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High-dynamic drive technology from Rexroth helps with the care of fresh cheeses.

A fully-automated weighing and packaging machine for powdery products was constructed using components from Rexroth.

KHS has developed a system that can fit handles to packaging of all shapes and sizes.

With its new production line Gyllenvaans Möbler of Sweden has tripled its production rate.

Special Food & Packaging

Rexroth Bosch Group

Impressum

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Dear Business Partners,

For more than three decades now Rexroth has been developing customized solutions for the automation of components, modules and complete systems for you, the manufacturers of machinery for the pharmaceutical, food and packaging industries. Working together we have continually optimized state-of-the-art technology in tens of thousands of machines to enable us to meet the ever-increasing demands of the end user: increasing product diversity, shorter product life cycles, more frequent change of product and format, as well as lower operating costs.

As machine builders you meet these requirements with modular concepts combined with increased flexibility, yet without compromising on performance. The extensive Rexroth portfolio of all drive and control technologies from a single source helps you to implement these concepts with a minimum of expense and effort. This is because Rexroth products and solutions are based consistently on open interfaces and international standards.

Rexroth was decisive in helping to shape the change from mechanically coupled machines to the electronically synchronized food and packaging machines of the third generation. Now we are taking this a step further. With our GenNext™-Technology we are offering you complete freedom of choice and thus also a decisive advantage: Whether centralized or decentralized control architectures, Rexroth can provide you with a wide range of hardware and software scalable system solutions. Whether you wish to automate using pneumatic or servo drives, with linear systems or linear motors, you can opt for the best solution, both technologically and economically, for every motion sequence.

Rexroth offers all drive and control technologies, as well as harmonized material handling and flow of information from a single source. The co-ordinated interfaces, the common engineering environment and our worldwide network in more than 80 countries all help you to save both on time and costs.

In this special edition of the drive & control Magazine we have put together some examples that are already in use. These demonstrate that Rexroth solutions are as various as the tasks facing machines for the pharmaceutical, food and packaging industries. We would also be pleased to discuss your potential customized automation solutions with you and, what’s more, how Rexroth could help you attain your goal faster.

Yours

Manfred Grundke

[Signature]
Gerhard Schubert GmbH is the first port of call when it comes to such picker lines or even complete packaging lines using robotics. The company, which is based in Crailsheim, in Germany, has a workforce of around 800 worldwide and achieved sales to the tune of 160 million Euro in 2005. It celebrated its 40th Anniversary in 2006 and is forerunner in the manufacture of innovative and creative packaging machinery. The principle pursued by Schubert-TLM is that of creating and developing machine concepts based consistently on three main criteria: Straightforward and robust mechanics, tools that are easy to change and intelligent automation.

Since 1984 Schubert has opted for Rexroth drive technology.

1,000 biscuits a minute
The answer to the question at the beginning of this article is supplied by the application example of a Schubert TLM-Picker Line for packing biscuits in trays. The TLM-Picker Line is a purely series-production machine, consisting of interconnected Type F44 modular robot stations. The number of stations used varies depending on the quantity to be packed. Each F44 station consists of two robotic units controlled by a visual image recognition system. There are four Rexroth servo axes for each robotic unit, serving as the drive for the robot upper and lower arms as well as the lifting and rotary movements.

Eight F44 stations perform the packaging operation at rate of 1,000 biscuits per minute.

At each end there are two likewise modular stations for handling the trays: one is used for placing the empty trays onto the conveyor system while a further one transfers the filled trays to the exit station for removing from the conveyor. These two stations also work with two robotic units respectively. The placing station is extended by a servo-driven power unit, which transfers the empty trays from the magazine to the assembly line by means of swivel and lifting movements.

The principle on which the TLM-Picker Line works is as simple as it is ingenious: The biscuits are continually fed onto a wide conveyor belt with an inwardly moving mechanism. The product input feed is flanked by two conveyor chains, which themselves...
also continually move the packing trays along the picker line, albeit in the opposite direction. The servo-driven swivel motion of the conveyor chains makes it possible for the pickers of the robot station to slide the biscuits into the trays with optimum accuracy. Finally, the packages, filled with biscuits, are transferred from the conveyor chains onto belts operating in parallel, ready for removal at the line stations designed specifically for this purpose.

