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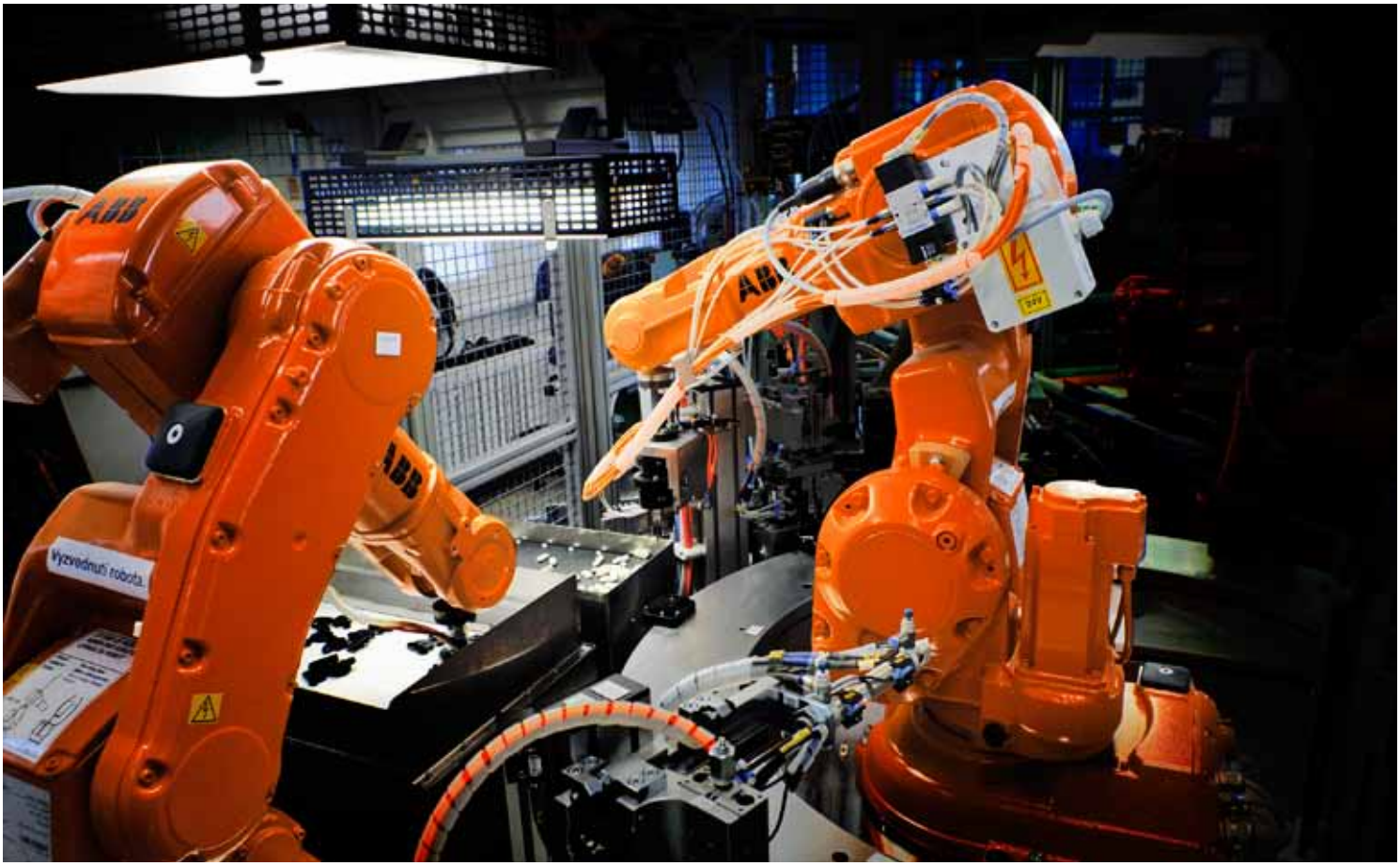
A customer magazine
of the ABB Group

robotics



Automation revolution

Power and productivity
for a better world™

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From manual to automatic

Robots at DAU Componentes have increased productivity through greater automation.

10

Old-timers with uptime

Four decades and 7.7 million cycles after being installed, these robots are still going strong.

robotics 1|12

Per Vegard Nerseth
Group Senior Vice President
Head of Business Unit Robotics, ABB

Welcome to the latest edition of *Robotics* magazine.

I firmly believe that the industrial robot industry stands on the threshold of a major investment cycle in the robotic automation revolution. We saw our business thrive in 2010/2011, and we are now growing faster than the market. I am also very happy to tell you that it appears 2012 will be another huge year for the robotics industry in general and ABB in particular.

Data from the International Federation of Robotics show that more than 150,000 new industrial robots were sold in 2011. This is by far the highest number ever recorded in one year. We recently reached a significant milestone of our own at ABB: the delivery of our 200,000th robot.

At ABB we place great importance on "understanding the demands of robotics users." This is something on which we have focused ever since the development of the first "all-electric" robot in 1974 (see article on page 10).

In these pages you will also find case studies illustrating how our tiny new robot, the IRB 120, has enabled L'Oreal (page 12) and BDMO (page 16) to increase their productivity, quality and manufacturing flexibility.

Recently, social factors have also begun to play important roles in user demands. Manufacturers must maintain a desirable and safe work environment in which employees carry out tasks that can often be dangerous, delicate, dull and dirty. It's thus easy to understand why many companies, such as Arla Foods (page 22), look to our industry for innovative solutions.

It is against this backdrop that I proudly present *Robotics* magazine. I hope that you enjoy reading it, and I welcome any feedback you may have on the articles and features. Please contact me at the following email address with any comments or questions:
per-vegard.nerseth@ch.abb.com.

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Designing and installing a new production line in four months was a challenge L'Oreal overcame with the help of ABB's smallest robot.

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This six-axes robot saves workers from repetitive strain injury.

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Calendar

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

> May 22 - 25
Automatica 2012, Munich

> June 05 - 07
Automation World, Shanghai

ABB Robotics' Technology Days attracts nearly 1,000 visitors

Attendees experience a wide array of demonstrations and seminars from ABB and a roster of affiliated technology providers.

