PACKAGING

A MAGAZINE FROM **ABB ROBOTICS**

JUNE **2007**

SWEET SOLUTION FOR CANDY PACKAGING

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Salami snacks get the robotic treatment at Unilever in Germany

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Paper stacked with finesse for SCA in the U.K.

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ABB

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Editorial

> It's no secret that industries that produce consumer products are becoming increasingly sophisticated when it comes to automation. And as these industries up their use of robots, we see new trends emerging that affect production. High hygienic requirements with machinery having direct contact with the naked product, for example (see story p. 4). Or changes in warehousing that call for automated palletizing (see story p. 28). In order to meet these changing needs, three elements are key: sophisticated robots, sophisticated gripper technology and sophisticated software. ABB knows how important it is to provide these elements, working as a team with system integrators, machine builders and component suppliers to develop overall solutions, as well as coming up with ABB's own solutions, such as the innovative new ABB Panel Mount Controller (see story p. 22). I hope that this issue of Packaging gives you ideas and inspiration for your own future automation.

Frank-Peter Kirgis
Segment Manager, Consumer Industries
ABB Robotics

The pharmaceutical industry is facing new pressures as it continues to change and adapt to the needs of today. Growth is shifting from mature to emerging markets, such as China, Brazil and Turkey. While new products are constantly under development, it takes a long time to get them to market because manufacturing solutions are typically specialized one-offs that are expensive and often prone to break downs. There is huge potential to remedy this with robotics. What pharmaceutical companies need are solutions that will provide superior uptime. They need flexible solutions with short changeover times – robots that can easily adapt to new and different products. In this issue of Packaging, we hope to show you solutions – such as IMA's dropper packaging (see page 24) – that you can learn from, whether you work with pharmaceuticals or any other consumer product.

Bengt Stom
Segment Manager, Pharmaceutical
ABB Robotics

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Calendar

2007

12–14 June
Packaging China
Shanghai, China

19–21 June
P-Mec China
Pudong Shanghai, China

20–22 June
Pharma Pack Japan
Tokyo, Japan

26–29 June
Pharmapack
Moscow, Russia

25–27 September
FachPack
Nuremburg, Germany

26–28 September
PPMA
Birmingham, U.K.

2–4 October
P-Mec Italy
Milan, Italy

15–18 October
PackExpo Las Vegas
Las Vegas, U.S.

13–15 November
FoodTech/ PharmaTech
Herning, Denmark

13–16 November
Europack-Euromanut
Lyon, France

Changes for Chinese tobacco

> The tobacco industry is one of the major revenue generators of the Chinese government with production and sales volume accounting for a third of the global total and annual realized taxes and interests over RMB 240 billion. Facing severe challenges from the global market, the Chinese tobacco industry has at the same time understood the need for higher production efficiency, lower costs and optimized enterprise competitiveness.

Aimed at addressing the high labor intensity and low efficiency of hand operation and poor automation of carton handling in the current Chinese tobacco industry, ABB has provided a variety of automation robot products for over 15 domestic cigarette factories such as Honghe, Yuxi and Qingdao. Solutions include finished product stacking and destacking, auxiliary material combination, robotic carton overturn and robotic tobacco shred unpacking.

In the China Cigarette Factory, one ABB stacking robot allows automatic stacking for 3 different brands product at one time. For domestic productive cigarette factories which require higher degree of automation, ABB developed a tobacco shred unpacking robot solution to replace unpacking equipment that had a big footprint, many equipment points, a high failure rate and inconvenient maintenance in the current market. ABB is making a complete range of efforts for sharpening competitive edge of Chinese tobacco industry.

Second Packaging Forum planned for Pack Expo

> For those working with consumer goods packaging, Pack Expo Las Vegas 2007 will be one of the biggest events of the year. Some 22,000 visitors and 1,200 companies are expected at the event, which runs October 15-17. ABB's stand - No. C-4017 in the center of the hall - will feature the introduction of the next generation of product-handling technology.

ABB will also be running its own Global Packaging Forum in conjunction with Pack Expo, from October 12-13 at the JW Marriott Hotel in Las Vegas. With speakers such as Marylin Matz from Cognex, Peter Marks from Foodmach and Bill Cairns from BMC Group, the Forum will explore future trends and benefits of robotic automation in the packaging industry.

Topics will range from global growth for robotics in packaging to the specifics of improving productivity through new gripper technologies. The Forum will also explore the impact that packaging now has on fiercely competitive consumer industries, such as food, beverage and pharmaceuticals.

The Global Packaging Forum gives decision makers, end users, system integrators and key industry leaders a chance to network, share experiences and facilitate business. For more information about the Forum, contact Margareta Zeicu at margareta.zeicu@se.abb.com.

PACK EXPO

By Holger Walch
Photos Trio Group

Salami under control

High-speed robots with specially developed grippers make sure that salamis are packaged at the highest cycle rates at Schafft/Unilever's plant in Ansbach, Germany.

> Since 1972, Bifi salami has been a mainstay in the German snack market. A product of Unilever, Bifi salamis had long been manufactured in the Bavarian town of Anspach, with certain aspects of the production done manually, such as insertion of the salamis in the rollstock machine manually. Then in 2006, the company made the switch to an automated solution with IRB 340 FlexPicker robots from ABB using gripper technology to take the six different sausage types from the conveyor belt and insert them in a rollstock machine.

Unilever commissioned robomotion GmbH from Stuttgart to plan and design the automation solution. The aim was to use a rollstock machine to its maximum capacity with the specified dimensions. The automation solution had to be ultra flexible so that six different products could be packed with one system and so it could be retrofitted for future products.

Robomotion's task was made more difficult because the customer placed stringent requirements on the precision and reliability of the insertion process – not to mention major deviations between the products. By planning and processing the project in partnership, it was possible to install and commission the entire system at Unilever within 10 days.

The mechanical gripping technology helped to increase the process reliability sharply, thus raising the production volume per robot. Increasing the speed of the handling process also increases the risk of product loss. This is where the positive fit principle of mechanical grippers comes into its own.

Not only can the physical loads lead to a high level of material loss, but also to a large number of empty lifts. Subsequent processes are also affected, for instance when packages are heat-sealed empty and have to be separated at the end of the process, or when packaging machines fail because the objects fall uncontrolled into the machine, causing disruptions and stoppages.

The mechanical grippers offer benefits over other technology because the positive-fit grip makes it almost impossible to drop the item, even at maximum accelerations and speeds. Picking and placing is carried out with great precision.

>

Using IRB 340 FlexPickers with specially designed grippers from Schunk, Bifi salami is picked more efficiently and with less waste.

Unilever chief engineer Carim Gad, left, with the team from robomotion and ABB.

Unilever wanted to increase the packaging machine's production and therefore turned to robomotion in the summer of 2005. This specialist in high-speed handling for hygiene-critical areas determined which streamlining measures could be used and how process reliability using mechanical grippers could be improved compared with previous technology.

Says Unilever project manager Torsten Rütze: "We were convinced by robomotion's technology. Thanks to the performance data produced there was no problem justifying the new investment. The tailored integration into our production environment saved us both time and money. The methodical approach and the safety procedures undertaken in each phase of the project reassured us that we had chosen the right supplier."

Working closely with Schunk, a firm specializing in gripper technology, the company first carried out a study and a pilot test in the laboratory. Robomotion demonstrated that the required cycle times could be achieved with a mechanical gripper solution while simultaneously increasing the process reliability. It was also possible to comply with the required food and hygiene regulations.

"As they were using tried and tested kinematics, the developers from robomotion and Schunk concentrated primarily on the process-oriented functional prototype, the drive and on optimizing the grippers," says Jörg Herrmann, who headed the project at Schunk on behalf of branch management. "Together we expanded on the original double gripper, adding a third gripper and a third lifting unit, and finally optimized the weight of the robot as a whole. This technology enabled us to come online in February 2006."

After working three shifts for six months, the principle developed had proven its capability. Thanks to the excellent planning, it was possible to cut back on one robot, thereby achieving an improved price/performance ratio for the system.

By running the packaging machine at full capacity, Unilever has been able to increase performance by up to 25 percent.

"With the new system, we're running the packaging machine at full capacity, giving us a performance increase of up to 25 percent compared with manual loading. The ability to cover peak loads is of particular interest. For example, in the run-up to the Football World Cup, special production shifts were operating at the weekend. This alone gave us a competitive edge, enabling us to deliver Bifis to our customers on schedule," says chief engineer Carim Gad.

IRB 340 FlexPickers operate at high speed on the Bifi packaging line. For the first time, the ABB production robots have been fitted with the triple gripper which is able to pick up three randomly positioned sausages one after the other from the conveyor belt in one process step, and place them individually in the rollstock machine. The positioning and location data required comes from an upstream image processing system which is in a position to capture the information relating to the individual sausages and pass it on to the master computer.

Jan Binder, technical director at robomotion, goes into detail about the further technical intricacies of the system. "The software we've developed enables an optimal supply of positioning data from the image processing to the robots, so the utilization ratio is planned optimally. Moreover, a system concept could be achieved which saves a lot of space and exhibits a high power density."

"This high-speed technology is not only of interest in the foodstuffs sector, as it can be used anywhere where small items have to be handled at high speeds, for example, in fast assembly and mounting processes," says Andreas Wolf, director of robomotion with responsibility for sales and preliminary development.

The high speeds open up new prospects for cost-effectiveness as the parts do not have to be pre-arranged or placed in magazine feeders, but can in effect be randomly placed on the conveyor belt, like bulk goods, and gripped there at high speed.

