life cycle of the robot.

ABB has 150,000 robots installed worldwide, and with heavy investments made in competence development, customers expect the same service level regardless of location. As many companies move out of high-cost countries and into markets such as China, Russia and India, there is a constant demand for service training. Competence development is a top priority for ABB Service and a continual challenge. Half of Pauwels’ investment budget goes into competence development to offer local service support in the local language.

The other half of his budget goes into service technology, which, he says, makes it easier for service people to do their job.

Remote Service is a new service option from ABB launched in 2007. It will enhance existing services and enable a better level of customer service by monitoring customer equipment through a wireless system. With the new remote control technology,

customers will also be able to log onto an ABB site to access reports on the history, events and productivity of their equipment. (See story, below right, for more information on remote service.)

ABB Robotics has a large number of service offerings. One of them is pre-owned robots, a service that refurbishes old robots or sells them on behalf of customers.

"We take robots that are five to 10 years old, refurbish them and give them back to the customer with a warranty so they can run them for an additional five to 10 years," Pauwels explains.

The pre-owned robots offer gives customers security and saves them money, he says. "As an original manufacturer [OEM], we can guarantee factory refurbishment. The customer knows the equipment will be refurbished in good shape, and we provide a warranty and service contract again."

All refurbishing, feasibility studies and computer programming are done on ABB premises, away from the customer environment, to avoid disrupting daily routines. Equipment downtime is kept to a minimum when a new model is introduced into a foundry or other customer environment.

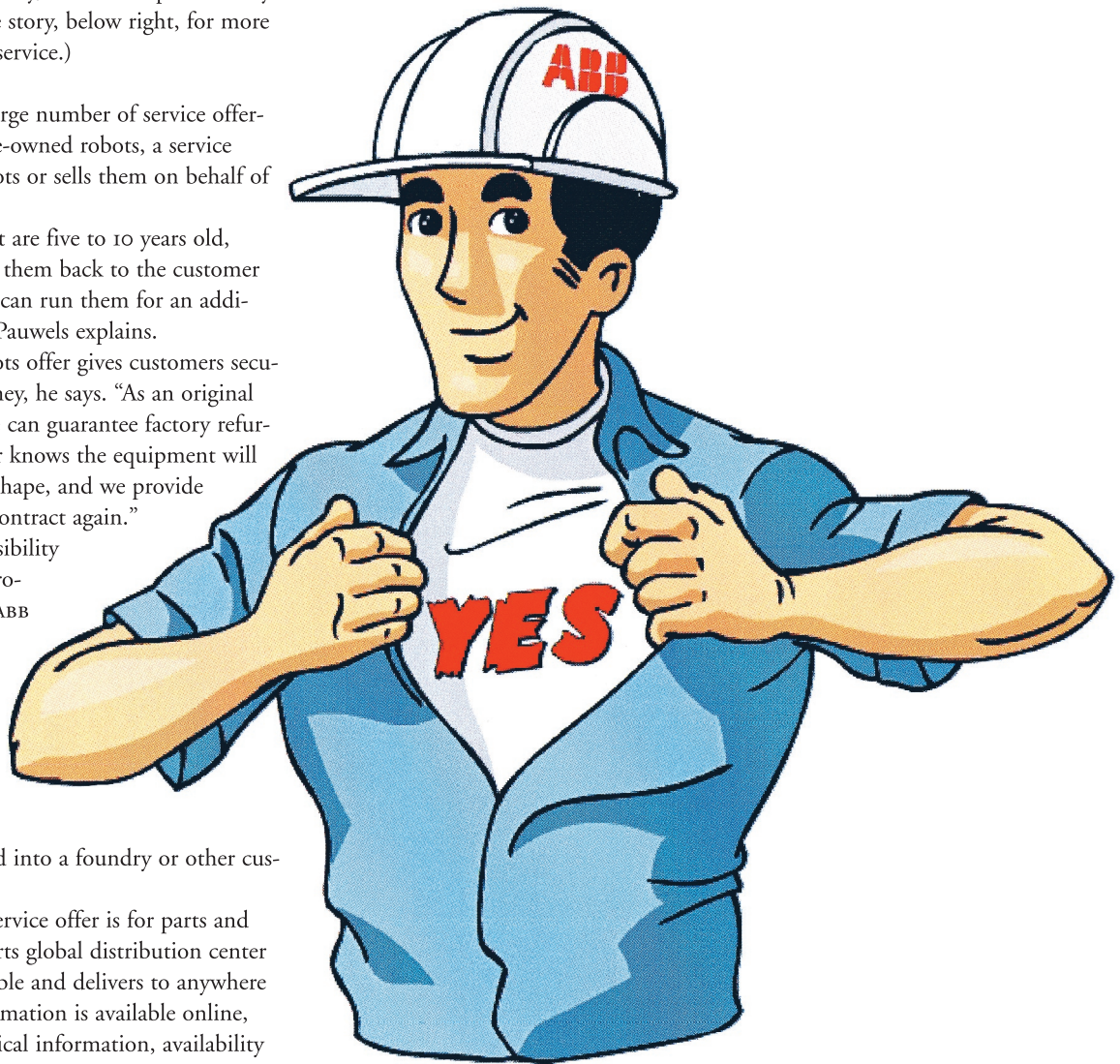
Another customer service offer is for parts and logistics. ABB's spare parts global distribution center has all spare parts available and delivers to anywhere in the world. Parts information is available online, including images, technical information, availability and prices. Parts can be ordered online as well.

