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ROBOTS HELP SINGAPORE AERO ENGINE SERVICES CUT TURN-TIME OF ENGINE OVERHAUL TO FIVE DAYS BELOW INDUSTRY STANDARD.

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G O O D E N O U G H ?

> The concept of “good enough” crops up in a wide number of fields, automation among them. In manufacturing in Asia, for example, the use of simple production methods that involve minimal automation has long been described as “good enough,” even as in the West manufacturers take a more comprehensive approach to automation.

Now these two approaches are becoming geographically less defined as each region comprehensivese automation and simplified production are beginning to coexist side by side. Increasingly companies are coming to understand that each country or region, each business or time period requires a unique automation strategy.

Today there are about 1 million robots installed throughout the world. The largest expansion is happening in China, the International Federation of Robotics (IFR) expects that by 2010 the number of robots in operation in the country will have increased by 400 percent over what were in use in 2005. This of course reflects the fact that China has a very low level of automation, compared with North America and Germany, so there is plenty of room for growth.

One obstacle for emerging markets has been the lack of skilled staff. This has held back the expansion of robotics in China as well, but now more and more people are gaining the requisite education and skills, allowing automation to move forward.

Lars Dahlén
Segment Manager, Metal Fabrication ABB Robotics

INTEGRATED HOSE PACKAGE KEY FEATURE OF ROBOT SYSTEM AT HOIST MANUFACTURER STROS.

MARKET HANDLING, ARC WELDING Turkish motor vehicle manufacturers are barreling along the fast lane, and Breyssli-Gestamp is keeping pace with them.

Good enough? 

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ABB’S FLEXARC GLOBAL APPLICATION CENTER IN OSTRAVA, CZECH REPUBLIC, IS PART OF A NEW GLOBAL CONCEPT TO PROVIDE A CENTRAL LOCATION FOR SERVICES AND SUPPORT RELATED TO ABB ARC WELDING ROBOT CELLS.

ABB’S ARC WELDING ROBOT CELLS ARE ONE OF ABB’S FLAGSHIP PRODUCTS, USED BY MAJOR MANUFACTURERS.

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THE OSTRAVA PLANT WILL SERVE CUSTOMERS IN THE ASIAN AND AMERICAN MARKETS.
A better-made blade

In Singapore, robots help cut the turn-times of engine overhaul by more than five days below the industry standard. Not only do the robots save money, they also improve the safety for workers.

By Tony Sitathan
Photos: Munshi Ahmed

In Singapore, robots help cut the turn-times of engine overhaul by more than five days below the industry standard. Not only do the robots save money, they also improve the safety for workers.

For Sean Ho of Singapore Aero Engine Services Private Limited (SAESL), achieving the Rolls Royce Component Overhaul Centre of Excellence Gold Award in recognition of Maintenance, Repair and Overhaul (MRO) of the 500 Rolls Royce Trent engine 18 months ahead of schedule was seen as a satisfying personal achievement.

“It took dedication, solid team effort and recognizing the need for early automation during the inception of SAESL that has made a world of difference,” says Ho, the operations section head of the 8.5 million u.s. dollar compressor blade facility at SAESL. Compared to other Rolls Royce Component Overhaul Centres in other parts of the world which relied on manual processes, SAESL realized the importance for automation and became one of the first to implement ABB robotics in its MRO roadmap making it the first automated compressor cell repairing center globally, he says.

SAESL from the start realized the importance of delivering shorter engine turn-times – the time required to fully overhaul and process an engine – by under 60 days, quicker than the industry benchmark of 65 days. Currently it plans to further reduce turn-times to 55 days.

Ang Boon Hua, formerly the service engineer who was responsible for setting up ABB robots in the compressor blade repair facility back in 2004 and currently the senior sales engineer, says the implementation process was done in stages. He recalls that the configuration had been modified several times due to the complexity. “There were six stages of compressor blades that needed to be commissioned,” Ang Boon Hua says. “And each stage of tuning the blade would lead to the configuration of over 200 robotic positions. In total there were more than a thousand robotic positions that needed to be configured. Another challenge was the need to customize the gripper, which acts to grip the compressor blade. It is designed to cater to multiple stages of blades as it cannot be designed specifically for one single stage of blade. They have to be adaptive enough to grip the blades in multiple stages.”

Service key to success

When the first Service Level Agreement (SLA) was signed in late 2007, Sean Ho was pleased with the technical response time and quick delivery of spare parts.

With an increase in customer traffic and more engines being serviced and overhauled, Ho says that SAESL is starting to see more engine parts coming in from overseas customers and not only from its predominant base of customers in Asia.

“We are seeing more external customers coming to us for their MRO solution. Almost 50 percent of business is from external customers and that trend is expected to grow in the future,” he says. That, according to Ho, is seen as the silver lining in a highly competitive and fast-evolving MRO market where airlines, including Singapore-based aerospace companies, are starting to emulate the success of SAESL.
Right from the start of the automation process, there was a prerogative to use only the state-of-the-art robotics from ABB. A careful selection of ABB robots was deployed over time, before the system went live. The IRB 2400L is used for material handling, picking and placing of compressor blades around different stations for welding and grinding of blade tips, including the IRB 140 that is used for blade tips lubrication material coating. The IRB 2400 in particular was selected for the picking and placing of compressor blade to and from the shot peening machine. The shot peening process is considered the most effective way to enhance the fatigue strength of components that are subject to extreme stress. The IRB 1400 was chosen for machine tending and to pick and place compressor blades to and from CMM for dimension inspection while the IRB 2400 is used for plasma coating and spraying of metal powder onto the engine components of build-up materials.