>FACTS

Efficient and flexible system

The new picking system from robomotion uses IRB 340 FlexPickers with grippers developed by Schunk. The system used for picking and placing Uniliver Bifi salamis offers a range of benefits, including:

- **A 25 percent increase in production**
- **Efficiency is so great, a robot was eliminated from the process**
- **No pre-arranging or pre-placing of the salamis prior to picking is necessary**
- **Flexible system thanks to software, image processing, rapid kinematics and angle grippers, which allow for quick switching to picking parts with new dimensions**
- **Read more about Schunk at *www.schunk.de***

The FlexPicker IRB 340 can handle up to 130 different product variations, including bags of 50 grams to one kilo filled with candies of all different shapes, from square to egg-shaped.

Meeting the chocolate challenge

Since 1913, Zaini has been producing chocolates for the Italian market. Today, the sweets are no longer made by hand, but they are just as carefully handled by robots

By Claudia B. Flisi
Photos Maurizio Camagna

> The Hollywood version of Willy Wonka's chocolate factory is far removed from the realities of contemporary candy manufacturing, but Willy Wonka might find some things in common with the Zaini S.p.A. chocolate and confection plants in and near Milan, Italy. For one thing, Willy Wonka's phantasmagorical sweets sprang from ingenious contraptions operated by his workforce of Oompa Loompas. Luigi Zaini's original factory, established in 1913, produced hand-crafted chocolates, cocoa and candies, but as the business grew, machinery was incorporated to help employees meet the growing demand.

Willy Wonka's product mix included inventions such as ice cream that never melts or chewing gum that never loses its flavor. Zaini produces a vast range of chocolates, confections, sugar-free candies, and seasonal items (such as Christmas candies, Valentine hearts and Easter eggs) at its two plants in Milan and Senago, Italy. In the economic boom following World War II, the company's production expanded through the creation of candies and chocolates enriched with vitamins and minerals, authorized by the Italian Ministry of Health.

Today the Zaini factories might not look out of place in Willy's Wonkavision Room. For example, at the Senago plant, the ABB FlexPicker IRB 340 has been working since 2005 to organize and box a wide range of bagged candies and chocolates. The IRB 340 >

Zaini technical specialist Dario Stringhetti checking the details of the packaging of the candies.

has an almost otherworldly ability to "see" up to 130 different product variations and adjust its activity accordingly, with minimal human supervision.

The FlexPicker came to Zaini at the recommendation of PRB Packaging Systems, specialists in end of line machinery and solutions, based in Bologna, Italy. "Zaini asked us to develop a system to handle a vast range of their products for packaging," recalls Agostino Biagini, a partner at PRB. "The system had to be flexible, easy to operate, and easy to modify, since the products and boxes for shipping change very frequently. This made the assignment especially difficult."

"We sell to supermarkets and retail outlets such as bars, and both are highly competitive markets," explains Amerigo Pallanti, factory manager for Zaini.

In competitive markets, even a small cost or effi-

"We expected a lot from this machine, and we got everything we expected."

Amerigo Pallanti, Zaini

>FACTS

Benefits

- Speed – can handle 90 50-gram packages a minute and 35 one-kilo packages a minute
- Flexibility – programmed to handle 40 different product formats and a total of 130 items
- Quality control – the telecamera can "see" open bags and alerts the operator so they can be removed before shipping
- Optimizing resources – frees up personnel to take on more challenging, less monotonous tasks.

Zaini

- Founded in 1913 by Luigi Zaini in Milan, Italy
- **Four product ranges:** chocolates, confections, sugar-free candies, seasonal items
- Produce 5,500 metric tons of candies and chocolates per year.
- Since 1918 headquarters have been located in via Imbonati 59, Milan, Italy
- Zaini's focus on quality officially recognized in 2005 with ISO 9001 certification
- Today's president is Luigi Zaini, grandson of the founder, the third generation of the family to run the company.
- 170 employees
- Sold in 44 countries.
- Read more about Zaini at *www.zainispa.it*

ciency advantage can be determinant in holding or winning share. An additional consideration for Zaini is the seasonal nature of the candy business, with huge volumes between September and December, less so for Valentine's Day through Easter, then tapering off till the following September. Flexibility on the production line means employees are free to handle more demanding assignments.

The proposed solution had to be reliable, flexible, precise, adaptable, and easy to operate, with equipment sensitive to changes in product format according to Biagini. PRB came up with a combination of the FlexPicker and its own F-30 vertical case packaging machine, capable of dealing with products that – when they arrive at this phase of the production cycle – are not always aligned on the production line but follow each other in a determined distance.

The biggest challenge for ABB, PRB and Zaini was to ensure that the robot could handle up to 40 formats and 130 different iterations: Zaini's range of bags holds from 50 grams to one kilo of chocolates or sweets, the bags' contents have different sizes and shapes (e.g., small squares, rounded eggs, hard candies), and there are different-sized packages for shipping and display, depending on the content and weight of the bags. In addition, "the formats change every day," observes Dario Stringhetti, a technical specialist at Zaini.

As the pre-bagged items roll down the production line, a telecamera "sees" the format and pre-disposes the robot to the proper activity so it can sort and place items in the appropriate containers. The camera is deliberately not mounted on the robot arm to prevent damage to the camera as a result of vibration from the robot's movements.

The IRB 340 proved equal to the chocolate challenge. It can handle 90 50-gram packages a minute and 35 one-kilo packages a minute, working two shifts (16 hours) a day, five days a week. Before the FlexPicker, no "pick and place" robot had ever taken on this level of complexity in a food or confection line. "The robot could go even faster but we don't do that for logistical reasons," notes Stringhetti.

"We expected a lot from this machine, and we got everything we expected," summarizes Pallanti.

Text and photos
by Anne Hammarskjöld

Global Packaging Forum

Vision for a bright

Robotics meets Packaging was the theme for two memorable days in Munich on November 8-10, 2006. Integrators, manufacturers and end users from four continents gathered to learn more about the current possibilities and future development in the food, beverage and pharmaceutical industries.

> The forum attracted delegates from 20 countries and four continents. Its topics covered a range of issues, including gripping technology, the future of robotics in packaging and advanced packaging solutions, among others. Per Stefan Gersbro from the International Packaging Institute spoke on the importance of environmentally friendly solutions for packaging integrity. It pays off in more ways than one to keep the environment in mind, he noted.

"Studies clearly show that companies that invest the most in recyclable packaging solutions also are the most profitable. Sure, the initial development cost of such packaging may be higher, but the return of investment is quick and highly profitable," Gersbro said.

Gersbo points out that the trend towards increasingly older populations in the West creates new demands for the packaging industry. Among other things, it's become ever more important that packaging is easy to open, for example for those with arthritis. Another important group behind the development of packaging solutions and material are the big grocery chains. Sainsbury's and WalMart are some of the private labels that push actively to meet customers' demands for hygiene, longevity and low prices. But they're not alone. The packaging industry as well supports the development of products that can meet the challenges of improving design, logistics, technology and materials, distribution and exposure, not to mention meeting environmental demands.

"The forum has been excellent. I would especially like to mention the high level of the presentations. It has also offered a good chance to network with established and new connections.

"I'll take a lot of new knowledge back home to present to my company. I have no doubt the forum will result in interesting new business possibilities."

David Hopper, RTS Flexible Systems, Great Britain

Vera Fritsche from VDMA painted a fact-filled picture of Germany as the world's biggest producer of packaging machinery. They meet some 34 percent of the markets needs. And 42 percent of all of the world's packaging machinery is bought by European companies. VDMA's numbers were given an added dimension by Klaus-Peter Ruf's presentation. The highly respected CEO for Transnova Ruf, he explained that under the past 15 years the number of robots in Germany has increased from 30,000 to 200,000. And the development shows no signs of slowing if you look at Europe in general. At the same time as competition from low-wage countries is rising, the use of robots in Europe is also rising. Meanwhile, as the demands increase, robots are becoming cheaper and faster. If the 1990 price would be given at 100 percent, the price in 2000 is 60 percent of that, and the number is expected to continue to shrink, with a projected price in 2020 of 30 percent of the 1990 price level. Similarly, robots are 60 percent faster today than they were in 1990, and by 2020 they should be double the speed of 1990's robots.

In his presentation, Ruf pointed out the rapidly growing importance of automation with flexible robots."More efficient production is the only way to meet the rise of labor costs, global competition and decreasing life cycles of consumer products."

Andreas Wolf came from robomotion and Ralf

future

"This has been a very interesting couple of days, among other things for presenting new trends within gripping technology. Advantages in costs and hygiene are, for example, some important factors to discuss in relation to each other. In short, this is a very good way for the industry to meet. I've learnt a lot and enjoyed myself at the same time."

Per-Stefan Gersbro,
International Packaging Institute, Switzerland

"This has been a very good conference, with unusual depth in the presentations. Further use of robots came through loud and clear. There are also a lot of people to get to know.

The forum has been a perfect way to mix business with pleasure,"

John Tonkes,
CEO of Hot Melt and Packaging Systems, Australia

The Forum provided a chance for key players in the packaging industry to discuss the challenges they face every day on the job.

Between sessions there was plenty of opportunity for networking among the attendees. Or just time to process all the information.