ABB Robotics hosted nearly 1,000 people on October 11–13, 2011 during its annual Technology Days event at its North American headquarters and training center in Auburn Hills, Michigan. The attendees included current and potential customers, system integrators, affiliated technology equipment providers, members of the media, and for the Thursday afternoon Open House, a wide-eyed crowd of students and robot enthusiasts.

The 5110-square-meter exhibit floor included over 40 live-robot-related demonstrations from ABB and over a dozen peripheral equipment providers. Featured were the latest robotic and automation technologies for a wide range of applications including arc and laser welding; picking packing and palletizing; and systems for painting, tool changing, RTV dispensing, machine tending and vision sensing.

Photo Alexander Farnsworth

Visitors to ABB's Technology Days are treated to an interesting variety of exhibits and demonstrations.

Much more than just robots

Technology Days also featured the expanding marketing and promotional collaboration among multiple business units and divisions of ABB. Fellow members of the Discrete Automation and Motion division team displayed drives, motors, PLC's and other control products, including motors from Baldor, a new member of the ABB Group. The Low Voltage Products division was well represented with an array of safety solutions from Jokab Safety, including enclosures, sensors, and controllers on many robotic demos. The sales teams quickly identified common customers and opportunities, providing a comprehensive and compelling ABB message that was very well received by the attendees.

Event highlights:

- An announcement about a new industry stocking program to expedite the delivery of the most popular ABB robot models and systems to North American customers;
- An IRB 4600 robot with a 1.5 meter Samsung Smart TV attached to the arm. Created by Robotic Arts, the "RoboScreen" featured a character that launched four robotic demos;
- A new RobotStudio PowerPac software to more easily program robotic palletizing systems, and a line-up of new ABB FlexGripper palletizing grippers;
- The ArcPack Lean 1410, a fully configured, quick start robotic welding package with an array of options to suit the needs of many small to medium welding operations.
- A pre-built FlexArc system ready for final configuration, shippable in two to four weeks from initial order date;
- Motion and PLC solutions demos and seminars from ABB (Baldor) on how to build cost effective and results-based motion and logic solutions for single or multi-axis machine-integrated automation systems.

> September 10 - 15
IMTS 2012,
Chicago

> October 09 - 11
Scanautomatic,
Gothenberg

> November 12 - 14
Fabtech 2012,
Las Vegas

The PalletPack 460 with the Claw gripper for high-speed bag palletizing.

ABB Robotics launches the PalletPack 460

Pre-engineered package delivers improved productivity, reduced set-up times and lower costs.

ABB Robotics has launched the PalletPack 460, a pre-engineered package of proven robotic palletizing components featuring the new IRB 460 robot, designed specifically for high-speed end-of-line palletizing. It will allow integrators to more easily specify and design palletizing systems, and reduce the barriers for end-users to realize the benefits of robotic palletizing automation.

Available for either high-speed bag or compact end-of-line case palletizing, the package consists of the following: an IRB 460 robot; a Flex-Gripper (with either the Claw or one-zone Clamp gripper); an ABB control PLC; an ABB safety PLC; PalletWare support software; user documentation; and the ABB FlexPendant, featuring an easy-to-use graphical HMI.

The heart of the PalletPack is the IRB 460, the fastest palletizing robot on the market. The 4-axis IRB 460 features a reach of 2.4 meters and 110-kilogram capacity, with a compact footprint that makes it ideal for integration into existing packing lines.

The programming and operation are carried out via the user friendly FlexPendant, the standard ABB Robotics HMI.

The new PalletPack 460 is fully supported by the ABB Robotics' global sales and service organization in 53 countries and over 100 locations.

Grand opening of ABB's Notting Hill Robotics Innovation Centre

ABB's Discrete Automation and Motion technology on display at center.

On October 25, 2011 ABB's new Robotics Innovation Center in Notting Hill, Australia, was unveiled to key channel partners from around Australia, as well as members of ABB's Shanghai and Swedish robotics teams. The launch included information and training seminars presented by key ABB Robotics staff from around the globe, followed by a display of the brand new IRB460 and IRB760 robots.

The Innovation Center was designed specifically for customer trials, robotics training and product demonstrations. It has been designed with flexibility in mind so it can be easily redesigned for future application demonstrations.

Included in the innovation center are demonstrations of ABB's value-added packages and tutorials covering the latest RobotStudio software. The Center will be a great asset to the company, offering a unique sales tool and education

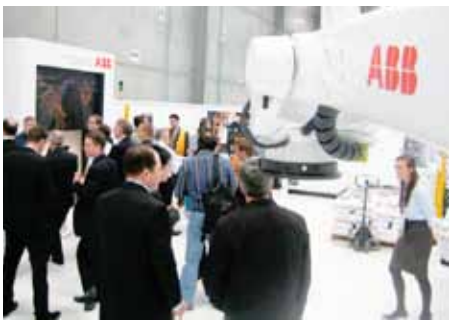


Photo: David Marshall

The Innovation Centre showcased the latest systems and technology from ABB Robotics.

From manual to automatic

Auto parts manufacturer DAU Componentes in Burgos, Spain, shifts gears on how it loads workpieces into CNC machines.

Text Harvey Holtom **Photography** César Urrutia

Automobile component manufacturer DAU Componentes was founded in Spain by the CROPU group of companies in order to produce more brake pistons. Today, the production facility produces an astonishing 20 million parts every year, mostly brake components and air conditioning compressor parts. That level of output requires continuous innovation in the company's production processes.

Recent changes at the factory in Burgos clearly demonstrate DAU's commitment to constant improvement. In January of 2010, DAU began automating the process of feeding "raw" workpieces into CNC machines, which cut the threading, polish the interiors and de-barb rough surfaces of parts.

Until that time workpieces had been loaded manually by an operator – a slow and expensive solution. Today, this task is handled instead by two ABB IRB 6620LX robots, each of which serves a line comprising four machines. The first step of the process, placing workpieces on trays, is now the only manual part of the operation. Top-mounted on a track, a robot takes over by picking up a raw workpiece – in this case, a ball housing used in automobile air-conditioning systems – from its tray and lifting it into the air. The robot then moves along the track to the machines. After what seems like a momentary hesitation (it is actually waiting for the order to load from any one of the four machines), the robot top-loads the ball housing into the appropriate machine and places it precisely on the chuck. Its job done, the robot returns

> "Greater automation means better products for less cost."