The benefits from deploying the robotic arms were almost immediate. According to Sean Ho, they reduce both man hours and the risks of humans working on transferring the blades from one production cycle to the next. “There is a higher degree of safety and fewer risks as compared to humans handling these aircraft parts and components in the most economical and diligent manner. Although the total return on investment cannot be easily measured since we have been using ABB robots from the start, there is a clear indication that using ABB robots has accelerated our workflow processes and our completion time,” he says.

“Now it was possible to run operations 24 hours, seven days a week, slashing operational costs and downtime. This has contributed to higher cost savings,” he says. He reveals that SAESL has spent almost 5 percent of its machinery and gear budget on ABB robots, which translates to less than USD 1 million in capital investments. There was ultimately a reduction of man hours by almost 10 percent and an improvement in the overall cycle time.

Due to the improvements in the workflow processes, Ho is proud of reducing the compressor blade repair cycle time by an additional four days. Instead of repairing the compressor blades within 21 days, Ho is now able to complete the process by 17 days. “We are able to analyze the data and the production processes more closely while scrutinizing the workflow more accurately therefore eliminating time wastage,” he says. “It is possible now to calculate accurately the cycle and production time.”

By using SAESL’s proprietary system developed in-house, as well as SAP R/3 as its benchmark enterprise resource planning and production software, he is able to rely more on outsourcing the overall maintenance of the repair facility by using OEM contractors and their agents.

Advantages with robots
• Reduction in man-hours of almost 10 percent, which ultimately led to lowering the costs of operations while improving productivity and lowering cycle downtime.
• Capable of delivering shorter engine turn-times of under 60 days, quicker than the industry benchmark of 65 days.
• Enhancement of the safety of workers and lower risks associated with movement of materials in the workflow processes.
• Lowered cycle time for repairing compressor blades from 21 down to 17 days.

SAESL in short
• SAESL was first incorporated in 1999 and is jointly owned by SIA Engineering Company (50 percent), Rolls-Royce (30 percent) and Hong Kong Aero Engine Services Limited (20 percent). It undertakes the repair and overhaul of Rolls-Royce Trent aero engines around the world and forms an integral part of the Rolls-Royce aftermarket service.
• Current clients include Singapore Airlines, Emirates, Virgin Atlantic, Malaysia Airlines, Thai Airways, South African Airways, Garuda Indonesia and Air Canada.
• The company employs close to 600 employees with plans to further recruit 150 more employees within two years.
• Sales was around USD 400 million in 2006 and is expected to increase above the industry average for 2007.
Easy Expansion

Winkelmann Longchuan has achieved astounding progress over the past decade, becoming the indispensible leading producer of fuel rails in China.

By Zhang Kun
Photo Liang Liang

In China, the rapid growth of Shanghai Winkelmann Longchuan swt Motorcomponents Co. Ltd. has surprised even the boss himself.

“We provide fuel rails to automobile makers,” says chief engineer Guo Feng. “In 1997, when the company was founded, we produced 1,000 rails a month. Today our monthly output is 280,000.”

Winkelmann Longchuan enjoyed this rapid growth thanks largely to the rapid development of China’s automobile industry, which was, Guo notes, “far beyond our expectations.”

The fuel rail is essentially a pipe delivering fuel to individual fuel injectors on combustion engines. It is an integral part of an automobile engine, and Winkelmann Longchuan is the largest manufacturer with approx 80 percent of the domestic market, says Guo.

The Winkelmann Longchuan joint venture was launched in 2005 as a way for the company to reach the European market. It remains the only Chinese company to export fuel rails internationally, selling its products to Russia, Italy and Germany.

Guo explains that as automakers develop new concept cars and environmentally friendly vehicles, his company’s products will be in demand. “Our high-pressure fuel rails disseminate the fuel in a fine spray and burn it more completely, which helps to save fuel,” he says.

In the next five years, Winkelmann Longchuan hopes to increase its productivity by 50 percent. “It’s our basic strategy to go for automation and increase production per person,” Guo says. In the past two years, the company has already made strides in this direction, doubling its productivity without increasing its workforce of 280.

“We have invested from USD 1.88 to 2.2 million a year in new equipment,” he says. “In 2008, we will introduce our third ABB welding robot to the workshop.”

All three are IRB 1410 robots. One of these robots does in a single process what has traditionally taken 10 to 12 procedures, each done by a separate worker on an assembly line.

The robots save not only labor costs but wear and tear on the workers.

He Jianfang, trained to be a robot operator when the first ABB robot arrived at Longchuan in 2001, explains: “With the robot doing the welding, people do not have to be close to the smell of ammonia and the strong lights. This makes my work safer and much easier. ABB has also been making improvements for clients, and the new robot will have a Chinese operation board, which will be much easier to operate.”

Guo comments: “An ABB robot works 24 hours a day. The product quality is so consistent that no human worker can compare.”

In addition, he says, “a robot greets visitors as soon as they arrive at our workshop, which helps to boost our company image.”

Guo says he is particularly pleased with the attention ABB gives his company. “ABB bears our requests in mind, and their products keep improving,” he says. For example, the second robot from ABB featured a raised welding table so that workers did not have to bend down to work. In addition, the working process was shortened. “It takes half the time it did before to complete one product,” says Guo. “This means that we can double our productivity without consuming more electricity.”