>FACTS

Program – Global Packaging Forum 2006

- **Future in Packaging**
  Per Stefan Gersbro, International Packaging Institute
- **German Packaging Machinery Industry**
  Vera Fritsche, VDMA
- **Future of Gripper Technology**
  Andreas Wolf and Rolf Steinman, Robomotion GmbH & Schunk GmbH
- **The Successful way of Robotics in Packaging**
  Michael Mölzer, Skinetta
- **Vacuum Technology for Robotics in Packaging**
  Volker Schnell, J. Schmalz GmbH
- **Future of Robots in Packaging**
  Klaus-Peter Ruf, TransNova Ruf
- **Robots in Packaging**
  David Hopper, RTS Flexible Systems
- **Partnering in Packaging – Arla Foods, SCA Packaging and ABB**
  Lars Siemen, ABB
- **Energy instead of stress**
  Sabine Schonertz-Hirz
- **Visit at robot installation**

Steinman represented Schunk, one of the world's leading developers and manufacturers of grippers. They described the challenges of developing grippers for the foodstuffs industry, since handling baked goods, meat, fish and fruits and vegetables is very different from handling of sheet metal, for example.

Weight and gripping pressure was a recurring theme among speakers. Among others, Volker Schnell from J. Schmalz GmbH returned to the subject during his presentation on vacuum technology within packaging. Schnell said that vacuum technology has a strong future, because "a wide variety of objects and products require combinations of gripping technologies."

If Germany is the world's most automated country, England has a ways to go when it comes to comparable production capacity. David Hopper from RTS Flexible Systems reported on the challenges awaiting the British foodstuffs industry on its way to ever more automated manufacturing. According to a recent study, the majority of industries have plans to invest in automation during the next 2-5 years. One should keep in mind that the foodstuffs industry accounts for 15 percent of the country's manufacturing companies, he said. This means there are big changes – and investments – on the way. But automated production solutions need to make a return on the investment in 1-4 years in order to sell them to chief financial officers.

No more gumming up the works

By James Allen
Photos IstockPhoto, HMPS

Wrigley's in Australia uses robots to lower labor costs and improve flexibility in producing its world-famous chewing gum.

> Wrigley's chewing gum has been popular among the world's gum chewers for more than a century. The company, which was founded in 1893, has long had a presence in Australia, where it first opened a factory in 1915. But while the company's original chewing gum flavors such as Juicy Fruit and Spearmint have changed little in the century since they were introduced, manufacturing has obviously undergone a revolution.

In 2005, Wrigley's in Australia started to look for automation solutions to address issues such as high direct labor costs, health and safety risks associated with manual handling and restricted floor space. Solutions had not only to address these issues but had to be flexible to accommodate change in product and packing medium, be low cost and easy to maintain and be economically priced as a capital purchase.

In response, the company invested heavily in a plant in Sydney which services the Pacific market. The new facility was designed, manufactured and commissioned by Hot Melt & Packaging Systems (HMPS) Pty. Ltd., which is a leader in robot application technology in Australia.

As Wrigley's and HMPS engineers worked on this project, it became obvious that the conventional case packer approach first considered was not going to deliver the goods in meeting all the required parameters. In particular, it could not supply the required flexibility to introduce new products quickly and cost efficiently. The team finally decided to go for a solution which combined the adaptability of robotics and the packaging know-how and experience of HMPS. The decision having been made to go the robotics route, Wrigley's and HMPS designers and engineers were able to come up with a layout and design to do the job.

The proposed installation consists of six robot packing cells operating in two groups of three. The task for each cell is to erect a carton, pack into the carton the requisite quantity of Wrigley's products and push the loaded carton onto an out-feed conveyor which takes the product from the group of three cells to an elevator and eventually through to a carton sealing unit.

Each cell contains an ABB IRB 2400 robot, which takes a blank regular slotted carton (RSC) from the magazine by means of a vacuum head, squares the carton and places it on a holding station. The robot then takes the product off the in-feed accumulation conveyor and proceeds to pack the carton until full. Once full, the carton is transferred using the robot head out onto the common out-feed conveyor. A floating operator is all that is necessary to keep all three carton magazines filled with RSC blanks for each of the robot cells.

Wrigley's gave HMPS the go ahead for the project in November 2005 with a required completion date for installation in mid 2006, which was achieved by HMPS. According to Ross Hannaford, engineering manager at Wrigley's, the company has been delighted with the results and has found the process of installation and commissioning to be comparatively painless. Says Hannaford: "The close cooperation between Wrigley's, HMPS and ABB has been instrumental in achieving an installation which went very well, and is on track to meet or exceed all its performance parameters."

HMPS is Australia's leading domestic producer of special purpose automated packaging solutions. It has been around for nearly 20 years and in that time has accumulated a vast amount of knowledge in the field of manipulating cardboard for packaging purposes, which founder John Tonkes wryly calls "cardboard engineering." Says Tonkes: "Cardboard is a difficult and inconsistent material which is consistent only in its inconsistency." Manufacturing tolerances in cartons as supplied by the manufacturer are wide enough to drive a bus through and packaging machinery must cope with that to be successful, he says. Tonkes is acknowledged to be a "cardboard engineer guru" within Australia.

The success of the project is undoubtedly due to a combination of a demanding customer who had the courage to be innovative, a supplier in HMPS who understands packaging and robot applications, and of course reliable and robust robots. Between them, they ensured this new installation did not gum up the works.

>FACTS

About HMPS

Hot Metal & Packaging Systems is a specialist in the development and manufacture of high-quality machinery for the automation of the carton packaging processes. The company specializes in custom-made solutions produced at short notice. HMPS has some 34 employees and exports approximately 30 percent of its production outside Australia. Read more about HMPS at *www.hmps.com.au.*

About the Wrigley Company

The Chicago-based Wrigley Company is the world's largest manufacturer of chewing and bubble gum and home to some of the best-known brands in the world. The company's Australian headquarters and factory are in Asquith, NSW. The company has 14 manufacturing factories worldwide: four in North America, four in Europe, one in Africa, and five in the Asia/Pacific region. Read more about Wrigley at *www.wrigley.com.*

Why robots?

With the help of HMPS, Wrigley's in Australia has used robots to improve production with:

- **Flexibility that can accommodate change in product and packing medium**
- **Easy maintenance**
- **Lower direct labor costs**
- **Better health and safety environment for workers**

By Tim Mansel
Photos Paul Harness

Talent for stacking paper

When paper company SCA decided to automize a manufacturing plant in the U.K., it decided to take the automation all the way to the end of the line: palletizing.

> Paper conversion is the name of the game at the SCA factory in Skelmersdale, a small town in the north-west of England, not far from Liverpool. The paper is delivered to the factory gate from the paper mill as mother reels, and leaves as toilet paper, hand towels or one of hundreds of other articles SCA produces in Skem, as everyone there calls the town.

Three years ago the company decided to create a new production hall in one of its mother reel stores, where the paper is stored on end, dwarfing everything around it. The plan was to build a fully automated manufacturing plant for their Away-From-Home products - paper products designed for industrial use, in public washrooms, for example, or garages. Part of the plan included fully automated end-of-line palletizing, complete with wrapping and labeling facilities. "It doesn't make much sense to have a fully automated manufacturing hall if you have people stacking boxes at the end," says SCA project engineer Tim Walsh.

Fully automated means robots, and for a specialist solution SCA turned to Langhammer Maschinenbau GmbH, experts in the field, based in Eisenberg, near Frankfurt in Germany. The result was a fully functional paper conversion plant comprising 10 production lines, each of which can be configured to carry any of SCA's vast array of products, and a palletizer comprising seven robot cells together with pallet wrapping and labeling facilities.

Langhammer supplied seven IRB 6650 robots from ABB for the project, complete with standard software, each equipped with its own handheld control unit, ABB's FlexPendant.

The robot cells are laid out along an 85-meter rail sunk into the factory floor, along which runs a shuttle car that delivers stacks of empty pallets to each cell, picks up the full pallets and drops them onto a conveyor, the "backbone," which takes them on to the wrappers and labeling machine at the end of the line.

"The sunken track is a benefit as is the laser protected shuttle cart," says Tim Walsh, "because it means the access throughout the hall is unimpeded. That creates good access to the whole production area, while keeping personnel safe due to the control systems on the cart." The track runs along a broad yellow band painted on the factory floor which clearly shows the route of the shuttle cart. When you do happen to cross without looking – there are mini-zebra crossings at various intervals – there's no danger of being run over. A laser safety system brings the car to a stop if it detects an obstruction.

The IRB 6650 needs to detect different paper widths.

At SCA in Skelmersdale, a wide variety of paper products are packaged.

Each cell comprises an infeed conveyor for the stack of empty pallets, an IRB 6650, a high-level infeed for the product coming to be palletized, an outfeed conveyor, which can hold a maximum of three full pallets, and an interleaf dispenser.

"Another major benefit of the way Langhammer designed this was that we didn't need to dig a foundation for each of the robot cells, which you have to do with a standard installation," says Tim Walsh.

"Robots create a large dynamic force that wants to pull them out of the ground, so they need to be securely anchored. But Langhammer builds each cell on steel plates in a sandwich board construction which distributes the forces evenly across the whole surface and massively reduces the dynamic force going into the floor.

"There was also the benefit that the cells arrived in Skem already built, which made them really easy to install. Each of them came in two halves so all we had to do was put the two halves in position, bolt them together, put the robot in place, and we were ready to go. It really is like 'Plug and Play.' When the

"...the cells arrived in Skem already built..."
Tim Walsh

The IRB 6650 robots easily handle paper wrapped in shrunk polythene, a difficult material to work with.

cell arrives you can be up and running in one day."

Langhammer won the contract to supply SCA at Skelmersdale in the face of stiff competition. Tim Walsh says that one of the reasons their tender was accepted was because of Langhammer's previous experience of working with the paper industry.

"Paper isn't an easy product to work with," he says. "We pack a lot of our articles in a shrunk polythene bag, which isn't as rigid as other packaging. Paper width can vary and the robot needs to be able to detect that when it's putting the product onto the pallet."