DAU Componentes produces 20 million car parts per year.

DAU Componentes

- Founded: 1994
- Activities: Production of automotive components (including machining and subsequent treatments)
- Workforce: 100 people
- 100% production exported to customers' plants in: Europe, Mexico, Brazil, South Africa, Thailand and Japan

Grupo CROPU Industrial Director, Isidro Alfonso, puts a premium on quality products.

to its initial position to pick up the next piece.

When asked why DAU chose ABB robots, Isidro Alfonso, Grupo CROPU Industrial Director, points to the participation of TEMS, an engineering firm with 35 years of experience providing engineering solutions for Spanish industries and multinational automotive companies. TEMS was acquired by Grupo CROPU in 2007, making it the group's engineering division.

"TEMS had the experience and the necessary know-how," says Alfonso. "They carried out a detailed analysis of our needs in this case, and as partners with ABB Spain, they felt they needed to look no further when it came to installing an automated system here. We had every confidence in their choice."

That confidence is well-placed, as this seemingly simple robotic solution has been a big success. Alfonso says, "We have eliminated the time it took for a manual operator to open the machine door, place the piece and close it again." The company thus achieves a cycle time that is 3 percent shorter, and thanks to the precision with which the piece is placed, the reject rate is also lower. All told, productivity has increased by 4 percent. Using robots is more ergonomic, and the fact that they are top-mounted provides great savings in terms of space.

Grupo CROPU

Founded in 1975 by José María Basconcillos, Grupo CROPU has production centers in three locations in Spain: Burgos, Santander and Valladolid. Initially specializing in surface treatments for the automobile industry, the company expanded to offer similar treatments to other sectors. Today the group includes Cropusa, the group "mother" plant that specializes in surface treatments and zamak injection; Componentes y Conjuntos (CyC), specializing in surface treatments, heat treatments and automobile parts; TEMS Cantabria, automation and special equipment engineering; Aleaciones Ligeras Aplicadas (ALA); and DAU Componentes.

Still a family-owned and -run concern, Grupo CROPU employs about 500 people and is Europe's number one manufacturer of brake pistons in both aluminum and steel. Other group activities include quality coating processes, zamak injection, precision machining, heat treatments, cold forging and aluminum casting.

Robot benefits

- Increase in productivity: 4%
- Reduction in cycle time: 3%
- Gain in floor space
- Lower labour costs
- More highly-qualified workforce
- Return on investment: < 3 years

But Alfonso doesn't measure the gains from the robots solely in such terms as increased productivity and reduced cycle times. "It is all about quality," he says. "Greater automation means better products for less cost. So, our competitiveness increases, and the company can hold its own against manufacturers in low-cost countries. This also creates a company culture of being more demanding."

Without its investments in automation, Alfonso believes "the company might simply go out of business."

Sensor sensibilities

Our arc welding expert talks heavy fabrication cells using robots.

Text Mark Oxlade **Photography** ABB Robotics

Automating the welding of heavy fabrications can be a daunting task. Without a basic understanding of the field tackling the problem, or even getting support, can be problematic. Often the mission is further complicated if your operation produces many part types and variants, mostly in low batches.

The good news is that a fabricator can follow a core set of steps to ensure a successful venture into the world of robotic welding of heavy fabrications.

It's a good idea to start with a list of possible products worthy of automation. As the list takes shape, you can start to group the components into families or groups — by joint type, material type, product family, or perhaps process constraints.

The following are three options available for automated heavy welding, in order of cost and complexity:

Mark Oxlade breaks down the essentials of automating a heavy welding fabrication cell.

1. Tactile sensing

In this type of system, voltage is applied to either the wire, gas shroud, or even a retracting probe, which becomes the tactile sensing means for the robot. The robot then carries out a search pattern in as many planes as is required to deduce the relationship between the original programmed point and the current position of the weld.

Tactile sensing systems are widely used and a trusted technology for cost-effectively locating joints on heavy weldments. With the recent introduction of a laser sensor, the tactile approach to searching has been much improved.

The sensing laser has an accuracy measured in microns and reacts at the speed of light. As a light beam, it can point into restricted areas where a torch/wire combination could be challenged.

2. Through-the-arc tracking

After it has been determined how the robot will find the joint the question becomes, "Can the robot get to the end reliably without further input?" If the robot's path is impeded, further searches may be required. If the weld joint cross section or gap varies along its length, then further sensing levels are required.

An adaptive sensing system offers two levels of through-the-arc tracking. Using impedance the system can measure the voltage and current as the weaving of the joint takes place; an optimal path is achieved as a result. If the joint also changes in volume along the path, the adaptive sensing systems can vary the process to compensate for the fill requirement. If multipass welds are required, the same sensing technology will record and displace the subsequent strings by the required offsets to achieve correct fusion, penetration, and fill characteristics.

3. Laser/vision guidance

A laser- or vision-based guidance system typically is required for more demanding joint types, where through-the-arc tracking may not provide enough data to guide the robot.

Over the last few years, these guidance systems have continued to improve in value and functionality. Technology integrators, which incorporate their own laser/vision guidance products on OEMs' welding equipment, provide systems that deliver accurate and reliable data for welding the most demanding joints. These systems are able to plot the position and capture all the critical variables to ensure the robot is able to produce a suitable weld for that specific joint.

Welding heavy fabrications with robots doesn't have to be a process filled with mystery—especially if you have a robotic eye looking out for you.

Old-timers with uptime

What is the lifetime of an ABB robot? That's a question one Swedish engineering firm can't answer yet – four IRB 6 robots it installed in the early 1970s are still polishing bends today.

Text David Wiles
Photography Daniel Andersson

At Magnussons i Genarp AB, Mats Jönsson oversees four

A time-tested solution

- Robots: 4 x IRB 6, with S1 controllers
- Cycle time: 4–6 minutes
- Daily production: approximately 260 bends polished per robot per day
- Total production: around 7.7 mil lion bends since the mid-1970s

When ABB robots were first installed at Magnussons i Genarp AB's anonymous-looking building in the midst of rural southern Sweden, ABBA topped the charts worldwide, oil cost $13 USD a barrel and the world's population numbered 4 billion. Almost four decades and 7.7 million cycles later, the robots are still at it, picking up and polishing tube bends with a touch that seems almost human.