“Other companies produce welding robots and they do have lower prices,” he admits, “but we stick with ABB because their product quality is stable and, like us, they continue to make improvements. Plus, their maintenance staff are always ready to help.”

“Sometimes we buy automatic equipment from other companies because ABB doesn’t offer a similar product, but if it’s available from ABB, then that’s where we buy it,” says Guo. “We trust ABB, and our cooperation with them has been very pleasant.”

**FACTS**

**About Winkelmann Longchuan**
- The Winkelmann Longchuan joint venture was founded in 2005; it has 280 employees.
- The company produces fuel rails.
- Its annual revenues are USD 19.1 million.
- Since its founding, company output has increased from 1,000 rails a month to 280,000.

**Efficiency Optimization**
- ABB robots complete in one welding process a task that traditionally took 10 to 12 workers.
- ABB robots free workers from contact with poisonous ammonia gas and intense lighting during welding.
- ABB robots ensure consistent product quality.
A strategy of innovation

In today’s tight auto market, innovation is the key to staying alive for U.S. auto parts maker Ogihara America Howell. In this ABB has a big role to play.

Located midway between the U.S. auto manufacturing centers of Lansing, Flint and Detroit, Michigan, the Ogihara America Howell facility stamps and assembles automotive body panels. The plant initially served the U.S. big three: GM, Ford and Chrysler. Over time the fortunes of those manufacturers have declined. Yet Ogihara has continued to thrive and maintain a prosperous business. How is that possible?

To Steve Peca, the executive manager for projects and advanced engineering for Ogihara America Howell, it’s no mystery. “What’s kept us here is innovation,” he says. “We’re very good at inventing things. We’re very creative, and our innovations keep us strong.” The company has shared a process and an innovation “It’s great. The deliverables are as with the robot cell for spot welding Ford Lincoln subassemblies. (See sidebar). Bowen points out that the robots in the cell are placed onto raised base plates rather than being bolted to the floor. “This makes for quicker installation, and when this program is done it’s easier for Ogihara to retool and reprogram,” he says.

Durability is also important in this business, and here Peca says an ABB robot shines. “It’s robust and strong enough that after six or seven years of measuring, we can put it on an assembly line, and it will last another eight years hauling parts around, moving parts from point to point and saving a human from danger.”

Looking ahead, Peca says that it’s crucial to continue to develop new technologies in order to manufacture products more quickly and accurately than the competition. The future for Ogihara is definitely in automation, he says.

>FACTS

Spot welding cell pumps up the production

A cell for welding rear-quarter subassemblies for the Ford Lincoln MXV typifies the collaboration between Ogihara and ABB. A special type of geometry-setting tool, a GEO end effector, was developed by ABB and first used for this project. Holding all the necessary location pins and clamps, it streamlines the loading of parts and greatly improves flexibility, eliminating the need for a re-spotting station and thus saving Ogihara floor space and equipment cost. The setup includes:

- FlexCell system. All components mounted on the base frame and wiring are integrated for maximum flexibility, safety and a smooth production process.
- Two ABB IRB 6600 robots with a 2.5-meter reach and a 175-kilogram capacity.
- Pedestal-mounted air-driven MFDC welding gun and projection nut welder.
- ABB Spotware computer software for customized application and ease of use.

>INSPECTION, SPOT WELDING

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Beyçelik Gestamp in fast lane

Turkey’s Beyçelik Gestamp Mold and Automotive Parts Production Industry Company is keeping pace with the country’s fast-expanding automotive industry, producing and supplying parts for car makers and commercial vehicle manufacturers, using ABB robots.

In 2007, Turkey produced a record 1,313,932 motor vehicles, including 622,881 automobiles, a 10 percent increase over the same period in 2006 and more than a fivefold rise from 1990.

“The country’s motor vehicle manufacturers are racing along in the fast lane, and we as suppliers are racing alongside them, providing parts and components,” says Mustafa Boga, commercial manager of Beyçelik Gestamp, as he takes guests along the company’s assembly floor where more than two dozen robots are feverishly welding chassis parts for vehicle manufacturers.

Beyçelik Gestamp is based in the city of Bursa, Turkey’s automobile manufacturing capital, 250 kilometers southeast of Istanbul. In its 50,000-square-meter production area the company produces assembled sheet metal parts and dies, chassis and skin panels, as well as front end and crash body parts for motor vehicles. It processes 100,000 tons of sheet metal a year.

Faik Çelik, a master craftsman in mold making, founded Beyçelik in 1978 as a mold production company. At the time there were only three employees. By 1983, Beyçelik started forming sheet metal for the automotive industry, a ready market for the company’s products. From that point the company grew rapidly. In 2007, the Spanish company Gestamp Automoción acquired a 50 percent share of Beyçelik. Nevertheless, Çelik still heads the company as chairman. His brother Nedim Çelik serves on the board of directors, and his son Baran Çelik, a mechanical engineer, is its CEO.

“We like working with robots,” says Boga, who joined the company in 1993 as a mechanical engineer, fresh out of college. “The efficiency of ABB robots has given us confidence to be aggressive in planning, investments and production.”

Since 2002, Beyçelik Gestamp has invested EUR 4 million in 26 spot welding, arc welding and transfer robots from ABB – including IRB 6650, IRB 6650, IRB 2400 robots as well as S4C and IRC5 controllers. In 2008, it placed orders for seven additional transfer robots from ABB that have yet to be installed.