While ABB supplied the robots, the gripper heads are designed and installed by Langhammer. Langhammer configures them so that they can pick up, for example, an individual case or an entire layer of cases. The heads also have pneumatic suckers on them, so they can also pick up individual slipsheets.

The robots themselves, Walsh says, are clever. "Not only will they stack the products, but they will also de-stack the empty pallets. Not all systems de-stack the empty pallets – they have separate de-stackers and the pallets are delivered individually to the robots. By having an integral de-stacker, we are utilizing the robot more fully."

Says Thomas Lommel, technical director at Langhammer, "We've been working with ABB for many years, and the experience of working with them has always been the best. All the software that we use is based on ABB robots."

"Langhammer were very good to work with," says Tim Walsh. "Initially they built one of the cells in their factory in Germany and we were able to go out there and test it and make sure that it matched our expectations."

Langhammer arrived on site in 2005 to start the installation and brought with them all the necessary parts to complete the job. The installation progressed at speed with detailed discussions and daily meetings to ensure that both parties were fully involved throughout the project.

"They also provide full technical back-up and a full spares facility. If something goes wrong they can have an engineer with us the next day to fix it. That's happened only once, but the engineer came from Germany the following day with the spare part," says Walsh.

There are thoughts of further modification, involving further cooperation with Langhammer. SCA wants each robot cell to be able to double-stack, so that when the shuttle car arrives it takes away two full pallets, not one. This has knock-on benefits along the line, making the wrapping process more economical, and enabling the warehouse space to be used more efficiently.

Of course economizing is what this is all about. By installing the automated palletizing system, SCA has been able to save on the cost of employing roughly 30 people.

>FACTS

SCA

- **Founded:** 1929
- **Employees:** 51,000 in 50 countries
- **Products:** personal care products, tissue, packaging, publication papers and solid-wood products.
- **Sales:** Annual sales in 2006 amounted to EUR 11bn
- *www.sca.com*

Langhammer

- **Founded:** 1971
- **Employees:** 150
- **Products:** Langhammer is a machine-building firm specializing in complete conveying and palletizing systems with customers worldwide.
- *www.langhammer.de*

Benefits of robotization

- **Cost savings equivalent to employment of 30 people**
- **increased competitiveness**
- **quieter, safer production environment**
- **increased flexibility**

Says Lars Siggelin of AstraZeneca: “Making production systems efficient is a vital part of what we do.”

Getting rid of aches and pains

How robotization plays a part in the packaging of one of the world’s best-selling medicines.

By Graeme Forster
Photos Carl-Johan Ericson

> Nexium, AstraZeneca’s blockbuster treatment for dyspepsia, peptic ulcers and various other gastric-acid related disorders, is big business. It was the third-largest selling drug in the world in 2005, hauling in 5.7 billion US dollars for its maker. Nexium is a further development of the drug Losec, one of the most successful drugs of all time. AstraZeneca was spurred on to create Nexium by the pending patent expiration of Losec. The success of Nexium helps maintain AstraZeneca’s position as one of the world’s leading pharmaceutical companies.

There are Nexium product lines producing the tablets in half a dozen countries. And while the millions of Nexium tablets that are sold daily bring relief to the ailing stomachs of the world, packaging the tablets for the marketplace has caused its fair share of headaches. For a start, the tablets themselves are moisture-sensitive, so they must be wrapped in a sealed foil blister pack. But then the blisters of the pack are quite large, and would get damaged by being stuffed in a pocket or a handbag, so a special design was produced whereby the pack folds over on

itself, with the blisters interlocking, and the outside is protected by a wrap-around card sleeve. The end result is something that looks just like a wallet and protects the pills while they are being carried about.

You can understand the attraction of a computerized, robotized packaging line by the sheer complexity of what follows next. The number of pills per wallet varies according to the market. Some carry as few as three for sampling purposes; others carry up to 14. The wallets themselves must be packed into shipper cases, and these must then be packed onto pallets. Some wallets are destined for re-packaging in other markets, so they are packed into special cartons and then palleted. There are dozens of combinations of blister packs, wallets and shipper cases. And each one has to be identified with its own unique bar code. Human processing of the complex variety of pack combinations would slow production or necessitate the opening of extra lines. Hence the need for robots.

The AstraZeneca plant at Södertälje, south of Stockholm, features four dedicated Nexium lines supplied with turnkey ABB robotic pack-handling solutions. The basic pharmaceutical ingredients are mixed elsewhere at the site and then formed into tablets. These are fed into the foiling machine and emerge in a series of foiled blister packs. The packs are glued, the paper wallet is wrapped around the blister, and a sealing label is attached. A batch number is printed on each pack and checked by vision camera. The completed packs are then moved forward into the robot cells, where they are packed into either shipping cases or cartons, depending on their market destination.

Each robot cell consists of two robots: a smaller IRB 140 and a larger IRB 4400. The IRB 4400 assembles the cardboard shipper cases, moving them for taping, weighing and printing with a serial number, places them on pallets. Some 30 to 40 boxes later, at around 100 cartons, the pallet is automatically replaced, using an automatic fork-lift truck.

Each Nexium line can produce up to 10,000 wallets every hour with minimum human intervention, and the end packing requirement can be altered rapidly from a central computer.

"Our key requirement for each automated line was to make it as digital as possible," says Lars Siggelin, senior project manager of AstraZeneca's Global Technical Services. "Before this automated handling, there was a time-consuming challenge in switching between the shipper cases. With different numbers of wallets in the cartons, that meant different sizes of shipper case and having to change the handling parts. This solution makes the changeover quickly and smoothly, with no change parts. You just key in the new data, and away it goes."

Other automated refinements supplied as part of the ABB solution also make a change to the level of the line's efficiency. Labeling of cartons was once done by hand with preprinted labels. Now an inkjet printer prints the information directly on the case. A bar code is part of this information, and this is checked by a reader. If the information is correct, it is recorded and stored in a central data system for batch information. If there is an irregularity, the robot will remove the relevant case from the line.

"Profitability is a key part of any business, but particularly so in large industries that have demanding investors," says Siggelin. "Making production systems efficient is therefore a vital part of what we do … and it was while we were looking at the Nexium lines that we realized that the exiting end-of-line packaging systems were a mess – too complicated, too many parts, too much setup required. We needed an effective solution – rather like our patients need our products." ⊙

>FACTS

Why Robots?

Robotization of the end-of-line packaging systems for Nexium has enabled AstraZeneca to maintain high production rates while accommodating flexible and varied product packaging requirements. AstraZeneca's packaging facilities for blisters and wallets in Södertälje has a total of nine robotized cells, featuring a mix of 16 robots from ABB and other suppliers.

All About AstraZeneca

- **AstraZeneca PLC, formed April 6, 1999**
- **Pharmaceutical company**
- **Corporate headquarters in London, research and development in Södertälje, Sweden**
- **CEO:** David Brennan
- **Sales (2006):** USD 26,475 million
- **Number of employees:** 65,000
- ***www.astrazeneca.com***

AstraZeneca's Nexium wallet pack.

By Rory Gibson
Photos Cameron Laird

Dance of the robots

A new palletizing system at one Australian brewery adds a quiet, graceful do-si-do to the palletizing line, at the same time offering greater flexibility and savings in maintenance.

> Making the beer and getting it to millions of thirsty Aussies is a serious business. And a big one. Australia makes about 2 billion liters of beer a year, and the country consistently ranks in the top 10 of beer consumers in the world in terms of liters drunk per person.

One of the country's largest breweries, and certainly its most modern, is the giant Foster's plant at Yatala near the Gold Coast, Australia's famed surfing and holiday mecca in the southeast corner of the state of Queensland.

The Yatala brewery can make about 540 million liters of beer a year, roughly 25 percent of the nation's output, and some of Australia's most recognized brands of beer are brewed and packaged there.

Cartons packed with bottles full of famous brews such as Victoria Bitter – Australia's No. 1 selling beer – Crown Lager, Carlton Mid and Foster's roll off the plant's four "palletizer" lines at a mind-boggling rate, 24 hours a day, six days a week.

It is in the palletizer area that you can easily see the contrast between the past and the future.

The palletizer lines do what their name suggests: They stack the cartons of freshly bottled beer onto pallets, ready for warehousing and eventual distribution by trucks throughout the vast expanses of Queensland and its neighboring state, New South Wales.

The pallets typically hold 70 cartons (seven layers of 10 packs, each containing 24 375ml bottles), which need to be stacked precisely. Only the interlocking pattern of the stack and a small dab of glue on each box create the cohesion to keep everything in place for transport.

Creating that interlocking pattern at speed is a crucial part of what the palletizers do.

Three of the palletizers are conventional, employing technology largely unchanged for decades. They use rollers, dividers and rotators to position cartons for their arrival onto the pallets into a pre-ordained pattern designed to maximize stack stability.

It is fast and effective, but if you want to change the pattern it can take two hours to reset the equipment. And there are many moving parts, which means a lot of noise, potential danger to workers and high maintenance costs.

The fourth palletizer is different.

Here two ABB IRB 4400 robots work quietly in tandem, one behind the other, to position the cartons of beer streaming towards them.

Mounted above the conveyor belt they curtsy to each approaching box, looking like water birds dipping their beaks into the lake shallows.

Having sensed where their quarry sits, each

>FACTS

Benefits:

- The robotic pattern-forming system is flexible, allowing the introduction of new products and palletizing patterns without compromising the pattern-forming function used on existing products.
- It also allows simple, repeatable changeovers between products and patterns.
- The system realizes substantial savings on maintenance costs, due to the high reliability of the ABB robots.
- In the event of one robot faulting, the palletizer can continue production, albeit at a reduced rate, using the other robot.
- The system can handle cartons, shrink-wrapped trays or trays with no shrink film, as the packs are situated on the plastic modular pattern-forming belt in a precise position, with minimal clearance between accumulating packs.
- The end result is a layer of packs that require little final compression by layer squarers at the stripping zone.