The speed of the installation is controlled fully automatically through the various picker stations by means of decentralized intelligence. A central computer is therefore not required and the otherwise obligatory product buffer can also be dispensed with.

52 servo axes with decentralized intelligence guarantee motion

One important component of intelligent automation – as one of the three main criteria of Schubert machine construction – is Rexroth drive technology, which does full justice to the TLM automation philosophy. Firstly, the 52 Rexroth servo drives from the IndraDrive series have open and digital interfaces. SERCOS, the universally standardized interface, is used for the highly sophisticated synchronization tasks. Secondly, the drives and the machine control are always of modular design; the device hardware, for example, is very service-friendly, with its Plug&Play principle making it easily exchangeable. The configuration data of the individual applications can be transferred easily via the multimedia memory card, a standard component of Rexroth IndraDrive. Furthermore, the drive technology with its integrated safety functions fits seamlessly into the TLM concept of decentralized intelligence.

The intelligent safety functions, which in this scalability and universality is only offered by Rexroth IndraDrive with Safety on Board, supports not only the in-feed block and secure hold, but also permits safe movements via the digital, dual-channel signal processing in the drive. This function simplifies and accelerates machine set-up, for example. The integral safety functions are EU prototype tested and are certified to EN 954-1, Category 3. In close co-operation with Schubert, Rexroth optimized the highly dynamic IndraDrive drive to meet the latest requirements of the packaging industry. Rexroth used servo drive technology with Safety on Board and the additional drive-integrated open loop control system with swift, intelligent brake control on the robotic unit of the TLM Line. This has replaced the mechanical solution for monitoring the work area of two interpolating axes. And the result: Increased cycle rates through maximum drive dynamics.

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Ralf Schubert, Divisional Manager, Technical Engineering and Assembly, at Gerhard Schubert GmbH comments, “Rexroth has the world’s best drives. They are innovative and accepted everywhere.”
Agriculture:

VarioFlow Conveys Sweet Fruit

Strawberries require a high level of speed, as the harvested fruit must be packaged and sent in the shortest amount of time so that they are fresh when purchased and eaten. This is why the Spanish CORA cooperative use Rexroth’s VarioFlow chain conveyor system.

Strawberries as far as the eye can see. In the province of Huelva, near the border between Spain and Portugal, CORA, which has turned into the largest European cooperative for strawberry cultivation produces more than 65,000 tons of strawberries on an acreage of approximately 1,000 hectares. Strawberries are particularly delicate and must be quickly sorted, packaged, and sent after picking. Thus, the factor of speed had the utmost priority when CORA selected a new type of transport technology.

The cooperative commissioned the system integrator Construcciones Mecánicas Santa Gema S.L. in Lepe/Huelva to construct a new transport system to replace large parts of the previously used conveyor belt. Manuel Piedra Chaves, Production Manager at CORA, explains why the decision to go with Rexroth VarioFlow was easy: “We knew about Rexroth and that their name stands for quality and reliability. Santa Gema also reported past positive experience with the chain conveyor system.”

Fast and flexible

Only six to eight hours pass between the time when the strawberries are carefully picked by hand and when they are transported. The process consists of 16 workstations, starting with feeding in the fruit and the baskets, to weighing and palletizing. The VarioFlow chain conveyor system links the manual workstations and takes over basket conveying...
or outfeeding to the other stations in the system where the baskets are weighed and fruit is added or taken away as need.

According to Piedra Chavis, the speed of the Rexroth chain conveyor system was the decisive factor, “With fresh produce, time is of the utmost importance to be able to remain competitive. This is why primarily the speed of VarioFlow convinced us.”

Easy Integration
In normal operation, 500 to 800 tons of fruit are conveyed, but this can also go up to as much as 1,100 tons with 24-hour operation and a completely active system. The aluminum system can transport three sizes of strawberry baskets (from 250 to 1,000 grams) with a speed of 50 meters per minute.

Juan Manuel Cruz Soler, manager at Santa Gema, corroborates the easy integration of the VarioFlow, “Because the chain conveyor system was to be integrated in the middle section of the existing installation, the flexible and modular construction of the VarioFlow was a real benefit. We were able to adapt the system to the existing conveyor belt parts without any problems at all, set up discharge points to individual workstations, and link the automatic labeling and packaging stations.”