“When we decided to use robots in welding, it was not easy to adapt the robots, due to the variety and small quantity of the parts produced,” notes Boga. “So we planned a flexible production solution together with our integrator, as Rotech. With this flexibility, production quantity has increased and quality of the welded equipment has improved.”

“Our production has doubled as a result of the use of robots,” he continues. “We employ half the amount of people that would have been needed for manual welding. We also use 75 percent less space, and we waste less.”

The robotic systems produce a significantly higher quality of parts, resulting in a standard production quantity, and we waste less.”

The robots have also provided a better work environment, Boga says. “Our production has doubled as a result of the use of robots.”

Mustafa Boga, Beyçelik Gestamp
Blurred line between East and West

In terms of production philosophy and methods, the line between East and West is becoming less defined. An individual approach seems to be the trend.

East is east and west is west and never the twain shall meet, Rudyard Kipling once wrote. He was referring to the fact that the British tended to force their own conditions on the places they colonized, rather than adapting themselves to foreign conditions.

In the industrial context, there is in the same way a sharp line between East and West. Asia traditionally relying on relatively low levels of automation while the West tends to take a more comprehensive, automated approach.

Now, however, the sharp differences in production processes between the East and the West are disappearing. Instead of Asian production philosophies being pitted against those in Europe or North America, more and more each region, business or time period is requiring its own production strategy.

“European companies are aware of the fact that each country – and sometimes each part of a country – requires a unique automation strategy,” says Dennis Fritsch, of the Fraunhofer Institute for Manufacturing Engineering and Automation in Stuttgart, Germany. “The strategy is influenced by many factors, such as economic aspects, but it is also determined by how easy it is to get the required specialists, how easy it is to get spare parts and so on.

“A robot is a very powerful machine, but it needs skilled labor for maintenance and programming,” he continues. “People must have sufficient education to work with robots. German companies, for example, have a lot of experience with robotics and automation. In many other countries this is lacking. As a consequence, these countries concentrate on less comprehensive applications of robots and automation technologies.”

“Complex systems are more expensive,” Fritsch adds. “A robotic solution can be a good and economical solution in one country and a less economical solution in another country.”

But now in Asia the situation is changing, he says. Automation is booming and the demand for skilled staff is huge. And while there are increasingly more people in Asia with the requisite education to work with robotic solutions, still more are needed. The demand is higher than the supply.

Moreover, says Fritsch, as industries in Asia and elsewhere turn to automation, more and more complex solutions are being introduced. At the same time everyone is keeping a very careful eye on costs. Efficiency is the key word. How a manufacturing plant is organized very much relies on each individual need, the product, application and market.

The concept at the forefront is “lean production” – a production philosophy that can be adopted regardless of the location or business a company is in. First introduced by Toyota as the Toyota Production System, lean production dominates businesses and organizations worldwide – in all areas, from manufacturing through to R&D and administration.

Joni Rautavuori is in charge of ABB’s Global Robot Products. In his various operations management roles he has been implementing Operation Excellence techniques like Theory Of Constraints (TOC), Lean Manufacturing and Demand Flow Technology. He has gained multi-cultural experience in implementing these practices in Western Europe, Eastern Europe, US and recently in Asia.

Dennis Fritsch
Dennis Fritsch is working in the robot systems department of the Fraunhofer Institute for Manufacturing Engineering and Automation in Stuttgart. Since 2007 he is Group Manager for Handling- and Assembly systems.

Joni Rautavuori
Joni Rautavuori is the Head of Global Operations at ABB Robot Products. In his various operations management roles he has been implementing Operation Excellence techniques like Theory Of Constraints (TOC), Lean Manufacturing and Demand Flow Technology.

The rapid growth in China is enabling companies to invest in more advanced equipment and new facilities,” he continues. “Foreign companies are bringing their latest products and production technologies into China, and this will help China to be even more efficient in the future.

But, Rautavuori cautions, “maintenance aspects are not well known in China, and this will be one of the concerns as automation increases.”

For his part, Fritsch believes that the comprehensive and the simple ways of organizing production will continue to co-exist even as the East embraces automation.

“Both methods are good methods, because they are appropriate for the local constraints,” says Fritsch. “There are still a lot of companies in Germany and the West that are looking for simple solutions, and at the same time there are a growing number of companies in Asia that are looking for more advanced manufacturing technologies.”

Operational stock and forecast industrial robots at year end 2005 and 2010 (IFR).

> FACTS

Fraunhofer Institute
The research institute Fraunhofer IPA, focus on technological functions in the production sector of industrial companies. IPA has about 150 scientific employees and an operating budget of EUR 27,5 million (2005).

Dennis Fritsch
Dennis Fritsch is working in the robot systems department of the Fraunhofer Institute for Manufacturing Engineering and Automation in Stuttgart. Since 2007 he is Group Manager for Handling- and Assembly systems.
CMT welding offers speed and control

Recent advances in CMT welding technology are opening up a wealth of new possibilities for robots.

> **CMT (Cold Metal Transfer)** welding results in welds with high levels of accuracy on thin-section materials usually reserved for TIG (tungsten inert gas) welding.

And CMT welding may well be the way of the future. According to Steve Bartholomew, metal fabrication account manager for ABB Robotics, CMT welding technologies could overtake and dominate manual TIG welding in sheet-metal arc welding applications.

“The improved efficiencies available through CMT unlock a host of potential new applications for robots in markets that were previously dependent upon costly highly skilled labor,” says Bartholomew. “And pay-back on investment is on average one year.”