In 1973 Leif Jönsson, CEO of the family-run engineering firm Magnussons, came across an ASEA stand at an exhibition in Stockholm. ASEA, today known as ABB, was displaying the world's first electrically-driven, microprocessor-controlled robot, the IRB 6. Jönsson immediately saw the robot's productivity potential for his business and purchased one; today the workshop is still running, with three additional IRB 6s that Jönsson bought soon afterward.

Magnussons produces pipe bends for use in a variety of industrial applications. The company takes six-meter-long stainless steel tubes of various diameters, cuts them into sections and then bends them. The bending process is a closely guarded secret, but the result is a bend with no thinning or distortion of the metal. Magnussons customers include Alfa Laval and Tetra Pak.

The robots pick a bend from a vertical magazine that can hold between 12 and 35 units and carry it to a sanding belt. With what looks like the greatest of care, it moves the bend back and forth over the rotating belt, stopping after about a minute to set the bend down, gently pick it up from the other end, and continue sanding. Once sanded, the robot swings around to repeat the process with nylon brushes to give the bends a brushed finish. The whole process takes about four to six minutes.

IRB 6 robots that have been polishing stainless steel pipe bends for almost forty years.

The reasons for investing in robots, such as safer working conditions and higher productivity, are the same today. “This is dirty, monotonous, repetitive work,” says Mats Jönsson, who has worked at Magnussons since joining in 1980 at age 18. “It’s tough on the shoulders when done manually, and the women who did the polishing before the robots arrived would get injured over time.”

Mats estimates that a robot is about 25 to 30 percent more productive than a human. “An experienced worker could probably work as fast as the robot,” he says, “but robots don’t need breaks.”

Yellowing newspaper clippings from the 1970s kept by Magnussons carry headlines such as, “An employer’s dream-worker: no sleep, no holiday, never sick.” Another proclaims: “You have no chance: here is the robot that will put you out of a job.” Mats says, “Robots were new and revolutionary then, and some of the workers thought, ‘The robots are coming – we’re going to lose our jobs!’” But despite employees’ initial fears, no jobs were lost at Magnussons; the workers who had done the polishing by hand were put to work on other tasks.

Huge international demand for Magnussons’ bends in the 70s and 80s meant that four robots worked every day, all day. “My father would finish work at four, then come back here at 10 in the evening to fill up the magazines,” says Mats. “And the robots would carry on for another six hours. The only limitations on running them unassisted are that the magazines require filling up with new bends, and the sandpaper wears out and needs replacing.”

The S1 control systems for the robots are still running on the original cassette-based software. Says Mats, “There is no need to update the software because they’re still doing the same job as they were doing in the 1970s.

“And anyway,” he adds with a smile, “I don’t think we could because you can’t connect a laptop to the control system.”

Understandably, spare parts can be tricky to acquire; so far, the company has managed to track them down on the Internet. “Touch wood, we haven’t had to do many repairs,” says Mats. During the last six years, for example, the robots have only caused three stops.

After almost two million cycles each, the robots are still fairly low-maintenance. Mats just needs to check on them from time to time as he works with other tasks. He says of the robots, “They are worth their weight in gold.”

So how much longer can these robots keep going? Magnussons has no idea; but it plans to produce bends in the same way for years to come.

Quick makeover

L'Oréal needed to set up a new production line for hair color products as soon as possible. The highlight of the solution was a new robot with a tiny footprint.

Text Mark Cardwell **Photography** Mathieu Belanger


PCM

Packaging experts

PharmaCos has been offering turnkey packaging solutions to the pharmaceutical and cosmetics industries since 1998. For more information, and to check out one of the largest online marketplaces for used cosmetics and pharmaceutical equipment, visit **www.pcmachinery.com.**

From design to solution

After designing a 3-D model with ABB RobotStudio, it took Pharmacos' Sylvain Gauthier two months to build, assemble and test the new line. The solution integrates a Kalix cartoner system, an IRB 120 robot from ABB and an Allan Bradley programmable logic controller (PLC) to keep count and control input and output. To see the robot in action, visit ABB's video channel at **youtube.com/abbrobotics.**

The international cosmetics industry is a competitive, fast-paced business. When demand from hair salons across Europe skyrocketed in 2009 for L'Oréal's INOA – the world's first ammonia-free permanent hair color – the French cosmetics giant immediately made plans to ramp up production.

At the time, L'Oréal Canada's flagship plant in Montreal had two production cells that churned out some 150 million units a year of hair-coloring liquids and creams. The facility was asked to begin manufacturing large quantities of INOA in only four months.

"It was a huge challenge," recalled Guy Fafard, the plant's technical supervisor. "When we discussed it with our production manager, he said there was no way we could design and install a new production line in such a short period of time. He said it simply couldn't be done. But we had to find a way to make it happen."

Fafard turned to PharmaCos Machinery, a local leader for turnkey solutions in pharmaceutical and cosmetics packaging equipment that often does custom, needed-it-yesterday production projects for L'Oréal. Within days, the company's technological development director, Sylvain Gauthier, was walking the floor of the busy plant with Fafard to get a firsthand feel for the project.

Multiple considerations

"It was a complicated mandate," said Gauthier, who worked as a technician at the L'Oréal plant for 10 years before joining PharmaCos a decade ago. In addition to the tight deadline and the use of an explosion-proof tube filler (because INOA uses small amounts of alcohol in place of ammonia), the new line needed to be able to take tubes, put them in trays and load them (plus an instruction sheet) into a ready-to-ship package.

According to Gauthier, such a two-step, two-micro-stop cartoner pro-

L'Oreal and Pharmacos teamed up to increase production under extremely tight deadlines.

cess would normally be done manually. However, it was critical that the new line always keep moving, because a stop would cause the pressurized fill to overfill the first tube (due to the positive pressure in the reservoir). He also had to respect the plant's production philosophy of having only a single operator for small lines such as the INOA project. "My only option," Gauthier recalled, "was to design and build a new conveyor based on a 29-mm center-to-center tray and a small robot."