To meet the demands of a variety of customers, ABB offers Service Agreements based on three different service packages: Warranty, Response and Maintenance.

For a fixed annual fee, the Warranty package takes care of everything concerning field services and spare parts. "It works much like an insurance premium, and the customer knows what his yearly cost of ownership is," Pauwels says.

The Response package is for "self maintainers," customers who do a lot of maintenance themselves but need intervention and support if something happens they can't fix themselves. ABB can guarantee to be at the customer site within four hours, depending on geographical proximity. ABB Robotics also offers a Maintenance package, with scheduled maintenance checks and a maintenance report.

Planned agreements, along with added-value services, are increasingly common in the service field, says Pauwels. "We see service as a stand-alone business," he says. "We won't only knock on the door if a customer wants new equipment; the customer can rely on us to take care of the whole life cycle of the equipment." ☉



Remote Service

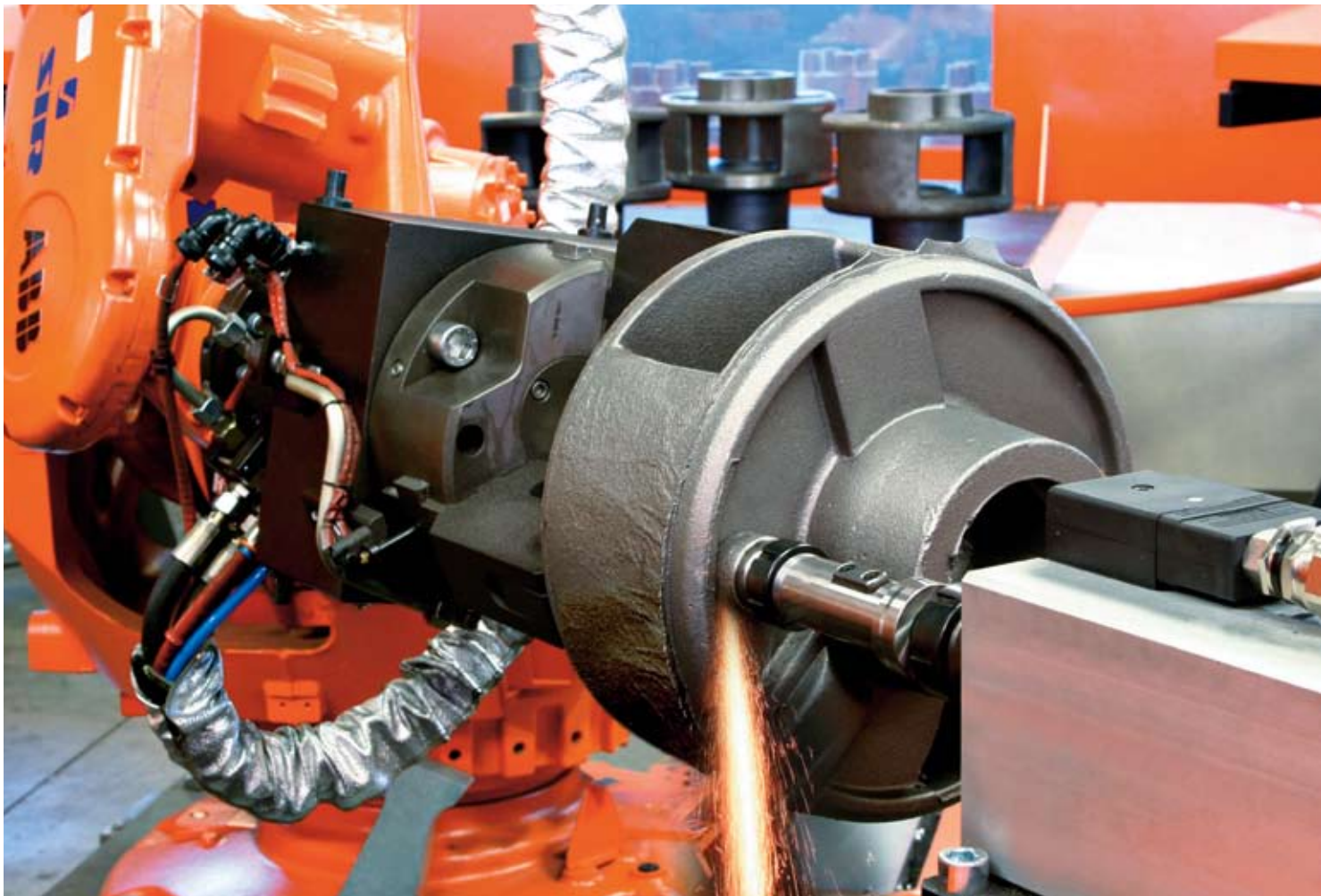
ABB Remote Service is a new service technology that enhances existing ABB services by monitoring customer equipment through a wireless system.