Until now sheet-metal product manufacturers have faced a choice between TIG or MIG (metal inert gas) welding for arc welding sheet metal. MIG welding has covered much of the market, while TIG welding is most commonly used for welding thin-section material. TIG welding has a number of advantages, in particular a high degree of accuracy. TIG welding, however, has traditionally been performed manually as it requires a high level of skill. It is considered unsuitable for robotisation.

Fronius International introduced the concept of CMT welding in 2005. By using the MIG welding method of applying a wire consumable, Fronius found a way of welding with a high degree of accuracy on thin-section materials usually reserved for TIG welding.

“For robot manufacturers, the main advantage of CMT is that is based on the MIG welding process, a proven process for robotic automation” says Bartholomew. “It means that the user should he chose to switch from one type to another,” says Bartholomew. “We expect to see far greater use of robots for arc welding, as users become aware of their ability to simplify welding processes.”

Almost no weld is too difficult for the compact IRB 1600ID, with its integrated hose package.

> The IRB 1600ID is a key component in many airm-designed robot automation systems. Its big advantage is that it can rotate 360 degrees and use a combination of multiple axis movements to manage even the most difficult welds without need for human touch-ups. The compact wrist and upper arm are an additional plus. “The upper arm is very slim and smooth, so it can enter very narrow spaces,” says Per Löwgren, global product manager for Fronius robots. “The welding cable is also integrated with the arm. It follows the arm’s movement so it doesn’t hang out and disturb any of the auxiliary equipment around it. That makes it very reliable and, from a reach point of view, it allows you to enter very tight areas without the cable getting caught on any fixtures or workpieces.”

This integrated hose package also means that systems using the IRB 1600ID can have much higher robot densities, if required. “When the arm is moving, the hose package does not move uncontrollably in different directions,” says Löwgren. “Unlike with traditional hose packages, it means you can have robots placed in very close proximity without danger of stoppages caused by machine movements getting hooked up with each other. As two robots work faster than one, this gives you the option of more or less doubling the output of one production cell.”

Naturally, depending on the customer’s specific needs, the product can also be used with a variety of both air- and water-cooled torches and hose packages from Binzel, such as Esab, Fronius and Sika.

“The dependability and comparative stiffness of the robot’s arm is also a big advantage,” says Löwgren. “It means that the machine is very suitable for offline programming.” The ability to use the RobotStudio program with a Virtual Controller for precisely and reliably setting cycles and positions means that the programming and commissioning time for IRB 1600ID robot installations can be as much as 50 percent shorter.

Factory direct

For metal specialists, nothing could be surer than starting with a comprehensive arc welding package - direct from the factory.

> When it comes to welding carbon steel, stainless steel and aluminum, metal manufacturers no longer have to put together systems piecemeal. Instead, they can turn to ABB’s new complete package that combines the best in welding and automation technology. A new package is available with ABB’s IRB 1600, IRB 1600ID (Integrated Dressing) and IRB 2400iA robots. This package uses welding technology from Fronius, including the Aristomig power source, the latest generation of integrated inverter power sources designed specifically for robotic MIG/MAG welding in metal fabrication industries.

The compact power source is based on inverter insulated gate bipolar transistor technology and an advanced process regula-

tor. The combination provides outstanding welding characteristics, including excellent control with a minimum of spatter, even at high welding speeds.

Hundred of ready-to-use synergic welding lines that offer combinations of welding method, material, wire diameters and shielding gases, allow for easy setup and operation. All the operator has to do is select the desired wire-feeding speed, and the Aristomig will automatically select the appropriate voltage.

This package also includes a special highly flexible, torsion-resistant Buxis cable developed by Abicor Binzel especially for the IRB 1600ID robot and offers solutions with air- and water-cooled torches for tig robots and standard robots as well. Both the power source and the robot controller are set up via the robot FlexPendant, allowing the operator control of the welding process at all times.

The robotics arc welding package contains connections to the media necessary for arc welding, such as electric power, large welding drums and bobbins for wire, shielding gas and pressurised air. It can be delivered with a range of ABB IRB positioners to fit the specific needs of the customer for workpieces ranging from 25 0 to 5,000 kilograms. The motion system with the robot and the positioner is controlled for the shortest possible cycle time and accurate coordinated motion with the robot based on an advanced software dynamic modeling technique.

This seamlessly integrated package can be delivered from ABB or directly from Fronius.
Located near the sleepy town of Sedlcany about an hour’s drive south of Prague, STROS-solemnlystrojny’s premises look nondescript from the outside, but inside its production hall an impressive manufacturing operation is at work. With 50 years in the business, STROS is one of the world’s leading suppliers of hoist machinery for building sites. It supplies high-quality work platforms as well as customized personnel and material hoists – hoists that can be expected to carry loads of up to 3,000 kilograms, speeds of up to 30 metres per minute and heights of up to 350 metres. Thus its tetrahedral vertical masts are a crucial component. As each mast section needs a total of 222 reliable welds, manufacturing them is an extremely labor intensive process.

Until recently, STROS had to use highly skilled welders to make these sections. Although it has been using robots for 25 years, these machines could not manage the complex arc welds in narrow spaces needed for these particular components. Consequently, in order to produce a satisfactory number of mast sections it had to employ three welders per shift at three separate workstations to make these pieces. Apart from the obvious outlay this required in terms of manpower and space, STROS found it increasingly difficult to recruit the highly qualified welders needed for this work. That’s why in 2007 the company decided to hold a tender for the complete robotization of its manufacturing process for mast sections. Of the four firms who participated, only the ABB group could fulfill all its requirements.