The southern Spanish cooperative opted for a VarioFlow VF90 with a 90 millimeter chain width, so that the strawberry baskets could also be optimally transported in curve sections. Thanks to a wide range of standardized curves and arcs, the limited installation space did not pose a problem.

Little space required
Santa Gema constructed a conveyor system that corresponded to the available space, incorporating a number of inclines, as well as sections with declines, which is why two different types of chains from the VarioFlow modular assembly system were combined. The standard flat chain is used to transport the strawberry baskets on the horizontal sections and a static friction chain for vertical transport, which must deal with inclines of up to 30° in some places in the CORA application.

Both the standard flat chain and the static friction chain are suitable for applications involving food and are easy to clean. Whereas this is, of course, an important condition for use with strawberries, Juan Manuel Cruz Soler also points out an essential financial aspect: “The conveyor chains in the VarioFlow system have a longer service life than any others on the market, even with an increased working speed.”

In this application, CORA has combined the VarioFlow chain conveyor system with components in the aluminum modular profile system from Bosch Rexroth AG. “We were immediately thrilled by the modular construction and the resulting flexibility in the entire system,” is how Manuel Piedra Chaves sums it up and adds, “In our field we have to be able to quickly react to changing market demands and be able to adapt our production. The VarioFlow, plus the aluminum profile components provide us with the best basis for this.”

The Rexroth VarioFlow chain conveyor system serves both manual and automatic work stations. It acts as a link between the conveyor belts, on which the freshly picked strawberries are delivered and later prepared for dispatch in transport boxes.

With 24-hour operation the system can convey up to 1,100 tons of strawberries per day. Speed is of the essence; the VarioFlow chain conveyor system transports strawberry baskets with a speed of 50 meters per minute.

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Automation systems are the core business of Cox MHP Inc., based in Flowood, Mississippi. The company was recently faced with an especially challenging application in the form of a machine for filling bags of a porous material with a granular product and sealing them. But these bags first had to be picked up. Vacuum technology could not be used here for two reasons: firstly, the bag was made of a porous material and secondly, the dusty environment, caused by filling the bag with the granular product, demanded a complex filtering technique. Clamps, grippers, hooks and other similar devices also failed here.

As Cox sought a solution to this problem a conversation took place with Rexroth. Brian Harvey, Engineering Manager for Cox MHP, remembers discussing current projects. “We took the opportunity of showing the Rexroth representative this problematic application, as time was getting tight on the project, and Rexroth presented us with this solution using the NCT Noncontact Transfer Unit.”

Transfer on air:
Noncontact transfer units pick-and-place porous bags

Completely without contact is how an indexing machine of the American company Cox MHP Inc. picks empty bags at five-second intervals from a magazine and places them in a pre-filling station. As the bags are made of porous material it is virtually impossible for vacuum devices to handle them, and with an especially dusty environment as well, the contactless NCT Transfer Units from Rexroth can really come into their own.

Three NCTs “float” the bags
Cox employs three NCTs on the indexing machine for handling the porous bags in the dusty environment: two 40 mm and one 60 mm-diameter disk-shaped devices. The two 40-mm devices are positioned side by side on a mounting plate on an actuator near the beginning of the indexing machine. “There are mounting holes on the back of them and we connect plastic tubing from an air compressor to the NCTs”, explains Harvey. The 10 x 20-cm empty bags, which weigh...
Rexroth NCT and the Bernoulli Principle
The NCT is a non-contact transfer unit. The disk-shaped components of the NCT Series are made of anodized aluminum alloy and have a special, grooved underside. They operate with non-lubricated compressed air and at an operating pressure ranging from 1 to 7 bar. These “disks” are around 1.7 cm high, and are available in diameters of 20, 30, 40 and 60 mm. At 124 g the NCT60, which is the largest component, is still considered a lightweight. At a pressure of 5 bar the NCT demonstrates a lifting force of 0.9 to 6.0 Newton, depending on the size. Air consumption lies between 100 and 210 l/min.

The NCT operates on the Bernoulli principle. In order to build aircraft, for example, the basic laws of physics, and in particular fluid mechanics, have to be taken into consideration. The Bernoulli principle specifies a relationship between flow rate and pressure. In aerodynamics this is applied to define the lift of an aircraft load-bearing surface during flight i.e. a wing or load-bearing surface is designed so that the air flows more swiftly over its upper side than its underside. This causes a lower pressure on the upper side. The ensuing pull results in lift and the aircraft takes off.