"From the ABB central diagnostic center, we can monitor equipment to see if and how it is running," says Jo Pauwels, ABB Robotics Services Business Unit Manager. "We can read the error log and instruct maintenance people on what to do or send out our own service engineer to the customer site. ABB Remote Service will result in enormous time and money savings for customers."

ABB's Remote Service package has three main aims: to extend the mean time between failures (MTBF) of robots and robotic components through better prediction; to shorten the subsequent mean time to repair (MTTR) through shorter reaction time; and to lower the overall total cost of ownership.

Using existing data in the robot controller and standard GPRS technology, this new service package centers around the concept of logging a robot's key performance data and sending this remotely to an ABB service center where it can be stored and used for reference and alarms where directly monitored. This information can then be used directly in conjunction with the three main aims stated above.

By Graeme Forster



Will of iron

By SIR
Photos courtesy SIR

Deburring iron castings is hard work. Unless you use robots.

> When Luciano Passoni established Soluzioni Industriali Robotizzate (SIR) in Italy in 1984, he started out by making 6-axis articulated robots and Cartesian grippers. But within several years, he realized that he couldn't compete with the big robot manufacturers, with their economies of scale and high productivity. So instead, he turned to integration. Today, the company has successfully made 1,700 installations around the world.

Among the many applications of SIR products, cast iron



Precise compensation is critical to the accuracy with which the profile is copied, says Davide Passoni of SIR.

foundry deburring is one of the most interesting, especially given just how difficult an application it is.

To satisfy the requirements of foundry processes, an extremely high-quality machine is needed, combined with unbeatable reliability and innovative engineering. In deburring, nothing can be left to chance – after all, you can't compete in Formula 1 with the family car, says Davide Passoni of SIR.

Quality isn't the only thing, however. It also takes flexibility and modularity, and SIR robotic cells can be assembled in a variety of configurations, both in terms of number and type of machining units, as well as the feeding system. Even the layout can vary in terms of footprint and configuration and the client can view a future cell in full detail in ABB RobotStudio, which gives a virtual tour of the proposed plant.

How is a foundry cell at SIR made? Inside the external cab, which is equipped with dust extraction



The milling and deburring units finish the piece to a precision of a few tenths of a millimeter with an IRB 6600 robot from ABB.

systems and is able to reduce the noise, is a genuine miniature workshop. Fully automated and autonomous, the cell is no more than 35 square meters. It is compact but easily accessible, with separate in-feed and out-feed areas for organized pallet and bin handling, says Passoni.