“ABB was the only one who could supply the entire workstation,” says STROS project manager Milan Škorpa. “We didn’t just want to buy a robot. We wanted a completely robotized workplace, which would include a positioner and would handle the transfer of components. ABB also did all the programming for us, which means they effectively delivered a complete workstation.”

The IRB 1600iD industrial robot with a process arm is a key feature of the robot automation system that is now in place at STROS. The machine’s arm is extremely slim and can combine multiple-axis movements and rotate 360 degrees, which makes it ideal for entering narrow spaces and carrying out the complex arc welds that are needed to complete the mast sections. An integrated welding cable follows the arm’s movements, which ensures that it doesn’t get caught in any surrounding fixtures or workpieces. In addition to the process arm’s maneuverability, Škorpa says ABB’s positioners for holding the pieces to be welded were also a major selling point. “The fact that the positioner can turn on more than one axis was crucial,” he says. “It’s necessary to be able to coordinate the robot’s movements on the track with the positioner.”

The process arm’s fluid interaction with the positioner is an impressive feat of balletic synchronicity, which according to Škorpa could not have been achieved without ABB’s readiness to work closely with STROS in designing the system. “The workers who make the mast sections had to collaborate with the supplier so that the system could be put into operation the way we wanted it,” he says. “First and foremost, the people at ABB were perfect experts. And they also willingly responded immediately to any problems we might have encountered.”

“By 2007 the company decided to hold a tender for the complete robotization of its manufacturing process for mast sections.”

Milan Škorpa, Project Manager

“ABB gives STROS a helping arm.”

“An innovative process arm is what sold Czech hoist manufacturer STROS on ABB’s IRB 1600iD robot solution. Not only does the arm provide multiple-axis movements, it can rotate 360 degrees, and includes an integrated welding cable.”

By Colin O’Connor

“There are important returns on the investment that can’t be quantified,” says Milan Škorpa.

“The robot effectively does the work of three welders using just one workstation.”

Milan Škorpa, Project Manager
STROS uses a rotating IRB 500 D positioner with two workstations to hold the individual parts of the mast section that are to be welded before the final piece is completed. This means that the robot is in constant use, because an operator can prepare pieces for welding on one side of the positioner while the other part is being welded. The positioner then rotates and welding continues while the operator removes the completed part on the other side and prepares the next component. The standard combined cycle time for making one mast section is 54 minutes, which is three times quicker than the time required by a human welder to make the same piece. “The robot effectively does the work of three welders using just one workstation,” says Škorpa.

“Such obvious savings in space and time mean that Škorpa believes STROS’s investment of CZK 7.5 million (EUR 300,000) in the robot system will have been recovered in two to three years, especially as the company was able to get 50 percent of the cost covered by a special EU grant for modernizing production technologies. Besides these concrete benefits, Škorpa claims the system’s intangible advantages are also significant. “There are important returns on the investment that can’t be quantified,” he says. “For instance, we no longer have to worry about trying to hire properly trained welders, who are in short supply these days because nobody wants to do this work anymore. It also pays off in terms of the quality of the welding. Even if you have a good welder, you are never going to get the same consistency that a machine gives you. And robots don’t forget any welds.”

**Benefits**

- One tailor-made robotized workstation produces the same number of pieces per eight-hour shift as three human welders would.
- Robot welding systems ensure consistent high-quality welds without any of the deviations produced by human welders.
- They eliminate the need to recruit qualified welders, who are in increasingly short supply.
- Welding mast sections with robots guarantees constant high levels of geometric precision, which means that the sections fit perfectly with each other when being used to assemble hoists.
- The systems can be easily reprogrammed to produce other parts.

**About STROS**

- STROS is one of the world’s leading suppliers of machinery for building sites.
- The company has been in business for more than 40 years and has a longstanding focus on manufacturing hoists for material and personnel, working platforms and other steel structures.
- It employs 220 people and exports its products to 35 countries in Europe, Asia, the Middle East and the Americas.
If you’ve ever encountered a road resurfacing project while traveling in the United States, chances are good that you’ve observed Roadtec equipment in action.

The behemoth machine that cuts up the asphalt and conveys it to the bed of a dump truck for delivery to an asphalt recycling facility in a road resurfacing project is likely a Roadtec Cold Planer. Roadtec patented the revolutionary Roadtec Shuttle Buggy, a material transfer vehicle that revolutionized the road resurfacing industry. Roadtec equipment can be found worldwide.

Roadtec is one of a consortium of 16 companies that make up Astec Industries Inc. Following the lead of Astec Underground into robotic manufacturing, now Roadtec is building its mills using ABB Robotics. Company executives anticipate doubling production levels and enhancing uniformity, thanks to the technology provided by ABB through Wolf Robotics of Colorado.

“We will actually have to add one more person to the production team,” says Mike Bliss, director of manufacturing for Roadtec. “But the output will change. The biggest thing will be the reduction of man-hours. We’ll go from about 120 hours to 60 hours to make a mill drum. That will let us produce twice as many drums as we were making, and we think we’ll be able to tweak that even more once we get into routine production.”

Rhey Houston, a fixture designer with 15 years at the company, undertook the task of researching companies that could fulfill Roadtec’s needs. “I went right to the Internet and found Wolf Robotics,” he says. “They seemed capable and had all the answers we needed.” Best of all, the company had been around since 1944, had once been owned by ABB Robotics and was now an integrator of ABB products.