> "He said it simply couldn't be done. But we had to find a way to make it happen."

Gauthier decided to use one of the ABB robots his company had in stock. Initially he planned to go with the IRB 140, which has a 5-kg payload. But while talking to ABB Canada's robotics account manager, Pierre Lavallée, Gauthier learned that ABB was in the process of bringing a new, even smaller robot to market – the IRB 120.

"Pierre told me he had a demonstrator in Toronto that he could loan me right away to get our project started," said Gauthier. "Three weeks later, the robot was in our plant. It was a challenge to set it up and integrate it all and adjust it," said Gauthier. "But once we got it going, it worked like a charm."

Steady production

Designed to run at a slow speed because of the tube filler, the new system at L'Oréal began production in April, 2010 – almost four months after the order to build it was issued. Notably, the IRB 120 demonstrator ran for six months before it was replaced by a new model.

Robot benefits

- Small footprint to save space
- Quick to set up and begin production
- Easily accessible for maintenance

"It was an amazing accomplishment," said Fafard, who has since overseen the design and development of a second high-speed system (again with the collaboration of PharmaCos) that recently went into production to help meet the ongoing strong demand for INOA hair products in Europe. "It shows how important it is for a company in such a fast-moving industry as cosmetics to develop relationships with contractors who can respond quickly to our needs."

Package deal

When BDMO automated the final stage of its production process for Vivabox packaging, the production speed went up 20–35 percent.

Text Bob Emmerson **Photography** Ruben Keestra

The package is an important part of a product; after all, it's usually the first thing that prospective buyers see. Vivabox gift packages are distinctive, and in Belgium consumers know that they contain quality products. The packages have become so successful that they have become a brand in their own right.

Vivabox is one of packaging producer BDMO's largest product lines at its factory in Meulebeke Belgium. The manufacturing process of the actual box and its lid involves several stages, all of which are automated on various product lines. For example, the carton has to be cut, scored, folded and taped. After that, the relevant printed cover is applied – in other words, the cover that depicts the gift contained therein.

Until recently, the last part of the process was not automated. It involved inserting a thermoplastic tray, and different trays are used to hold different gifts. For example, one may be used to hold four miniature bottles of malt whisky, while another might hold coffee sachets, two cups and saucers.

These thermoplastic trays were inserted by hand because they are relatively thin – they flex, and the fit has to be tight. Up to that point of the process, automation produces 1,000 boxes every hour. That meant that up to seven people were needed to keep up with the flow of boxes, one every three seconds.

Could the insertion of the tray also be automated? That was the question BDMO put to Viscon, a local systems integrator after Daniel Callewaert, BDMO's Maintenance Manager, saw a roadside video wall that promoted their robotics and transport automation expertise.

BDMO requested offers from Viscon and a competitor. Viscon's winning offer proposed a 'pick-and-place' system that could handle 1,200 trays an hour. The tight fit problem was resolved by using the 6-axis functionality of ABB's IRB 120 robot; it inserts the tray at an angle before pushing it firmly down to the base and onto spots of glue.

The resulting solution now runs 16 hours a day in two shifts, and the personnel head count has gone down from seven to three. Needless to say, the cost savings have been significant.

> "The robotic solution gave us an immediate 20 percent boost."

The solution was fine-tuned after the initial trial, and this boosted the placement rate to 1,400 trays, thereby adding additional reserve capacity. Pieter Debucquoy, BDMO's Maintenance Coordinator, says, "The earlier production speed of 1,000 Vivaboxes was determined by the manual insertion process. The robotic solution gave us an immediate 20 percent boost, and after the fine-tuning we have the possibility to add an additional 15 percent." Ironically, the preceding part of the process has become the new bottleneck.

Looking ahead, BDMO will use robots to automate other production processes; for example, inserting one finished box inside another in order to reduce shipping costs.

BDMO Maintenance Coordinator Pieter Debucquoy says he is pleased with the dramatic increase in speed.

BDMO (Bruggeman & Desouter)

- BDMO produces more than 10 million packages a year.
- BDMO has 55 full-time staff at its Meulebeke facility. The company employs part-time workers during peak periods.
- The company manufactures a wide range of high-quality packages as well as creative packing solutions.

Cost savings on the new solution at BDMO Belgian plant have been as significant as the 20 percent boost in production speed.

The past three years have seen the demand for industrial robots in the food sector grow by an astonishing 300%.

Keeping it clean

Modern robot technology has provided food producers with a hygienic alternative to human hands.

Text Alan Spreckley **Photography** Perryman's

The modern-day food industry is both largely conservative and very diverse. Food producers have to respond quickly to consumer and retailer demands. What's more, vigorous food hygiene standards rightly require producers to pursue and achieve a hygienic production process; one preferably untouched by human hands.

For any food producer, potential contamination of their product is a nightmarish scenario that begins with astronomical recall and wastage costs. The subsequent loss of customer confidence adds to the disaster, with well developed reputations ruined overnight. Then there are the consequences of legal actions that might arise as a result of injury caused by contamination.

ABB's UK food segment manager, Alan Spreckley, feels that the time is right for players in the food sector to embrace robotics as a way to improve hygiene in their factories. "For consumers who buy the products, the risk of contamination needs to be lowered as much as possible," he says. "This can only be done by automating and removing human intervention."

Demand for industrial robots in the food sector grew by 300 percent since 2008, with units managing a wide range of production and handling tasks.

The majority of robots in the food sector tend to be engaged in picking, packing and palletizing operations. For suppliers and manufacturers of robotic automation, the challenge is to persuade food producers that the same benefits reaped from end-of-line processes are also possible in other areas of production, including hygienic handling.