The robot, an ABB IRB 6600 with a 220-kilogram wrist payload, is equipped with an IRC5 controller. The robot is used for deburring and milling and boasts four different quick-mount grippers, each specially designed to handle a single type of part. An opposite configuration, with wrist-mounted tools and fixed workpieces, is also possible.

The robot is integral to the cell, surrounded by the process units. The robotic cell is usually composed of a deburring unit, equipped with multi-directional compensation, a milling unit with axial compensation, and a grinding station. For all these systems, SIR does not use commercially available products, but designs and builds its own. Precise compensation is critical to the accuracy with which the profile is copied, says Passoni, and SIR's solution allows for compensation of the tool position both radially relative to the rotational axis, and along the compression and extension axes.

To get the correct force on the workpiece, the compensation pressure is software controlled as the

tool follows its programmed path. Internal pressurization, constant mill lubrication and sharpening, quick tool changeovers during processing – these are just some of the typical features of SIR equipment, says Passoni.

Cycle times can vary from 90 seconds to 4 minutes depending on the workpiece. The cell cuts off the sprues, grinds the largest burrs and casting pillars, after which the milling and deburring units finish the piece to a precision of a few tenths of a millimeter. ○

>FACTS

About SIR

- Founded in 1984 by Luciano Passoni
- Turnover of 21.5 million euro
- Over 80 employees
- Acquired in 1991 by the Barbieri & Tarozzi Group
- More than 1700 installations commissioned in Italy and abroad
- ABB robots are essential to the success of deburring. An Absolute Accuracy package, combined with the rigidity of the robot, are required to handle the considerable mechanical and structural stresses generated by the process.

Go with a better flow

For Swedish die-casting company Ljunghäll AB, a high degree of automation is a prerequisite in the constant endeavor to achieve cost-efficiency.

> Ljunghäll AB is situated in Södra Vi, Sweden, 10 kilometers from Vimmerby, the childhood home of beloved Swedish children's author Astrid Lindgren. The company came to Södra Vi in 1963, and since then it has developed into one of Europe's leading die casters, with the automobile and telecoms industries as its largest customer segments.

Ljunghäll is a strong advocate of automation. "We have 92 ABB robots in operation serving almost all our casting machines," says Nicklas Jaldefeldt, in the company's maintenance department. Jaldefeldt is "robot daddy" at Ljunghäll with responsibility for a group of six robots. "All automation is about reducing the number of manufacturing stages and increasing the rate of production," he says. "Where it previously required seven or eight men to complete a part, the robot cells at each casting machine now do the same job."

Owned until 2003 by the grandchildren and great grandchildren of company founder Edvin Ljungkvist, Ljunghäll is now principally owned by Finnish company Capman, which has a large industrial presence in the Nordic countries.

"We are planning to become a more international player," says Göran Hjertstedt, who has been the new CEO since the change of ownership two years ago.

"At present we are engaged in fine-tuning a new business system that will link our processes together with the information flows in our planning more smoothly than before, so that we are better equipped for forthcoming challenges."

Some 15 thousand metric tons of aluminum bars arrive at the smelting works each year to be smelted down in Ljunghäll's nine ovens and then portioned out to 44 fully automatic casting machines, all of which are operated by ABB robots.

"The first robot was put into operation some time during 1986–87," says Jaldefeldt. Today, he says, Ljunghäll has every model of ABB's 6-axis robots – with the exception of the IRB 7600. "We have no need for such a large robot," he says. "A lifting capacity that extends from five to 200 kilograms is sufficient for us."

Over the years the company's robot teams have programmed, aligned and updated all of the 92 ABB robots that are currently in operation at the foundry. For machining of castings there are 57 numerically controlled machines, some of which are part of the 28 automated robot cells for machining and installing parts for finished products.

"It should come as no surprise that there are interesting assignments for the 40 technicians in the maintenance department and our robot team," says Jaldefeldt.

"In addition to keeping the machines in good shape we have to keep our knowledge up to date about new control systems, the latest refinements in programming and all new industrial engineering processes."

Ljunghäll realized at an early stage the importance of linking up the flows of material with complete machining into finished products that can be delivered directly to the customers' manufacturing lines. Good examples of this are the four complete lines for manufacturing oil sumps for cars. The die-cast parts are fed into the robots along with other components that make up the sumps. All machining of castings then takes place automatically, as does cleaning and drying, after which the robots assemble the oil sumps and carry out a rigorous leakage test before the finished products leave the cell.