Roadtec began working with Wolf in June 2007, designing two robots to build its 900 series mills – the biggest cold-planing equipment it makes – for highway resurfacing. Houston reports that Wolf’s customer support was fantastic throughout the process. But by the time the equipment was designed and
installed in March 2008, Roadtec’s buyer requests had shifted from large equipment intended for highway reconstruction – the 900 series machines – to smaller mills better suited for private roadways and narrower applications. Luckily the robots flexibility meant they can work for other mills as well, continuing to provide Roadtec an advantage.

“Our job is all in relation to road bills passing Congress,” says Houston. “If highway funding bills are large, companies get a lot of money and they buy a lot of machines. We’re not selling the series 900 mills we thought we would, but the robot builds all the drums for other mills, too.”

Wolf designed the initial software, but Roadtec staff programmers do the work of recalibrating it to meet the varying dimensions of the products in current demand. The 500 and 700 series mills, made for narrower roads, are the hot items in today’s market. The robotic equipment can meet the need. “A robot can make numerous repetitions of parts, and it will make every one of them identical,” says Houston. “It helps our sales because the customer knows that every mill will be the same. It will decrease our manpower to load blocks on the drum. In turn, we have to make special preparations for the robot as well. We have to make sure everything is exact, or it won’t work for the robot.”

Roadtec uses an IRB 4400 material-handling robot to pick up the pedestal blocks and teeth and place them on the drum. From there an IRB2400L six-axis welding robot secures the blocks and teeth in place. The two robots are mounted side-by-side to a floor track system that is used to transport the robots between the staging area for the pedestal blocks and the milling drum. The IRB 4400 robot has a gripper end tool that picks up a pedestal block and then places it in a location jig where it reorients the part to ensure accuracy and then it swings around and holds the block in place on the drum as the IRB 2400 robot reaches in and tack welds the block to the drum in three locations. Once secured the IRB 4400 releases from the block and goes back to pick another block from the staging area. The drum rotates to present a new location for the next block and the process is repeated. When all blocks have been placed and tack welded the IRB 2400 robot then returns and completes the welds on each block. The operation does not require the robots to move simultaneously with each other. But they need to be aware of each others location and projected movements. Done manually, the process takes up to 100 hours to place and weld the teeth, but the robot can get the job done in 10 hours or less. “Do the math,” says Houston. “It doesn’t take long to start making money that way.”

The robotic process creates a more uniform, better-refined finished product as well. Houston points to a pair of drums, one with blocks welded by hand and a finished drum that was set and welded by the new robots. The difference in workmanship is evident. The manually welded piece is rough and inexact, while the robotically produced product is smoothly welded, each tooth perfectly placed in a spiral around the drum.

Rickey Ellis worked as a manual welder for 30 years, and now his job is overseeing the robotic welding process. “I’m in a T-shirt instead of a long sleeve shirt, sitting there getting physically sweaty. Now I can sit in the chair, punch a button and watch it do its thing. I love it. I’m looking forward to this making my life easier.”

Houston is pretty sure the robotic applications are going to make everyone’s life easier at Roadtec and will provide a better product for their customers as well. “The robot is a very beneficial application here at Roadtec,” he says.

> Facts

## Benefits of Robotization at Roadtec:

- **Decreased production time:** Roadtec expects to produce drums in half the time.
- **Increased production output:** Building twice as much product.
- **More uniform product:** The welding robot creates a cleaner line, the same way every time.
- **Safety:** The robot works in a completely enclosed system, keeping smoke, welding glare and loud noise inside the system and away from workers. This helps reduce eye burns from welding. The steel drum, which is very shiny, causes a hazardous glare of welding sparks. Fewer workers are exposed to the glare in the contained environment.

Roadtec sold 95 machines in 2007, building 50 to 60 percent in house and purchasing the remainder for resale. In 2008, Roadtec projects sales of 110 mill machines and expects to make more of them in house, thanks to the robot installation.

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**About Roadtec**

- Produces cold planers, material transfer vehicles and asphalt pavers.
- Known for simple-to-use designs that are compatible with U.S. Department of Transportation specifications.

www.abb.com/robotics
The global thirst for minerals and metals has rubbed off on AB Allt i Plåt, a small company in southern Sweden that manufactures, among other products, cabs for mining machines and cranes.

A big step for a small company

It was a simple equation. The unemployment rate for professional welders in southern Sweden, in the region of Småland, is so low that the family-owned company Allt i Plåt (loosely translated as Everything Within Sheet Metal) decided to meet increased demand for its products with a welding system from Andon Automation based on a three-axis manipulator and a dedicated handling system.

Allt i Plåt, which employs about 50 people, have installed a robotic welding cell from Andon Automation with an abb robot (delivered by Andon Automation) in one of its large manufacturing halls as part of a company-wide modernization strategy – the biggest in the company’s history.

“We invested sek 25 million in 2007 to upgrade our facilities and modernize our equipment,” says Christer Persson, who took over the company with his brother and sister in 1995.

The changes in the factory are on a grand scale. Besides the robotic cell, which is used to weld up to 600 meters of joints on a 1,000-kilogram mining machine’s cab, Allt i Plåt has also installed a German-made Trumpf laser precision cutting machine in an adjacent 1,600-square-meter hall.