The same applies to the non-contact transfer units, whereby the airflow below the device creates a vacuum and thus a lifting force in the center and around the circumference. Due to this combination of dynamic vacuum and constant airflow, the raised object does not come into contact with the NCT surface. The Rexroth NCTs are thus suitable for all applications where vacuum technology cannot be applied, and they permit handling of highly sensitive or fragile objects.

but a few grams, are stacked in magazines. As the NCTs move to pick up the top bag in the magazine, they do so without contacting the porous bag. The two NCTs move along an XY axis. Next they travel about 30 cm down to pick up the bag and ascend again. Next they travel horizontally for a little less than 60 cm, releasing the bag to the third NCT. This 60-mm unit “holds” the bag in place so that other devices on the Cox machine can take it into bag-filling and sewing stations. The NCTs from Rexroth present a bag every five seconds to the main portion of the indexing machine.

“The customer has been running the system in full production since October 2003”, says Harvey. “It’s a one-of-a-kind machine and the customer is very happy with it.”
Robots in Cheese-making:

What does it Take to Produce a Good Cheese?

First-class raw materials, careful maturing as well as, without doubt, one or two secrets gleaned from the head cheese-maker at the factory, determine the quality of a cheese and whether it tastes good or not. Since streamlined manufacturing and high quality requirements also call for mechanical support in the cheese maturing room, the picture is characterized not only by salt water baths and brushes but also by partly or fully automated systems with high dynamic response drive technology.

Cheese is a pure natural product. In Switzerland more than 450 different varieties of cheese are produced, chiefly from cows’ milk. The quality of these first class products starts with so-called "forage" on meadows and alpine pastures. The way in which the curd is formed, the nature of the maturing process and the maturing period finally determine the characteristics.

When it comes to maturing cheeses, the greater part of the work is a natural process of curd formation through the use of rennet or acid. The ripening of the cheese from the inside to outside is primarily a matter of time but is influenced externally in the maturing room through the application of liquid wax.

In order to do this, the whole cheese is taken off the shelves, turned and brushed with liquid wax, a complex microbial ecosystem based on salt water.

This process is carried out several times each week. The work involved is correspondingly intensive and laborious. Nowadays the staff in the maturing rooms are assisted by robots that can handle the cheese. In addition, they are able to meet the existing high quality requirements and operate with consistent uniformity around the clock. High dynamic response drive technology ensures careful and vibration-free handling of the fresh cheeses.

Back in 1987, the first robot for use in
cheese production was developed and built at Rino Weder AG in Oberriet, Switzerland, in close co-operation with cheese-making specialists. The aim was to use machines to replace the physically demanding work involved in maturing cheeses, at the same time achieving consistently high quality by means of automation. The stringent requirements pertaining to the manufacture and processing of foodstuffs is further enhanced here by the special maturing climate of 15 degrees Celsius and 90 percent humidity. One particular challenge in this environment is ensuring absolutely reliable functioning of the maturing system. The biological maturing process in the cheese cannot simply be halted should something out of the ordinary occur. It is not possible to substitute manual input for the capabilities of a system of this kind, for example, like the one installed in the form of a cheese-handling robot at the Imlig cheese factory at Oberriet. Depending on its design, a single robot is, after all, capable of turning and brushing up to 20 000 whole cheeses a day with practically no human involvement. In the event of even a single day’s breakdown the damage incurred through loss of quality would be correspondingly great.

Gentle handling at high speed
As far as the handling the cheeses is concerned, this must proceed free of any vibration despite high speeds. Depending on the size, there will be three to five whole cheeses lying separately on one wooden board. Every hour, working at full capacity, the robot, travelling on rails between the shelves, removes some 200 to 250 such boards from the 6m high shelves and puts them back again. The Rexroth EcoDrive with SERCOS interface ensures, through its smooth acceleration and deceleration movements, that the cheeses do not slip or become damaged. Communication via the SERCOS interface guarantees the rapid and reliable transfer of data, together with parameterization of the drives, in a five millisecond rhythm. The fiber optics used in the control cabinet above the handling module on the robot guarantee a high degree of safety with respect to EMC.