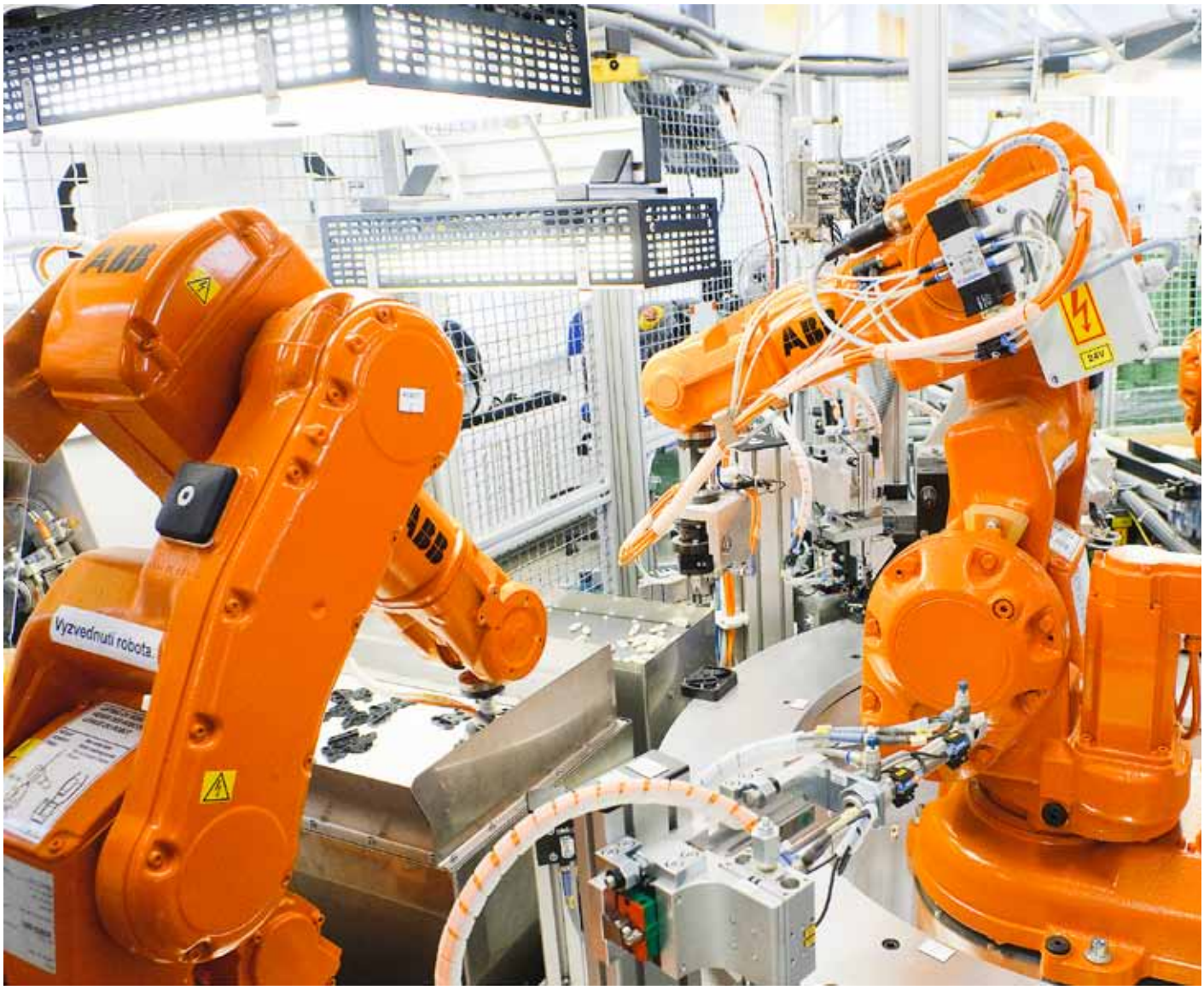
This change in perspective could be helped along through various initiatives. For instance, the European Hygienic Engineering & Design Group has published many best-practice guidelines and recommendations to comply with the increase of regulations and standards relating to the hygienic design of machinery for packaging and processing applications. Additionally, the EU has called on machinery suppliers to meet essential hygienic requirements for the handling of foodstuffs.

These initiatives have helped create robotics implementation companies focused on the hygienic needs of food producers. IGI Ltd is one such company, providing a wide range of food safety services – from creating the right processes to supporting companies through incidents or investigations to microbiological testing.

"Robots traditionally remove people from hazardous and unhealthy work environments," says IGI Managing Director Ian Greaves. "High repetition work invariably results in lapses in concentration. It only takes a split second for an accident to occur, and that can have long-term consequences."

Robots designed for food and beverage applications offer a highly hygienic and sanitary solution for food processing and primary packaging. They do not contract illnesses or have foreign bodies, such as hair or nails, which could fall into and contaminate food products.

The challenge for manufacturers now is to reassess their strategy in order to identify opportunities to exploit the hygienic advantages of integrating robotics into food and beverage operations. For applications where hygienic conditions are paramount, it's time to embrace the advantages that automation can bring.



Quality Czech

ABB Elektro-Praga employs robots to save on wages, boost production and raise quality levels.

Text James Drake
Photography Vladimir Weiss

When ABB Group bought Czech electrotechnical engineering manufacturer Elektro-Praga in 1993, it was lured by two major selling points: high-quality products and low wages. That's not surprising; Czechs have a long tradition of high-quality light engineering that was strong enough to survive 40 years of communism. But with the country's accession to the European Union six years ago, salary levels have been steadily climbing.

In 2009 Elektro-Praga (now officially re-named ABB Elektro-Praga) decided to install a new production line at its factory in the northern town of Jablonec nad Nisou, and the company could no longer rely on cheap human labor. Instead, it chose a production system that featured three IRB 140 robots from its sister company, ABB Robotics.

The IRB 140 is a compact general-purpose robotic arm powered by a high-performance control unit - IRC5. Each six-axis machine boasts quick acceleration and a high payload.

"Although it's small, the robot is exceptionally fast, accurate and powerful," says Petr Prade, Chief of Design at MMT, the system integrator firm that built the new production line. "It has one of the fastest cycle times of any articulated robot."

Elektro-Praga – which specializes in wiring accessories (low-voltage circuit breakers, switches and sockets, movable components and control products) – currently employs the new robotics installation for the company's Tango line of dual plug sockets. But in the near future, the company plans to use the same production unit for at least four other product lines.