On Foster's

Foster's is a global brewing and wine-making company, with major markets in Australasia, Europe, Britain and the United States, producing brands such as Foster's and Carlton beers and Beringer and Mildara wines.

Throughout the 20th century, the various entities that would eventually form Foster's Group expanded through acquisition and brand development to become leading beverage companies in their markets, establishing Foster's Lager as one of the world's top-selling beers.

The multi-faceted entity changed its name to Foster's Group in 2006, and employs about 8,000 people worldwide. Read more at *www.fosters.com.au.*

On Foodmach

Melbourne-based Foodmach was founded in 1972 as a custom "design and build" engineering house. Today, Foodmach provides palletizing, depalletizing, conveying and robotic systems for the Australian food and beverage industry.

Clients include Foster's, Coca-Cola, Nestlé, Lion Nathan, MasterFoods, Heinz and Kraft.

The company's Robomatrix system is a configurable robotic system, capable of infinitely variable pattern-forming for high-speed palletizing. The robots, in Foster's case IRB 4400s, are capable of rapid and precise movements up to five times faster than their conventional pick-up-and-place rivals. Read more at *www.foodmach.com.au.*

machine will grab a carton and shove it into position according to the pattern their minders have asked them to build.

Their minders – Kevan Morgan and Geoff Gould – couldn't be happier.

Gould is the brewery's site services project manager, and Morgan is the electrical packaging/projects coordinator. Between them they commissioned and now supervise the roboticized palletizer.

When they look at their handiwork they see the future.

"Conventional palletizing systems are a thing of the past," says Gould. "They have been around forever, but their days are numbered. This robotic system will become the norm.

"The robots aren't quicker, but they are much simpler and more predictable."

And reliable. Since installation in 2004, the robots, made by ABB, have been in operation for nearly 9,000 hours, stopping only for routine maintenance.

When the robot system was trialed, Foster's stipulated the criteria to Foodmach, the company that supplied the robot cell: reliability, flexibility, gentle product handling, low maintenance, low noise, unmanned operation and no time for extended commissioning. They set a target of 99.5 percent compliance.

What they got was 100 percent.

Morgan and Gould were impressed, and there were a few skeptics at Foster's who were wary of the new technology who had to bite their tongues.

"A lot can go wrong with conventional palletizers," says Morgan, "But the reliability of the robots has caused us no problems. The advantage of not having to maintain high-speed line dividers and carton rotators is a substantial cost benefit."

Maintenance for the two robots costs 4,876 Australian dollars a year and requires about a day of downtime.

Morgan says the other major benefit was that the Robomatrix software allowed an operator to trial different stacking patterns and instruct the robot accordingly. "It is an intuitive system," says Gould. "You can create a virtual stack, and Robomatrix will tell you if you can do it."

For Foodmach, a company that specializes in material movement systems for the food and beverage industries, getting Foster's to sign up for Robomatrix was a coup. "Getting Foster's to embrace that technology was the main issue for us." says Foodmach Queensland representative John Harris.

Having embraced it, Foster's has been toasting its success ever since.

Retailers need grippers that are flexible and able to handle a variety of products that have never been packaged by robots before.

A Gripping Tale

One of the keys to the advancement of robotics is the development of new and innovative grippers. Welcome to the future.

By Alexander Farnsworth
Photos Schunk

> Advancements in robotics are about doing more with less, and about copying human arm movements for maximum efficiency. But robots do more than human arms can – they lift more, faster and tirelessly.

Greater flexibility, lighter weight materials, new technical advances in sensors, a finicky retail environment where purchasing managers are buying less but more variety (mixed palletizing), and a move into new industries like food processing (hygienic design) – these are some of the dominant trends in robotic gripper technology today.

The laws of geometry have not changed since the Greek mathematician Euclid wrote them down in The Elements in 300 BC, and they remain the basis for how today's robots and their grippers function. After all packaging is all about fitting something into a box, and geometric principles dictate how many can fit.

But gripper technology has come a long way since the days of Euclid, with literally hundreds of different solutions for all imaginable industries. And in most industries, there is an increased pressure to come up with cost-saving alternatives to increase profitability. This is what is driving developments in robotics and gripper technology as automated tools for packaging and sorting find their way into new applications, or move upstream into production.

"The human hand is the most flexible tool you could ever think of," says Dr. Andreas Wolf of robomotion, a robot technology consultancy in Germany, and author of the definitive book *Grippers in Motion*. The book provides a comprehensive guide to automation processes involving gripping and manipulation.

"But unfortunately, robotic hands with all their sensors, joints and flexibility tend to be very expensive, and not every process needs the flexibility of

a human hand," says Wolf. "At the moment most industrial manufacturing that uses robots tend to have a dedicated gripper for the task.

"At the same time, the intelligent gripping systems and service robots that we have today are the early signs of a new, more flexible automation technology, which will be capable to auto-adapt to changing environments. Applications in the food processing industry, pharmaceuticals and agricultural production are not yet standard, but they do offer a growing market for automated solutions in the near future."

As an example of grippers that can adapt to their environment, researchers at New York University's Courant Institute have developed a new kind of gripper they describe as reactive. It responds to stimuli from its sensors they way a hand would from nerves, and changes its grip accordingly.

But in general, the size and shape of robotic grippers depend in great measure on what it is that they are intended to grip. There are grippers that stack, grip, suck, force-fit, or form-fit, single grip or multi-grip. Some are purely mechanical. Others use vacuum technology. And as consumer goods manufacturers are increasingly making products in every imaginable shape, material and size, the robotics have to become increasingly sophisticated.

"Cycles are going faster and faster today," says Peter Tell, PIAB's Chief Technical Officer who invented the COAX multistage vacuum cartridge ejector system that is particularly suited to object picking and palletizing (see story at right). "Every manufacturing company wants to increase production at a lower cost. It is about doing more with less."

A well-known paint and coating manufacturer in the U.S. installed a COAX system on one of its packaging robots and has improved its operation with higher line throughput at a lower cost. Replacing a manual case-palletizing process – an arduous and physically demanding task that required three shifts a day, seven days a week – the customer now has the flexibility to better meet the needs of big retailers that may request quick supply order changes from one type or color of paint to another, reported *Packaging Digest* in a recent issue.

And then comes NASA. In September 2006, NASA's Goddard Space Flight Center received R&D magazine's annual R&D 100 award for developing what it calls "a conformal gripper." This gripper was originally developed for lunar missions, and because it uses an array of pins that gently conform to any object's shape, it basically renders obsolete the slew of operation-dedicated grippers that are on the market today.

High tech space-born applications aside, what is really driving developments in automation is one of the rising trends of convenience foods, says Jörg Herrmann, from Germany's gripper manufacturer Schunk.

"The food and packaging industry is a growing market for us as people increasingly want more flexible packaging containing ready-made foods," says Herrmann. "And the demographics are clear. There are more and more single households, which means that people are not buying two kilos of meat. What they buy instead e.g. is a single portion with meat, noodles and a vegetable. So the robots and gripping systems that pick, pack and palletize all this food have to be designed especially for the food industry. The hygienic design is a big trend for components that have direct contact with food," says Herrmann.

While palletizing and de-palletizing is one of the primary tasks of robots in the packaging industry, what is happening more and more, says Volker Schnell from Schmalz, a German company which specializes in vacuum technology, is that customers need the possibility to have mixed pallets.

"The market is asking for more complex handling applications like using robots to palletize different products in different layers under more complex circumstances," says Schnell. "At the same time there are tremendous advancements in sensor technology, image processing for the gripper controls, and online condition monitoring of the robots and grippers."

>FACTS

A gripper snapshot

Here's a look at some innovative grippers and the companies who make them:

Schunk and robomotion

Two Germany-based companies, Schunk, which focuses on development, manufacturing and improvement of production methods, and robot technology specialist robomotion, have jointly developed a special hygienic gripper for the meat industry: the mechanical two-finger Angled Gripper Type LMG 64. The gripper features a hygienic design that is easy to clean and a payload of 10 kg and a gripping force 350 Newton. The gripper is sealed according to IP69 K standards, and can be used for FDA-approved materials. Read more at *www.schunk.de* and *www.robomotion.de.*

PIAB

Sweden-based vacuum and measuring technique specialist PIAB has developed COAX, an advanced solution for creating vacuum with compressed air. COAX cartridges are smaller, more efficient and more reliable than conventional ejectors. This allows for the design of a flexible, modular vacuum system. COAX technology is ideal for machine integration in a variety of material handling applications for the packaging, automotive and graphic industries. Read more at *www.piab.com.*

J.Schmalz

German company Schmalz is another leading company in the area of vacuum handling technology. For the packaging industry, Schmalz has large-area vacuum grippers, the FX/FXC, with an innovative valve concept that is energy efficient even with short cycle times. The grippers are suitable for use in a range of applications, including automated palletizing, depalletizing, commissioning and sorting of many different types of goods in various sizes with only a single gripper. The gripper also is designed for handling of workpieces made of many different materials, such as cardboard, wood, sheet metal (dry) and plastic, with or without apertures. Read more at *www.schmalz.de.*

Less space, more flexibility

The new panel-mounting IRC5 robot controller from ABB takes up nearly 75 percent less space, and with the possibility of mounting within existing control panels, makes it easier to meet hygiene and other needs.