Easy operation
The cheese-handling robot at the Imlig cheese factory travels on rails between the racks and works through entire rows of shelves independently. It removes the boards on which the whole cheeses are placed and conveys these to the attached processing module. Here the cheeses are pushed off the board onto an arm, which turns them through 180 degrees and then places them on so-called baskets for further processing. The cheeses are brushed with liquid cheese wax – to a secret recipe – and simultaneously rotated and subsequently placed back on the board and returned to the shelves.

Using a simple operational sequence the head cheese-maker can specify particular maturing cycles and handling parameters, enabling him to use his expertise in relation to the craft to determine the quality of his products. Rexroth drive technology has proved itself over many years in the testing climatic conditions that characterize the process of cheese-maturing. The high dynamic response drives guarantee safe and careful motion sequences and thus make a positive contribution to ensuring a first class cheese product – manufactured using natural raw materials from “Heidi country”!

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Packaging Technology:

New Cylinder Sensor: To Ensure It Really Sticks

Packaging needs to do much more than simply securing the contents. Wholesale packaging in particular plays an important role in conveying information on the product. On the one hand the legal stipulations regarding labeling have to be observed; the ingredients of food for example and warnings on tobacco products. On the other hand an advertising message is also being conveyed. The barcode for electronic checkouts is also now mandatory.

The company emkon, in Kirchlinteln, in Lower Saxony, Germany, manufactures packaging machines which fulfil the requirements of modern packaging. A new product in the assortment is the packer emkon.shark. This “shark” is suitable for the packaging of bags and foldable boxes. Flexibility is a “must” for the material being used and for the package sizes. The machine is designed for fast changes. The packaging material, coming from the belt or from the roll, is cut to size with a specially designed knife, enclosing the required number of products with hot or cold glue using the “wrap-around” technique.

Precision glue application
In order to glue the different widths of the packaging materials accurately, the slides with the glue must be precision-controlled. This is where Rexroth pneumatics comes in. A mini cylinder moves the gluing head, which must be moved out and back at a regular, but not too high a speed. The new integrated SF1 cylinder sensor permits the exact positioning of the application head over the total length of the cylinder. At the different end points of the glue track, signal points are set, which are specified in the control program. Without a mechanical conversion, the machine can be changed from program ‘Paper width narrow’ to ‘Paper width wide’. The cylinder always moves the total distance and deposits the glue over
The SF1 is a completely new sensor development, which was installed by emkon as a prototype in an exhibition machine. It provides an inexpensive alternative to conventional path-measuring systems. “At present we are checking which functions most draw our customers’ attention”, explains Ernst-August Meyer, Manager Predevelopment Pneumatics at Rexroth. “With emkon, this is the analogue path measurement. The distance to be glued comes directly from the 0-10V signal that the cylinder transmits.” By means of a sensor attached directly to the cylinder, the number of movable components is reduced, which offers advantages with respect to commissioning and service. Compared with a conventional sensor, which has to be manually aligned, no inadvertent setting can occur. The version with digital switching points reduces the cabling required, which makes the construction simpler. In systems that are difficult to access, the switching points can also be set by means of a handheld remote control device. The variant with analogue path measurement used by emkon continually maps the movement, representing a further step in the direction of condition monitoring.

Emkon uses electric axes from Rexroth. By opting for the SF1 sensor, the company is profiting from a further technology from the Drive and Control company.

Different lengths, depending on the programme. Conversion times can thus be noticeably shortened. Different lengths are covered with a single cylinder, which saves on components and space. The valuable installation space is therefore available for modular additions or retrofitted extensions. As a compact machine, the packer also has a small footprint, as we refer to the stand area of a system in machine-building jargon.

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Emkon uses electric axes from Rexroth. By opting for the SF1 sensor, the company is profiting from a further technology from the Drive and Control company.

Short Retooling Times

“Our increasingly modular system is especially interesting for major customers who, for example, wish to introduce products into a specific market and later sell them into other markets using different packaging. Decisive factors here are the different legal stipulations of the individual markets or the demands on the product packaging”, says Andreas Dittrich, Managing Director of emkon, explaining the requirements of his customers. A fast tool-change between different packaging types and sizes is also of interest for short-term promotions or individual events. According to Dittrich, the target for a mechanical conversion is less than ten minutes. Here, every process logged in the control rather than manually gains time. ☞

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“At present we are checking which functions most draw our customers’ attention.”
Plant Construction:

Chain Conveyor for Cookies

Every day approximately 20 tons of shortbread cookies leave the United Biscuits factory in Zaandam, Holland. These crumbly cookies have to be transported very carefully, even in their boxes. The chain conveyor system VarioFlow S safely transports the cookies from one packaging machine to another.