"These robot cells have led to an extensive

"Simulation enables the customer and us to see both the advantages and disadvantages in a specific idea."

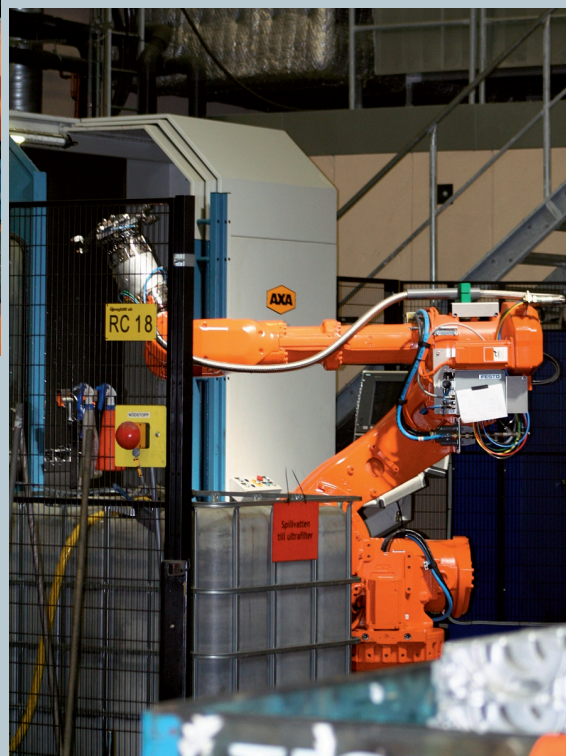
Göran Hjertstedt





Benefits from automation

- Number of manufacturing stages reduced
- Production increased
- Robot cells do the job of seven to eight workers
- Flow of material linked with complete machining into finished products that can be delivered directly to the customers' manufacturing lines.



Some 92 robots from ABB build oil sumps from start to finish at Ljunghälls.

>FACTS

About Ljunghäll AB

Number of employees: 735

Annual revenues 2005: 960 million Swedish kronor

Metric tonnage: 15,000

Production area: 37,000 square meters

Head office: Södra Vi, Sweden

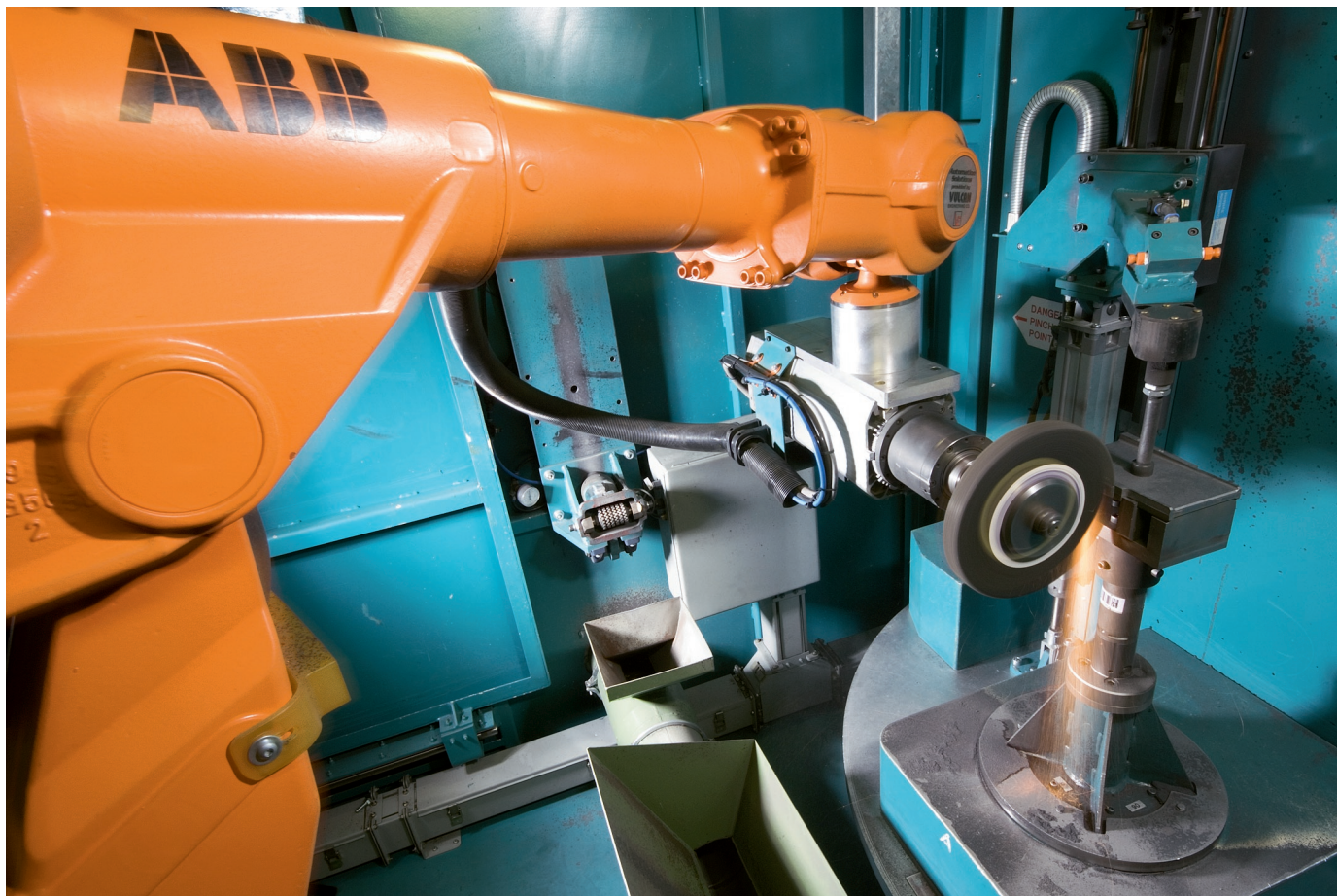
In-house maintenance department: includes six robot technicians