> Easy integration with existing equipment designs, substantial space savings and exceptional versatility are some of the many benefits which the new panel-mounting IRC5 robot controllers from ABB Robotics offer to users of industrial robots.

In addition, because the new panel-mounting IRC5 controllers are supplied in chassis form for mounting in the user's own control panel, they make it easy to meet special requirements such as hygienic systems with stainless steel enclosures, and systems which can withstand wash-down cleaning. They are ideal, for example, for use with food-handling and other applications where raw items are packaged.

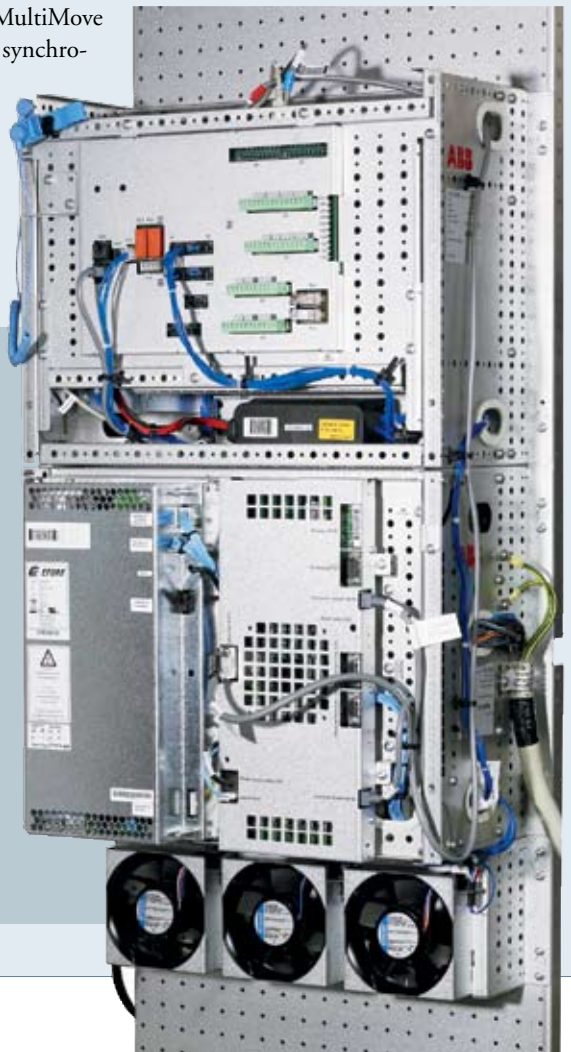
Providing all the functionality of the existing fully enclosed controllers, the new IRC5 panel-mounting controllers are just 250mm deep, giving users a nearly 75 percent savings in space. This makes them particularly easy to accommodate, while the elimination of the integral enclosures can also save on costs.

Fifth-generation products, the new controllers have been specifically designed to provide end users with simplified application planning, set up, operation and maintenance of single or multiple robot cells. Used in conjunction with the controllers, FlexPendant hand-held terminals – with touch screens and Windows-style operation – provide an intuitive yet powerful user interface.

To ensure maximum versatility, ABB's new panel-mounting IRC5 robot controllers feature a modular design, with separate modules for robot control functions, axis drives and process control functions. An Ethernet link provides communication between the modules.

This modularity makes it easy to configure assemblies which exactly match the requirements of the application, as well as making the systems straightforward to service and upgrade.

The new units can each control up to four robots, allowing significant economies to be made in multi-robot installations. The TrueMove and QuickMove technologies used in the controllers automatically optimise motions for all robots and external axes, while MultiMove functionality allows fully synchronous operation of multiple robots, opening up application areas which would otherwise be difficult or impossible to address.



The new panel-mounting IRC5 controller doesn't just save space, it's also ideal for use with special enclosures when hygiene is paramount.

>FACTS

About the IRC5 panel-mounted controller from ABB:

- Dimensions: 750x498x280 mm (1050x498x350 mm including trafo + boards)
- Available for IRB 140, IRB 340, IRB 260, IRB 2400 (Not available for IRB 44xx, IRB 66xx, IRB 76xx)
- IRB 1600 pending
- No external axis possibility
- Must be encapsulated (due to EMC)
- Fans and transformer must be specified
- Temperature control is OEM/SI responsibility
- Mounted vertically - with fans, can be horizontally mounted
- 7 m customer cables for IRB 140 and IRB 340 without connectors (All other cables must be prepared by customers before connecting)

By Katrin Winterhalter
Photo Feige

Safe solution for sensitive enzymes

For filling drums with enzymes, Feige provides a fully automated solution that is not only efficient, but keeps employees separate from the product.

> A leading Danish enzyme manufacturer recently started filling its products using two RobotFillers made by Feige GmbH in Bad Oldesloe, Germany. The new RobotFiller is currently the most flexible filling system available on the world market for liquid products and pastes.

In front of the actual filling area, a new type of unstacking unit has been installed which separates the stack of containers or stacked pallets. Materials airlocks in the areas for incoming and outgoing containers before the filling cabin ensure the necessary separation of the filling area from the storage area.

The heart of the installation consists of two type 91 RobotFillers from Feige GmbH, Abfülltechnik. The company is the global market leader in machinery for filling liquids and pastes.

The space available for the Danish enzyme manufacturer for filling its products – five different types into container drums – was so tight that conventional filling technology could not be installed there. On top of this, the enzymes and their vapors can affect the operators. So the entire filling process had to be automated and separated from other areas by means of a filling cabin.

The company turned to Feige GmbH, who provided two type 91 RobotFillers, which crucially offers fully automated product changes without the necessity for operator intervention in the installation or filling cabin. The operator merely has to select a new data set on the touch panel. The exchangeable filling valves can be cleaned fully automatically in the meantime.

The central component of each filling unit is an IRB 660 4-axis industrial robot with a load-bearing capacity of 180 kg. The RobotFiller starts working on the pallet from the top as soon as the pallet is in the operating position. The IRB 660 traverses the calculated coordinates and computes the positions of the bungholes. It then establishes the height of the pallet. After this, it picks up the filling valve and fills the containers one after another.

Once the pallet is completely filled, the IRB 660 exchanges the filling valve with the screwing unit, and finally clinches it with a metal sealing cap. The sealing cap is fitted to the drums by the robot.

"The sealing cap is an important factor for many customers as a seal of authenticity" says Bert Lindenberg, who as one of the two directors of Feige, is responsible for sales, customer services and technology. The fully processed containers leave the filling area through a materials airlock, connecting to a turntable on which the pallets are automatically labeled.

ABB supplied the two IRB 660 robots including the IRC5 control system. For Bert Lindenberg, precise accuracy of the individual steps is a decisive criterion. "If a robot moves to a certain position, it must travel precisely to this position without fail two million times. As the space is very limited on the customer's premises, absolutely precise positioning of the robot is a key factor," he explains.

The IRB 660 opens and closes the containers with its bung screwing tool.

>FACTS

Automated advantages

For filling drums with enzymes, using robots provides a range of benefits:

- Process is fully automated so employees don't come in contact with the enzymes
- Cleaning is also automated
- Space-saving robots fit into tight quarters
- High-load bearing capacity of robots that have to deal with heavy product pipes
- High production rates of 45 x 200-liter drums per hour

Feige at a glance

Feige GmbH, Abfülltechnik is part of the Haver & Boecker Group.

Feige is a leading company in the manufacture of machines and installations for the filling of liquids and pastes into pails, canisters, cans, drums and IBCs. Its customer base includes well-known major companies and a large number of medium-sized concerns in the chemical, pharmaceutical and petrochemical industries, manufacturers of building materials, dyes and paints, and also in the food processing, logistics and packaging businesses. Read more at *www.feige.de*.

Healthy infection of ideas

By Claudia Magli
Photos IMA

With pressure to save on costs and become more efficient, the pharmaceutical industry is learning robotic tricks from the food industry, with help from Italian automation specialist IMA.

Flow-packed droppers arrive in random order for pickup by the IRB 340.

> IMA Industria Macchine Automatiche, with headquarters at Castenaso, Bologna, has a philosophy based on research and innovation. For over 40 years, the company has produced hi-tech automatic machines for the pharmaceutical, cosmetics, tea and coffee industries, with a wide range of customers all over the world.

Recently, the company devised a special version of the Flexa cartoning machine that integrates ABB's IRB 340 robot. Specially designed for a U.S. pharmaceutical company, the solution automates the pick-up of flow-packed droppers from a conveyor belt (where they arrive scrambled), and the insertion of the droppers in a carton along with a bottle containing penicillin. And all of this is done at phenomenally high rates.

In no small part, the solution is a result of the courage of IMA in revising, while the project was actually being developed, the feed concept that had already been fully approved by the customer. Instead, IMA proposed a more effective solution that transferred methods and experience from the food segment and cleverly adapted them to the specific demands of pharmaceutical production.

The new version of the Flexa cartoning machine was made to meet the demands of its American user, who needed to replace an old penicillin bottle packaging system where the dropper handling was mostly done by hand. The challenge, says IMA, consisted not so much in processing and placing the bottles in cartons, which is a usual demand that did not pose any problems, but rather in handling the flowpacked droppers, in particular at a rate of 150 pieces a minute. Flow packs are extremely variable, with some packs adhering perfectly to the product while others swell up, which makes them difficult to handle and position correctly for feeding into the cartoning machine.

To solve the problem, IMA used two FlexPicker ABB IRB 340 parallel robots. The robots pick up the droppers from a belt on which they arrive scrambled, and there the droppers are viewed and identified with the PickMaster, ABB's robot guidance system that includes vision based on Cognex hardware, which is integrated into the FlexPicker. Customized grippers were devised by IMA.