Food production makes special demands on technology. This applies even when already packaged cookies are transported in the factory. Jan Esselmann, system technician at United Biscuits' plant in Zaandam, knows about all these problems. He has spent 17 years trying to figure out the best way to transport packaged cookies and snacks between individual production stations. “You can’t avoid crumbs when making and packaging cookies, which creates special transport problems.”

Little Maintenance

The group came up with three essential criteria during their search for just the right system: long conveyor sections, various chain widths all in one program, and little effort necessary for maintenance and cleaning. “These three were really the most important requirements, and the VarioFlow S chain conveyor system meets them all,” confirms United Biscuits’ system technician. Working together with Flex-Industries, the Dutch sales partner for all the products in the Bosch Rexroth AG assembly technology program, the company was able to set up the new conveyor system in just a few months.

Shortbread production is spread out over two levels in the factory. The cookies are baked in an oven in the upper level and are then sent on 1.5 meter wide chains through a cooling system. Packaging takes place down on the lower level. Here, 250 gram boxes are sealed in plastic individually or in packs of three, and then transported to where they are placed into larger boxes for shipping. The VarioFlow S chain conveyor system transports these three different-sized packages. United Biscuits uses chain widths of 80 (single packs), 160 (triple packs), and 320 (boxes) millimeters for this task. “It was a big advantage that we could get all three widths from just one modular system,” explains Esselmann. He notes additional pros in terms of system planning...
and later conveyor maintenance, “The entire system is made up of components that vary very little, which reduces spare parts stocks. Plus, the chain links are just plugged together so that we don’t need any special tools to open or modify a line.”

Minimal Cleaning
A long-term employee at the cookie factory, Jan Esselmann especially likes the open system construction. “Although the cookies are already packaged before they reach this section there is always the chance that crumbs will fall on the conveyor. Of course, this is all considered production waste, but it could quickly cause the chain to glide less smoothly.” VarioFlow S does not have any profiles in the middle, which makes the system almost completely open and lets the crumbs fall through. This means the system stays clear of debris longer, requires less cleaning, and parts do not have to be exchanged as often as with closed systems. A longer service life is an important criterion for the innovative curve technology used in VarioFlow S and a patented ball bearing is integrated into all the curves. The result is that the system looks a bit like a roller coaster in some sections.

Besides shorter, curvy sections, United Biscuits also needed a very long 40 meter section. VarioFlow S could even manage this lengthy distance with just one drive. The circulating chain is actually 80 meters long. Thanks to the integrated bearing, it is particularly stable, even with five vertical curves.

Absolutely convinced by a perfectly running system, Jan Esselmann is confident about future system changes, “This system is so flexible, thanks to its special construction, chain links, and easy assembly. It won’t be a problem to change the layout later on if we need to.”

In some sections, the conveyor section layout looks a bit like a roller coaster. United Biscuits uses various widths depending on the package. The 80 mm chain for individual packages and 160 mm for triple packs are able to run so close next to and below each other thanks to an integrated bearing in the VarioFlow S.
“Good value for money but without compromising on the high quality.” This is how Bill Binckes, Sales Engineer at Westweigh Systems in Johannesburg, South Africa, describes the demands he places on the new weighing and packaging machine. Working in close co-operation with Tectra Automation, Johannesburg, Westweigh constructed a unit in less than two months for a customer in Botswana. “In spite of the fact that this is fully automated, we are able to offer it at a third of the cost of an imported unit”, reiterates Binckes. Up to twelve bags a minute, weighing between ten and 12.5 kilograms, can be filled and packaged by the new unit.

In this weighing and packaging machine for sugar, flour and other powder mills, the unit supplier Tectra Automation incorporated just about every device Bosch Rexroth AG had to offer in their product range. At the heart of the unit lies a Rexroth CL200 Profibus Master PLC with local/on-board input/output, an NT 200 power supply module and ZE200-DP central processing unit that can control up to 64 DP slave units. Westweigh opted to employ Profibus as the communication protocol. This controls the Rexroth EcoDrive 03 servo drives and a single, 16-bank Rexroth HF03 pneumatic valve terminal system, used for bag opening, closing, folding and gluing.