"That'll present no problem at all," says ABB Robotics Senior Account Manager Vladimír Slabý. "It takes no more than 10 minutes to adjust the production line for another product variant. It's possible to change the variant up to 30 times per week, resulting in real 'production to order.'"

The production unit that MMT devised incorporates three Flea2 digital cameras – the ideal solution, Prade believes, for handling imaging applications such as high-speed assembly or semiconductor inspection. The cameras run on Cognex Vision Pro software, which supports the coordination of the robots and enables the arms to "pick and place" components at each point in the assembly process.

The line began serial production in November 2009. The robots, which only require one operator, work two eight-hour shifts per day. Cycle time is only 2.3 seconds, and the robots process 8,500 pieces per shift. (Before automation, each shift had up to nine people processing 950 pieces each.)

The IRB 140 robots have their own sophisticated control systems that allow arbitrary task programming. Any number and virtually any type of visual inspection can be included within the cycle by simply amending the robot and PLC programs.

"If there's a blockage or something like that, the computer screen will tell me precisely where and what the problem is, so the time that the system stands idle while I fix it is absolutely minimal," says operator Jana Dolková, who used to help assemble the sockets by hand before the robots were installed.

"And of course," interjects quality control inspector Petr Neuman, "unlike humans, the robots leave no fingerprints!"

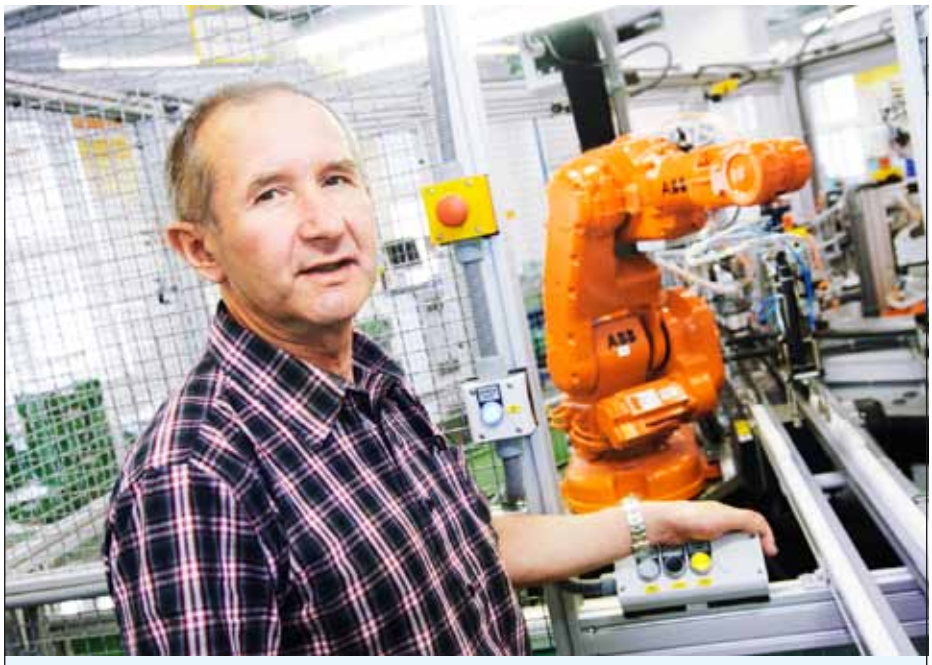
The IRB 140's flexibility has proved invaluable elsewhere in the production plant. "Some months ago, we experienced problems with the material feed on another assembly line for light switches," recalls Technology Department Manager Vladimír Růžička. "We solved this by using another IRB 140 linked to a vision system."

Now, Růžička says, the small metallic frames are being fed reliably. "And the line's output has been boosted by 15 percent – just by using a single robot!"

In fact, the robot's adaptability (not to mention its speedy turnaround capacity) is just one reason for the IRB 140's popularity all over the world. Another is its ease of use: Once the software has been configured, operators only need a few hours' training.

"For multiple operations, six-axis robots are always the best way to go," says Prade. "We favor the IRB 140, as it is easy to re-use in any future installation."

But according to Slabý, the clincher is the compactness of the robot, which allows it to fit into a very small space, or even another machine. "If you can save space, you save money," he says. "And after all, saving – and making – money is what this robot is all about!"



MMT

Czech systems integrator MMT offers comprehensive services in the area of mechanical engineering and robotic automation for all branches of industrial production. Based in Jablonec nad Nisou, the company supplies components, machines and equipment to a range of companies, from small operations to such large concerns as Siemens, Lear and Bosch.

Since it was founded in 1996, MMT's work has spread to Switzerland, Germany, Poland and other Central and Western European countries. Services come with a standard two-year guarantee, and MMT troubleshooters will visit clients' operations within 24 hours to personally attend to any problems.

IRB 140

- ABB's smallest six-axis robot, the IRB 140 has a payload of 6 kg, a spherical reach of 810 mm that is 360 degrees rotational, fast acceleration and a large working envelope.
- It can be suspended, wall-mounted or floor-mounted at any angle, permitting flexible, easy and cost-effective integration with process equipment.
- Open software language and system configurability allow for adding new functionality.
- All mechanical arms are IP67-protected.
- The Collision Detection option with full path retraction makes the robot reliable and safe.
- TrueMove second-generation technology ensures accuracy for path, position and speed.

Light work

For Delsbo Candle, producing more than 100 million candles a year would be impossible without the accessibility, usability and error handling provided by robots.

Text Mats Lundström **Photography** Phillipe Rendu

Some materials are difficult to handle in industrial production. Despite its many beneficial attributes stearic acid, or stearin, is one such material. The saturated fatty acid requires at least 58 °C so as not to solidify, and often lies like dust on everything at factories that use it in production.

This has not stopped Delsbo Candle from becoming one of the major producers of eco-friendly candles using stearin. With corporate giants such as IKEA, ICA, Duni and Clas Ohlsson as clients, the company has managed to quickly take a firm grip of the eco-candle market share. “A key reason for this is that we were the first candle maker with the Swan ecolabel,” says Delsbo Candle CEO Torbjorn Jonsson during a tour of the company’s factory. “Getting to where we are now required a pretty big conversion with massive process changes; for example, starting to use eco paints. Clearly, though, it was a step in the right direction for us and the environment.”