Once the positions and the orientation of the

droppers have been calculated, the PickMaster transfers their coordinates via the ethernet to each of the two robots, while phasing both their workloads, and the robots are capable of working at rates that are a lot higher than those demanded by the customer. The system works in several stages that entail the temporary storage of the flowpacks in minipallets, their subsequent orientation and, only after that, insertion into the cartoning machine.

The solution devised in cooperation with ABB offers a series of advantages. For one, the overall layout of the machine takes up less space. A risk analysis has shown that there are a limited number of critical points. And a robotized system, in the mid- to long-term, guarantees lower maintenance costs and a far less complex tooling-up period compared to mechanical solutions.

But what really makes the difference above all is the flexibility. By merely replacing the pick and place head of the robots, they can handle similar products, anything from syringes to spoons instead of droppers.

While the end customer was initially concerned about the programming of the robot, the problem ended up being non-existent, since IMA and ABB provide all the assistance needed, before, during and after installation.

As IMA has stated, the solution represents an "opening up, a dialogue between this segment and others, food first and foremost, in a continuous exchange of experiences and technologies, where everyone has a lot to gain. To confirm a certain synergy between the two areas that, up to even just a few years ago seemed far apart. More and more project engineers today committed to pharmaceutical companies have transferred over from the food sector, or at any rate come from the field of consumer products."

This is due above all to the growing attention reserved to costs and times, IMA states, two competitive variables that the pharmaceutical industry also pays increasingly close attention to. The radical changes that are affecting the entire pharmaceutical market force the producers – and thus their suppliers – to pay maximum attention to the overall efficiency of their lines; and in this the food segment has a lot to teach.

If in the past packaging lines were only devised for a single product and format, now they have to be flexible, efficient and adaptable to different products and formats. With these kinds of complex demands, robots can give the best answers as has been demonstrated in the food and in many other industrial sectors already.

>FACTS

Why automate pharmaceutical packaging?

As pharmaceutical companies increasingly follow the food and other industries in automating their packaging processes, the solution from IMA using ABB IRB 340 robots is a good example of the advantages of using robots:

- the overall layout of the machine takes up less space
- limited number of critical points
- lower maintenance costs and a far less complex tooling up period compared to mechanical solutions.

IMA at a glance

- World leader in the design and manufacture of automatic machines for the processing and packaging of pharmaceuticals, cosmetics, tea and coffee
- Consolidated turnover: 425.2 million Euro for the fiscal year 2006 (export: 92.3 percent)
- Employees: about 2,700, more than 1,100 are based overseas
- 15 manufacturing sites in Italy, Germany, Spain, U.K., U.S., India, China
- Worldwide sales network covering more than 70 countries.
- Read more at *www.ima.it.*

Sitting comforta for the moment

An IRB 4400 robot packs wooden furniture parts.

With the help of robots used for packing, Swedish furniture manufacturer Svedplan stays ahead of the competition.

By Graeme Forster
Photos Pontus Johansson

> Walking through the reception of Svedplan's factory outside Alingsås in southern Sweden is not like entering a regular factory. There is no distant roar of machinery, no grimy walls or well-worn posters of products past and present. Instead, you could be entering a plush hotel. Managing Director Preben Ritter rises from a fashionable couch in the foyer and shakes you warmly by the hand. "Welcome to our home," he says without irony: He lives just behind the factory.

But the coziness is deceiving. Svedplan is on the frontline in the battle that is the global furniture manufacturing business, and it is staying ahead through a mix of strategic manufacturing and automated technology. The latest move is to introduce automated packaging, a development that will both smooth the production output and – important from a health and safety point of view – eliminate a tedious and potentially strenuous manual task from the production process.

Svedplan began in 1944 as a traditional carpentry workshop, knocking out solid wood beds and couches. Today the company specializes in the production of flat-packed furniture units, manufacturing as many as 50,000 products a week for one of the world's big-

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gest furniture retailers. These are freighted directly from the factory to outlets and distribution centers around the world.

The connection with the big global retailer started in 1973, thanks to Svedplan's expertise in foiling (a process that gives chipboard a wood-like veneer). As production ramped up to meet demand, the customer applied pressure to bring costs down. Automation was a natural development in the production process, and simple robots have long been involved in loading and unloading production lines, together with automated processes for drilling holes. But packaging the various components was still largely a slow, manual activity: Flat-packed beds and chests of drawers are heavy items and awkward to manhandle.

When Ritter took his post three years ago he had two main concerns: to improve processes as a way to maintain competitiveness with low-cost production sources and to reduce the risk to handlers in the packaging process. The solution was provided by Teamster AB, specialists in automated process technology.

The aim of the Teamster Automatic Packing solution was to create a concept that was flexible enough to handle a wide range of large products. Svedplan produces boxes that vary from 400 by 200 by 200 mm to 2,300 by 900 by 200 mm. It also had to allow for fast changes between products and be capable of being installed on an existing manual packing line. The Teamster recommendation was to automate half of the manual packing line, creating three stations with a total of eight robots. Five IRB 4400 robots would be used to pack products into boxes. Three IRB 660 robots would feed the IRB 4400 robots parts directly from pallets.

The project, an investment of 20 million Swedish crowns, began in January 2006 and was completed by July of the same year, with installation taking place during the summer shutdown. Teamster also supplied education and training.

Partly as a result of this new automation, throughput has increased by up to 45 percent per hour.

>FACTS

Robot pluses

The installation of five IRB 4400 robots and three IRB 660 robots for the packaging of Svedplan's furniture has provided the company with direct benefits.

- **Production has increased by as much as 45 percent, with automated lines preparing 10 to 15 boxes per hour, compared with six to10 boxes per hour on the manual lines.**
- **Work conditions for employees have improved without loss of jobs.**
- **The company can expect a return on investment of two to three years.**

Spotlight on … Svedplan AB

- **Designers and manufacturers of large-volume, flat-packed furniture**
- **Based in Alingsås in southern Sweden**
- **140 employees**
- **2005 turnover SEK 300 million**
- **Part of the Licentia Group**
- **Read more at *www.svedplan.se***

Spotlight on … Teamster AB

- **Specialists in industrial automation technology**
- **Based in Gothenburg, southern Sweden**
- **40 employees**
- **Company partnered with ABB**
- **Read more at *www.teamster.se***

The volume on the robot lines is 10 to 15 boxes per hour, compared with six to 10 boxes per hour on the remaining manual lines. At this rate, reckons Ritter, the company should realize return on investment in two to three years. And it will have the technology to survive in the highly competitive furniture industry.

Products are saved as recipes in the supervision system and therefore can be switched quickly and efficiently. New products can be introduced rapidly by entering pack size details into an Excel spread sheet along with details of the new packing position and station and then downloading this information to the central control system.

Ritter has also noticed another improvement: that of the workers' attitudes toward automation in the workplace. "At first, people were extremely wary of this new technology," he explains. "Now they feel proud of it." Ritter assured the workers that, far from threatening their jobs, it was the only way of preserving employment in the face of global competition. There have been no job losses at the factory as a result.

Still, this remarkable company, which sees its chests of drawers and its beds sold in some 50 countries around the world, has no plans to sit back and take it easy – however comfortable it likes to make other people.

"At first people were extremely wary... Now they feel proud of it."

Preben Ritter, Svedplan

Robotics re-sha the supply chain

Automated systems are being used more than ever in warehouses, logistics and distribution centers. Why? Because robots give companies a competitive edge by reducing costs and streamlining the supply chain.

By Amanda Price
Illustration Salgood Sam

> Historically, robot applications have been limited to the automotive and electronic sectors. But over the past decade, growth in material handling orders indicates that the robotics industry is exploring new avenues, particularly in consumer goods such as food, beverage and pharmaceuticals.

Robotic-based material handling in distribution systems is among the fastest growing applications in flexible automation, alongside packaging. This is due to manufacturers and distributors responding to the demands of their retail customers – particularly large, influential ones – who require that products come to their facilities palletized in a structure that suits them. The configuration of each pallet is customized to meet their specific needs, a task that has been difficult to execute in the past.

Mixed load pallets are emerging as one of the most efficient technologies currently available for the supply chain process. And robots are the only viable and flexible option for creating mixed load pallets.

Diversity of products handled by distribution centers and warehouses is expanding at an enormous

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rate. At the same time, these facilities are under immense pressure to reduce costs. Accommodating the broadest range of products, keeping capital expenditures low, and meeting quick return on investments are tough challenges faced by material handling facilities.

Although packing and palletizing involve a unique set of requirements for each and every order, managers responsible for warehousing operations are recognizing that an automated solution with rapid changeover capabilities can accommodate a wide diversity of operations and material while maintaining productivity.

Robotics is becoming a viable alternative to achieve yet a greater degree of flexibility in today's more complex material handling operations. A survey conducted by the United Kingdom's Material Handling Industry Association (MHIA) indicates that automated order picking and palletizing are some of the operations that companies are considering to automate.

As with any other machinery application, end users need to be able to justify such capital investment. The most obvious benefits of installing robots are reduction in sickness benefits, the overcoming of potential and existing labor shortages, better package quality, and improved working conditions. Less obvious are savings linked to a reduced head count such as a reduction in staff recruitment and training costs, tax and health contributions and even the number of parking spaces required. In many cases a work area reduction alone offers cost savings in real estate.

The cost savings above coupled with falling robot prices, increased speeds and improved accuracies, are imperatives for materials handling facilities and prompt a turn to robotics as the preferred solution.

Axium Industrial Automation understands that robotic automation offers a complete solution. Drawing on its 15 years experience in the manufacturing industry, Axium specializes in complex robotic palletizing/depalletizing solutions for warehouses. Working in partnership with ABB Robotics, Axium believes that robots play an important role in the future of warehousing.