“This communication between the robot and the positioner is where the advanced technology comes in,” says Lennart Niklasson of Andon Automation. The ultimate benefit, according to Persson, is that the robot can weld a whole cab in three hours, as opposed to a whole shift.

“And our customers also appreciate that we are using more efficient procedures.”

After the welding, each individual cab is painted, buffed and outfitted with all the necessary cables, sound isolation and safety glass.

“We were interested in a total system solution,” says Olle Persson (to the left). “And we decided on Andon and ABB after a customer conference where we saw the possibilities of their solution for us.”

“Welding time per cab has decreased to around three hours, compared with a whole shift if done manually. Increases capacity and production.

Allt i Plåt chose the IRB 1600 robot with the IRC 5 steering system from Andon Automation, an engineering specialist within arc welding and thermal cutting applications based in Örebro, Sweden. The company partners exclusively with ABB.

FACTS

Allt i Plåt’s benefits from automated welding
• Welding time per cab has decreased to around three hours, compared with a whole shift if done manually.
• Increases capacity and production.

Text and photo by Alexander Farnsworth

www.abb.com/robotics
Smart robots help propel growth

With the support of ABB robots, Shanghai Huizhong Automotive Manufacturing Co. Ltd. has successfully won major projects, greatly reinforcing its competencies. From 2005 to 2006, Huizhong was granted the status of global tier 1 supplier for General Motors Global, Ford North America, 106 Volkswagen, General Motors Global Epilon platform, Daimler Chrysler and Chang'an Ford. “By 2007, our sales volume has reached 120 million [RMB 4 billion],” Wang says. “Although we have expanded very rapidly, we need to enhance our competencies by developing our own products.”

Although China's producers may have certain advantages in terms of labor costs, Huizhong clearly knows that, as a company competing on the international stage, it must provide satisfactory products and services. “Price is a very important factor, but it is not the most fundamental one,” Wang explains. “How to enhance our capabilities in research and development is most important. To reinforce our competencies, we have chosen to partner with reputed suppliers, and this strategy is working very well.”

Huizhong started to use ABB welding robots in 2005, and now has more than 60 robots including IRB 2400C and IRB 140C as well as positioners IRB140SR and IRB 7508 in service, making parts for Ford and General Motors. “In fact, 2005 was a turning point for our company,” Wang adds. “The project to produce subframes for Ford was of great significance for us.”

Wang explains that it usually takes 10 to 12 months to develop a product such as a subframe. Wang and his team, however, were required to finish the job in five months. “Time was extremely tight,” he recalls. “The person responsible for the technical part of the project at Ford felt that it was totally a ‘mission impossible.’”

When Huizhong was searching for suppliers for the project, it chose ABB for the welding work and received four sets (a total of seven) of robots. “ABB lived up to our expectations,” Wang says. “They spared no effort in supporting us and tried their best to meet our standards on clamps. The robots are fantastic, but to make the welding work perfectly, we still needed high-quality clamps to help with accurate positioning. ABB solved the problem by cooperating with its local supplier.”

Wang and his colleagues amazed Ford by presenting their design within five months. “I went to ABB every day for a month to discuss the design,” Wang recalls with a smile. Soon Ford expanded its production, and Huizhong also increased its number of ABB robots. Now in the noisy workshop 14 robots weld at seven workstations.

Different workstations have different welding tasks, and now we can produce a total of 110 subframes per shift,” says Zhou Hui, supervisor for the Ford subframe line.

Having worked for Huizhong for 10 years, Zhou has operated a number of different welding robots. What impresses him most about the ABB robots is their user-friendliness. “We installed more robots last year,” he says, “and the updated operation panel is equipped with a touch screen that can display Chinese characters, which is really convenient for our workers. Although Ford’s production expansion does put pressure on us, we can handle it easily with the help of these robots.”

Thanks to ABB’s improvements to the future, the reliability of the parts has improved greatly. “It seems very easy, but ABB made a great effort on the improvement,” Wang says. “To ensure the quality of the future, ABB undertook the design work itself, a task that used to be performed by its supplier.”

With the success of the Ford project, Huizhong again allied with ABB, winning the is-Car project from General Motors. In this project, Huizhong produces the rear axle and subframe and has more than 40 ABB robots working on the project.

“I hope Huizhong will work even more closely with ABB to win even more support,” says Wang. “It would be perfect if ABB could join us when a project is still in the preliminary design stage.”

ABB Robots in Huizhong

- Huizhong started cooperating with ABB in 2005.
- Now Huizhong has about 60 ABB welding robots working on the Ford and General Motors projects.
- The user-friendly robots won Huizhong’s approval, not least because their operation panel can display Chinese characters.
- On the Ford line, a total of seven robot stations can complete welding on 110 subframes per shift.

FACTS

Shanghai Huizhong Automotive Manufacturing Co. Ltd.
- Established in 1991, Huizhong is a wholly owned subsidiary of the Shanghai Automobile Industry Corporation, the largest vehicle group in China.
- Huizhong employees more than 6,500 people around the world and has 12 plants in China, as well as offices in the United States, Germany and Australia.
- In China, Huizhong’s customers include Volkswagen, Audi, Hyundai, Ford, Fiat, Honda and Toyota.
- Huizhong now is a global tier 1 supplier for General Motors Global, Ford North America, FAW Volkswagen, General Motors Global Epilon platform, Daimler Chrysler and Chang’an Ford.
- In 2005, Huizhong had sales of USD 580 million (RMB 4 billion).