Unlike light paraffin – which is a petroleum product – the liquid raw material in the production of stearin is primarily animal fat, which is renewable. Stearin candles emit a limited amount of soot and chemicals that are hazardous to human health and the environment.

Delsbo Candle has five production lines, each managed by an operator. Each line contains a large ‘carousel’ in which the wicks of the soon-to-be candles are steeped. The carousel spins slowly so the candles can solidify before they are extracted and whisked over to ABB robots on the packaging line.

The company started using its first packaging robot in 1996, which primarily picked up newly steeped candles from the line and placed them into paper cartons. In 2010, the production line was completely renovated. “During the line upgrade, reliability was prioritized,” says Jonsson.

Front Automation, the systems integrator responsible for building the new robot cells at Delsbo Candle, knew that Delsbo Candle’s accessibility requirements were extremely high. The systems integrator installed the cells for two IRB 140 packaging robots and an IRB 260 for palletizing; they also provided training to Delsbo Candle’s employees. “The operators at Delsbo Candle have an impressive machine to take care of, but you can’t expect them to be robotic technicians,” says Thomas Rosell, CEO of Front Automation.

Jonsson emphasizes that the robots are not meant to replace employees, but to improve productivity. ABB robots save time and have helped to raise the quality of working life for Delsbo Candle’s employees.

“Our workers’ competencies lay in the production of candles,” says Jonsson. “Robots free up our operators’ time that they then use to run the machines and work on improvements.” According to Jonsson, new robot cells and a number of other improvements have increased productivity at the factory by more than 30 percent.

Production of environmentally-friendly stearin candles has been a booming business for Delsbo Candle.

Delsbo Candle

Delsbo Candle opened in 1944 under the name Norrländska Ljusstöperiet. By the end of the 1950s the company’s name changed to Delsbostintan, and by 1984 it was purchased by Duni AB. After the buyout, the factory underwent a comprehensive modernization process that resulted in significant efficiency upgrades. Olle Skog, who had been the site manager since 1982, eventually took over the company along with Anders Hagberg. Today they have about 35 employees, and mainly produce antique eco-friendly stearin candles.

In safe hands

A Swedish dairy automates a cheese packing line with four small robots, saving money and sparing workers repetitive strain injuries.

Text David Wiles
Photography Svante Örnberg

Arla Foods

- Production in 13 countries and sales offices in another 20
- Sells products in more than 100 countries
- Brands include Arla, Lurpak and Castello
- Amount of milk processed in 2010: 8.7 billion kg
- More than 16,000 employees
- Turnover in 2010: 6.6 billion euros

At dairy giant Arla Foods' factory in the small Swedish town of Götene, the repetitive work of packing cheese into boxes on Line 21 was taking its toll on the workforce. Plucking a block of plastic-wrapped cheese off a conveyor belt and putting it into the correct position in a box at the rate of nearly one per second caused such high rates of repetitive strain injuries that this particular part of the factory had been labeled a "red" workstation, a designation for areas with elevated health and safety risk.

"This is high-speed, repetitive work, and it led to injuries which in some cases were permanent," says Thomas Johansson, project manager at Arla Foods. Determined to take steps to protect the health of its workers, Arla Foods brought in engineering company Graniten to come up with an automated solution to take the strain off its employees.

Replacing workers with an automated solution would not be straightforward because of the limited space available. "We needed machines with a very small footprint that could nonetheless handle a high flow rate," he says. The robots would also have to deal with packing the cheese into both cardboard boxes and returnable plastic crates that have different dimensions and have to be packed differently. "So our demands were for a pretty sophisticated solution," says Johansson.

Graniten, based in Uddevalla, Sweden, has been supplying Arla Foods with specially designed machines since the mid-1990s, most of which have replaced manual product handling. "The basic idea was to create a better and safer working environment," says Martin Krewer, project manager at Graniten. "Our solution was to design a system with two operation levels: one for the crates and

Top: High-speed, repetitive work was switched over from humans to robots, eliminating the risk of repetitive strain injuries.

Left: The six-axes functionality of these robots makes them the perfect tool for picking up cheese from three different angles.

Robot benefits

- Capacity: 90 cheese units per minute
- Cycle time: 2.6 seconds per robot
- 16 man-hours saved per day
- Repetitive stress injuries eliminated
- Two-year payback

boxes and one for the cheese." Cheese comes in on the upper level and is distributed evenly to the four packing cells, each built around an IRB 120 robot from ABB. The cheese can be picked up from three different angles allowing the robots to pack all the different patterns required.

Krewer says that one of the main reasons that Graniten chose the IRB 120 – ABB's smallest-ever multipurpose industrial robot – was its six axes of movement. "That gives you tremendous flexibility and allows you to do exactly what you want," he explains. "And because of the robot's small size and low weight, we could wall-mount it above the line for better access to the packing boxes. We have been working with ABB robots for several years, and they are always well-tested. Their reliability is excellent." (The Arla Foods facility in Götene had already been using two IRB 340 and two IRB 360s.)

Prior to construction, Graniten used ABB's Robot Studio simulation program to simulate the cell and optimize the placement of robots for the shortest possible cycle time. The solution is controlled by ABB's IRC5 compact controller to ensure predictable and high-performance motion. Graniten provided about 50 hours of training to Arla Foods staff, and the 30 people who took part included electricians, mechanics and several of the operators who had previously packed the cheese by hand.

> "The basic idea was to create a better and safer working environment "

With a total footprint of just 7.5 m2, the four robots pack 90 units of cheese per minute – the same number of cheese that two workers did before. They are in operation from 6 AM to midnight, the equivalent of two shifts per day. One person is required to monitor the robots per shift, so about 16 man-hours are saved per day. And, most important, there are no more repetitive strain injuries on Line 21. The payback time is estimated to be about two years.

Johansson declares himself well-satisfied with Graniten's solution and adds that the workers who are now monitoring the robots rather than packing cheese by hand welcome the fact that they are no longer exposed to potential injury. He says, "The robots can't do everything that a person can do on this workstation, but they can certainly do 98–99 percent of the job."

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