rationalization of our manufacturing," says Jaldefeldt. "They take care of all machining and assembly so that the oil sumps are completely ready for packaging and delivery to our customers who can then use them directly in their assembly process."

In the vehicle industry, prefabricated products along with high quality and environmental certification are some requirements that are most in demand.

"To be a market leader today it is not enough to have a well-organized production facility with robots and numerically controlled machines," says CEO Hjertstedt.

"In addition we must involve ourselves wholeheartedly and at an early stage in our customers' development of new products and contribute practical advice about tools and processes," Hjertstedt says. "Sometimes we carry out a computer simulation of the casting process to provide a better illustration of the interaction between tool and material. Simulation enables the customer and us to see both the advantages and disadvantages in a specific idea and to conduct a constructive dialog about what the best solution is to ensure quality." ☉



In fine fettle

Fettling of castings is easier when done by robots. It also means higher production.

> Bradken is a specialist foundry that manufactures wear-resistant iron and steel castings used in the production of grinding, crushing and shot blasting equipment. Its Darlaston site in the West Midlands in the United Kingdom specializes in the production of high chromium white cast irons, low alloy tool steels and normal carbon grade steels for these markets.

By Mike Badger
Photos Firth Rixson/Vulcan

> FACTS

Automated fettling is better

Benefits of Bradken's 424FS T Foxall casting finishing cell with an IRB 4400 robot include:

- Flexibility via programming, with 72 individual component fettling programs developed on the system already
- Productivity can be improved, since robot can work 24 hours a day if needed
- Health and safety of workers improved with fettling no longer being done manually

Fettling of castings at the Darlaston site has traditionally been carried out using manual grinding techniques – a method that, though reasonably effective, accrues significant disadvantages in terms of possible white finger and repetitive strain injuries and the knock-on effect of the Health & Safety requirement for operators to take frequent, mandatory breaks. Thus, as operators take their enforced breaks, disruption to production flow is inevitable.

With the decision taken at senior management level to initiate automation within casting finishing operations, Bradken turned to Vulcan Europe, a specialist automation company within the foundry sector and a company with which Bradken has considerable experience.

Reviewing the requirements of Bradken, Vulcan Europe suggested that its “plug and play” 424FS T Foxall casting finishing cell would be the right fit for the Darlaston site and the system was installed in May 2005.

Focal point of the cell is an ABB IRB 4400 Foundry Plus robot. In addition to its normal six-axes

A Foxall fettling cell from Vulcan has improved safety at Bradken in the U.K.

of operation, the IRB 4400 has been modified to incorporate a 15kW (20hp) high speed spindle fitted with an automatic tool changing facility. Two types of grinding wheel are used: resin bonded abrasive wheels for rapid stock removal and CBN wheels for lighter, dressing work, with the former carrying out the bulk of the work.