Marc Ducharme of Axium says, "We have developed a unique solution for mixed-load palletizing that has received very positive responses when demonstrated to distribution centers. I believe that there is a very strong market for robotics in the future, although it is still in the early stages."

Axium works exclusivily with MagicLogic Optimization Inc., which developed Cube-IQ. Cube-IQ is an advanced load-planning program, capable of achieving the best possible loads for pallets. It has a complete graphical user interface, with point-and-click and drag-and-drop to build up loading pallets, and with on-screen and printed graphics.

Says Ducharme: "The concept of Cube-IQ is very simple, but the software is very powerful. It uses the same concept as configuring truck combinations, but just builds pallets. We have demonstrated this with potential customers using their real-life scenarios, and results have shown that the cost savings can be substantial, especially when order errors, inaccurate shipment, improper stock rotation and double deliveries are eliminated."

The fast handling speeds are due, in part, to the fact that today's generation of robots have high speed, low inertia motors and fast processors within the controllers. PC-based controller solutions, with their open architecture, have really made their mark.

"I believe that there is a very strong market for robotics in the future, although it is still in the early stages."

Marc Ducharme

Users are now able to control robots via user-friendly programming interfaces. These have been simplified so that engineers familiar with programmable logic controls are also able to program robots. The user interface for every robot is an intuitive screen. The user can easily implement parameter changes during operation, which significantly increases the quality and efficiency of the system. Simple machine programming can also be used for new product shapes and sizes as well as provides the possibility of viewing production statistics.

ABB Robotics believes that the best way to deliver robotic automation within materials handling applications is to establish formal alliances with system designers, builders and integrators. This enables information, technology and experience to be shared in a mutually secure manner to the benefit of the end user. The ABB Robotics Partner Network allows customized solutions to be developed to maximize economic benefits and ensure efficient robotic configuration for warehouses, logistics and distribution centers.

Materials handling facilities need to reassess their strategy to identify key opportunities to gain the advantage of integrating robotics into the operation.

As the tangible benefits of using robotic solutions are revealed, it is widely expected that robotics will be adopted at a much higher rate in industries outside its strong concentration in the automotive sector. As robotics makes a stronger appeal to a broad range of industries, the overall life cycle costs will follow a faster decent as initial purchase, integration and maintenance become standardized.

By Katrin Winterhalter
Photo Skinetta

In its final packaging line for the packaging of cosmetics bottles in various formats, Skinetta has succeeded in meeting all the tight requirements demanded by its customer, Cederroth.

Best with bottles

> The Swedish company Cederroth International AB manufactures products for the health care, personal care, first aid and household sectors. So far Sweden has been the most significant market for the company, which has around 850 employees in 30 European countries. The strongest growing market for Cederroth at present is Eastern Europe.

In November 2005 Cederroth commissioned Skinetta Pac-Systeme GmbH & Co. KG to provide a fully automated end-of-line packaging line for cosmetics bottles. Peripheral devices already present at the customer's premises had to be integrated and the line had to be capable of packaging 14 different formats, 12 with trays and two without trays.

The running-in and the Factory Acceptance Test of the entire final packaging line were carried out by Skinetta at its principal works in Ottobeuren, Germany. One year after the order was placed, in November 2006, the line went into production at Cederroth.

The cosmetics bottles, which come in a wide variety of designs, are fed onto the feed belt of the Skinetta line as they come from a labeler. An IRB 1600 robot from ABB picks up the standing or lying bottles in a wide variety of shapes and positions with its vacuum gripper, depending on the grouping required, and places them in trays or positions them straight onto the running belt of the film wrapping machine, with the robot synchronized with the speed of the belt. Conveyor tracking enables production to run continuously without having to pulse-run the belt. The result is high productivity.

Once the grouping of the bottles is complete, they are wrapped in film and then fed into the shrinking tunnel. A labeler at the machine exit also sticks labels onto the bundle, which is then placed on a pallet by a second ABB robot, an IRB 6600.

The IRB 6600 always places two bundles onto the pallet following the palletizing scheme in such a way that the label always faces outwards. It also removes cushioning from a magazine and lays it onto a layer on the pallet. This is where the long reach of the IRB 6600 comes into play.

The cushioning boards are needed to stabilize the stack of pallets. Low-grade board is generally used as cushioning. The result of this is that the robot often sucks up two or three layers of cushioning. To avoid several boards being sucked up, the robot sucks up the board on one side and turns its vacuum plate through approximately 15°. This causes the lower layers to loosen and drop back. A motion of this sort is feasible only with a 6-axis robot.

The application imposes high demands on robot technology and control. It must be highly flexible because the design and grouping of products is constantly changing, and life cycle times are becoming shorter and shorter. As the system runs in two shifts, six days a week, high reliability is essential. The flexibility of the robot system makes it capable of meeting new demands in the future which may arise.

Cederroth today offers a variable, flexible packaging concept for bottles and upside-down bottles in the widest variety of shapes with and without trays. Reliable packaging of all bottle formats including upside-down bottles is assured. The new final packaging line enables the customer to make optimized, rapid changes of format on all machines within around 20 minutes. An operator-friendly control concept with optional fault diagnostics complements this solution.

>FACTS

Skinetta profile

Skinetta Pac-Systeme develops and manufactures end-of-line packaging solutions for the pharmaceutical, cosmetics, food and non-food industries. Skinetta solutions range from packaging machines and lines to the entire design of end-of-line packaging for film, board and pallets. The company, which is part of the Kolb Group located in Memmingen, Germany, has more than 2,500 machines installed world wide. Read more at *www.skinetta.com.*

Cederroth profile

Cederroth International manufactures products for health care, personal care, first aid and the household sectors. The company has 850 employees and operates in 30 countries within Europe. Apart from its wholly owned subsidiaries in eight of these countries, Cederroth is represented in an additional 22 countries through local distributors. Read more at *www.cederroth.se.*

Bottom line boosted for beans

At the Great Canadian Bean Company, robots take over from humans to palletize beans in a range of packages, saving money and improving conditions for workers.

By Laura Pierce
Photo The Great Canadian Bean Company

> The Great Canadian Bean Company really knows its beans – from navy to pinto to black turtle beans, not to mention dark red, light red and white kidney beans. For nearly 30 years, the global supplier of beans, based in London, Ontario has provided dry, edible beans to both the domestic and international canning and packaging industries.

On average, the company employs approximately two-dozen workers, who are charged with cleaning, sorting and bagging the beans. However, until recently the bags were manually palletized – a task that was taking a physical toll on employees. Plus, it was limiting the company's ability to meet increased daily production requirements.

"We were assigning multiple workers to palletize the bags, including one operator to fill and sew the bags and two to four operators to load the full bags onto pallets," says Bill MacLean, owner and president of the Great Canadian Bean Company. "The employees needed frequent breaks and were prone to injury from lifting the heavy bags."

With so many workers focused on one task, other areas of production were not operating as efficiently. The company needed to find a solution that would streamline the palletizing process, reduce workplace accident insurance premiums and provide more overall flexibility for bean production.

MacLean contacted the Automation Project Group, a robotics/automation systems integrator specializing in palletizing and packaging equipment for a recommendation. The Automation Project Group worked with ABB to install an IRB 640 palletizing robot at The Great Canadian Bean Company. The robot has a 352-pound handling capacity – allowing it to handle the heavy loads of full bags of beans – and palletizes to a height of 8.5 feet. Plus, it offers user-friendly software, so employees can easily program pallet patterns off-line on a separate personal computer and then download them to the controller.

The installation began in August 2005 and took approximately two weeks. The robot was incorporated into the existing bean packaging process so that it operates side-by-side with the manual workforce. Once filled, bags are transferred through the sewing station into a Kicker/Turner unit, which rotates the bag 90 degrees before laying it on its side. The bag then travels across a metering belt that ensures bags are gapped before entering the pickup roller conveyor. The ABB robot picks up the bags using a clam shell style gripper and places them in the pallet pattern selected by the operator.

Since the installation of the robot, the number of people palletizing and the number of workplace injuries from lifting and handling bags have been reduced to zero. In addition, pallets are loaded and shipped as fast as the beans are cleaned, they are made much more quickly, and damage to bags on pallets has been reduced to zero, allowing the company to deliver more products to its customers in a shorter amount of time.

"The biggest surprise was how easy it was for the operators to program the robot for different pallet configurations," says MacLean. "Prior to using the robot, the employees were very skeptical that it could do the job. Now, they can't imagine how they ever loaded all the pallets without it."

One benefit that was not calculated in advance was the reduction in broken and damaged bags. The bags must be loaded onto the pallet in very tight configurations so that they do not hang over the edge. If the bags are out too far, they brush against the entrance to overseas containers and are broken. Now, the robot places the bags precisely and correctly as required, resulting in no claims from such damages.

Interestingly enough, the robot has also been a big hit with local residents: Small groups come to see the robot working at the end of the bagging line.

The IRB 640 robot can handle packets of beans weighing up to 352 pounds.

>FACTS

Why robots?

"We explored a robotic solution and examined several robot companies and packaging companies for a product that would boost efficiency," says Dwayne Wanner, president, Automation Project Group. "We immediately chose ABB Robotics for its superior quality, great programming platform and its excellent service team."

In addition, the robotized palletizing solution has:

- Reduced the number of employees needed for the task so they can focus on other necessary tasks for the company to stay competitive
- Decreased the number of injuries of workers
- No more claims for broken bags since the robots pack them correctly every time.
- Read more about the Great Canadian Bean Company at *www.gcbc.ca.*

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