Immediately adjacent to the robot fixture is a two position, 180° rotary table with fitments for two NPL pneumatically operated workholding jigs, diametrically opposed at either side of the table. Thus, operators can simultaneously load or unload workpieces while the fettling cycle is in operation.

CBN wheels were initially trialed for all working cycles, as CBN wheel diameter does not diminish significantly from cycle-to-cycle through wear. Bradken, however, has had considerable success with bonded abrasive media for manual grinding and this ultimately proved to be the most viable and compatible option.

Finishing Shop supervisor Alan Price says: “Chromium alloys can be susceptible to cracking if subjected to excessive heat build-up, which propagate further during heat treatment. We have found with experience that rapid stock removal using bonded abrasives causes less heat build up than slower stock removal using CBN wheels. The downside is that wheel wear is significant, so much so that the grinding wheel contact surface has to be recalibrated by laser every 5-6 cycles.”

To cater for abrasive wheel wear the Foxall cell incorporates a laser calibration unit, and for general wheel maintenance, a standard wheel dressing facility. Airborne dust within the cell is removed through a dust extraction unit, which was installed by Bradken.

Programming and operation is through a Foxall HMI, which uses Vulcan TruTeach offline automatic programming. So far, 72 individual component fettling programs have been developed on the system by Alan Price.

Supervisor Price, who had no robot experience whatsoever until he undertook pre-installation training at Vulcan Europe and programming training at ABB Milton Keynes, believes the robot cell has had a major impact on the site's operations and its personnel. “Three operators have moved across from manual grinding operations and been trained up on the robot cell – and all are positive about the experience,” Price says.

“Though product cycle times are similar to manually-based operations, the robot can, if necessary, work 24 hours a day without a break – and operators can carry out other tasks while the cycle is in progress. Though we still carry out some manual grinding work, robot-based operations are definitely the way ahead.”



About Vulcan

Vulcan Europe (Richards Engineering Inc.) the established Leicester-based wholly owned European sales and manufacturing subsidiary of Vulcan Engineering Co. Alabama USA, has been awarded by ABB the Preferred Partner Status, Vulcan Europe's Foundry Robotics Division will form a crucial part of its manufacturing program designed to meet the demanding applications and productivity requirements of a modern foundry.

As an ABB Certified System Integrator Vulcan Europe will continue to design and integrate a wide variety of foundry robotic applications such as casting fettling, cut off, wax assembly & shelling applications, core setting & mould placement, core dressing, & combined vision systems.

About Bradken

Bradken was created by the merger of Firth Rixson plc and Forged Metals in early 2003. The company subsequently acquired Turbine Ring Technologies in the U.K. and Schlosser Forge in the U.S. Firth Rixson has also completed construction of – and will soon begin first-article production in – a new, 50,000sq/f, wholly owned subsidiary located in the Suzhou Industrial Park in Suzhou, China, a short distance from Shanghai.

Bradken's Darlaston site manager Jim Hayes sums up: “Though there was some minor resistance to the acquisition of the cell, it is now a focal point of our production. Thanks must go to Vulcan Europe, the Bradken project team and jig manufacturer NPL for all their hard work in developing the application solutions. Together, we have developed a viable, cost-effective and extremely reliable robot cell that now meets a wide variety of components applications and all our current Health & Safety requirements.”

A step closer to perfect production

Robots at aluminum foundry VDT Vobra have increased productivity and made life more pleasant for the workers. Pomac Automation made it happen.

> “We’ve had a 2-axis die sprayer on one of our die-casting machines for some time,” says Hans-Werner Zünd, works manager at VDT Vobra in the small German town of Enger, near Bielefeld, “and I always used to say: Why can’t you put a die sprayer on the smaller die-casting machines too? But everyone said it would be too complicated and it wouldn’t be worth it. And then Pomac came along, and we got robots.”

That was back in 1998, and VDT Vobra is little by little equipping all its aluminum die-casting machines with 6-axis Pomac robots for die spraying and extraction. Jan Klaassens, commercial technical manager at Pomac, remembers, “VDT Vobra knew us because we

already supplied them with automatic ladles [which scoop the molten aluminum into the molds]. They were looking for new ladles, and we got to talking about robots.”

Pomac Automation, which is based in Tolbert in the Netherlands, is an ABB system integrator that specializes in making dedicated machines and integrating robots for the entire foundry process. And that, says VDT Vobra foundry manager Uwe Heise, is an advantage. “It’s important to us to have one person to talk to about everything,” he says.

So far VDT Vobra has four cells equipped with Pomac robots. Each cell has one robot to spray the die with lubricant and blow-dry it and another to remove the part from the die, confirm that the part really has been removed, dip it in the cooling water and deposit it ready for stamping to remove scrap.

The company uses a range of ABB robots, depending on the maximum weights of the parts to be dealt with. Two cells are each equipped with an IRB 1600 die sprayer and an IRB 2400 extractor. Another cell has an IRB 2400 extractor matched with an IRB 140 die sprayer, and two IRB 4400s equip the fourth cell. In addition, there is an IRB 140 die sprayer in a fifth cell, without an extractor.

VDT Vobra is not the only company in the world to aim for perfection, with no errors in production, but what makes it different is how it approaches that unreachable target. VDT Vobra has realized that robots help it get closer. “The more I can take the human element out of the system,” says Heise, “the more accurate I can make the production and the fewer variations I have in quality.”

It also means increases in efficiency. Zünd estimates that a cell produces 15 percent more with robots, not including the improvement in quality. And, says Heise, “it makes the work less strenuous for the staff. They become more like machine supervisors.” In the future, that could mean that two workers could oversee three cells or that additional processes, such as drilling, could be introduced at the foundry stage. Currently that’s all done by CNC machines in a separate step.

Increased productivity is one of the reasons for VDT Vobra’s recent success. It was founded in 1958 in

One of two spraying cells with a Bühler 530 machine and an IRB 1600 robot.





>FACTS

VDT Vobra

- Foundry specialists producing aluminum alloy parts between 5 grams and 5 kilograms in weight using clamping pressures of 160 – 840 tons
- Complete service from CAD to finishing
- Based in Enger, Westphalia, Germany
- 100 staff; revenues of 11 million euros in 2006
- Quality certification ISO/TS 16949; environmental certification DIN EN ISO 14001.
- read more at www.vdt-vobra.de

Pomac Automation

- Company developing automation solutions for the foundry industry
- Makes own equipment and integrates ABB robots
- Provides the extractor function for ABB's own extractor
- Family business based in Tolbert, Netherlands
- 30 staff.
- read more at www.pomac.nl

Why robots?

- 15 percent increased productivity
- Improved reliability of product quality
- Easy programming and quick turnarounds
- Work becomes less strenuous; staff skill base increases.



"The more I can take the human element out of the system, the more accurate I can make the production and the fewer variations I have in quality," says VDT Vobra foundry manager Uwe Heise.

Berlin, but since the company moved all its production to Enger in 1993, it has boomed. Revenues have risen from 2.5 million euros in 1993 to 11 million euros in 2006, while staff numbers have been kept low (a rise to 100 from 40). Like all die casters, the company's main customer is the automotive industry, which takes half the aluminum parts it makes, but the company also supplies parts for machine tools, electrical and medical equipment and even the furniture industry.

High productivity depends on efficient machines and skilled workers, and Pomac contributes to both. Hilbert Poelstra, Pomac sales manager, says, "We have to ensure that their machines work permanently, so we have to be ready to send someone here to deal with problems as soon as they occur." Klaassens goes even further: "We are integrators," he says, "who offer a good product and a good service – and perhaps the service is more important."

Both Pomac and VDT Vobra place considerable emphasis on training operators. Klaassens is bringing a robot to a nearby training center for a weeklong course in programming. "Pomac used to do the training in the Netherlands," says Zünd, "but this way staff can come back to the factory in the evening if there's a crisis." After the course all the operators will be able to program their robots. Says Klaassens: "The programming is based on ABB's program and is very open. And because we specialize in foundry automation, we can make it exactly right for the needs of the industry. But we must also say that the new ABB programming is very easy to operate." Heise agrees, "It's a huge improvement – like night and day."

VDT Vobra's CEO, Reinhard Otte, is full of praise

for the cooperation. "There's been a very good communication between us and Pomac," he says. "We see them as partners, using what they do best to help us to do what we do best." ☉

One strategic move to victory.



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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.

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