In this weighing and packaging machine for sugar, flour and other powder mills, the unit supplier Tectra Automation incorporated just about every device Bosch Rexroth AG had to offer in their product range. At the heart of the unit lies a Rexroth CL200 Profibus Master PLC with local/on-board input/output, an NT 200 power supply module and ZE200-DP central processing unit that can control up to 64 DP slave units. Westweigh opted to employ Profibus as the communication protocol. This controls the Rexroth EcoDrive 03 servo drives and a single, 16-bank Rexroth HF03 pneumatic valve terminal system, used for bag opening, closing, folding and gluing.

Westweigh Systems in Johannesburg, South Africa, has been working together with Tectra Automation to develop a competitive, fully automated weighing and packaging machine for powder mills. The mechanics, basic elements, drive and control technology as well as profiles and pneumatics from Rexroth play a considerable part when “Bakers Pride” is filled and packaged.

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Everything from a single source
The entire frame of the machine was constructed from extruded aluminum profiles and basic mechanical elements which meet the high standards set by the food industry, from which the entire frame was constructed with over 500 m of aluminum profile and more than 4 000 fastening elements. In addition to the aluminum profile, Tectra Automation also provided Rexroth linear guides and ball screw drives for direct attachment of the servo motors and also provided a sealed unit that minimizes the ingress of dirt.

In the meantime Westweigh has supplied the first weighing and packaging unit to a company in Botswana and Bill Binckes is convinced: “I can confidently state that this is the first fully automated weighing and packaging machine manufactured in South Africa that can compete world-wide.”

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The quality of the flour is crucial to the baker’s end products.
Modernization:

Express Production of Padded Envelopes

“In a continuous process the Polyair fully-automated production line laminates, folds, glues, seals and cuts bubble wrap and paper rolls to produce the popular padded envelopes, which are used to transport fragile contents safely. An increasing number of faults with the obsolete control system meant that the line was starting to suffer from frequent breakdowns in spite of intact mechanics.

Open interface
CCS took on the modernization of the installation without disrupting normal production, integrating a system solution comprising PPC Motion & Logic control, DKC intelligent servo drives and synchronous MKD AC servo motors from Rexroth, optimized for packaging applications. The powerful controller synchronizes the servo axes using pre-configured programming modules and commands the servo drives over a SERCOS fiber optic interface for precise synchronization. What is particularly time-critical here is the transition from the continuous processing of the material rolls to the synchronized sealing device, which seals the base and one of the sides of what will eventually become a padded envelope. “We were able to integrate the Rexroth motion control into the existing machine control with ease via the open-architecture communication interface offered by Rexroth”, reflects Dave Stuber.

20 minutes faster
The production line now runs with considerably fewer interruptions, the optimized motion sequence saving around 700 meters of paper and bubble wrap per day. In particular, CCS has considerably simplified the operating interface based on the motion control system: Where the operator formerly had to struggle with more than a hundred different screens using the old program for process and servo control, five menus now suffice. This modification alone has accelerated every product format change by 20 minutes. “Since Polyair has been working with Rexroth drive and control technology, machine availability on this line has significantly increased”, emphasizes Dave Stuber. Polyair was also convinced by this solution and awarded further retrofits to CCS and Rexroth.

“With production costs of 1,000 US Dollars per hour, every minute of uptime counts”, reaffirms Dave Stuber, President of system integrator Custom Control Solutions, Inc. (CCS) of Bartlett, Illinois (USA). He helped modernize the production line for the manufacture of padded envelopes by Canadian company Polyair Inter Pack Inc. of Toronto, Canada, with powerful Rexroth drive and control technology.

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Food Industry:

Indulging a Sweet Tooth – Confectionery Machines with Rexroth Pneumatics

The production of fine chocolates and confectionery is time-consuming and expensive. Nevertheless, the demand for exclusive sweet delicacies has been showing an above-average increase for a number of years. Carle/Montanari SpA’s new refining machine makes it possible for the confectionery trade to save on costs and, at the same time, to continue to improve the quality of its chocolates. In so doing the machine’s manufacturer has opted entirely for Rexroth pneumatics.

Carle/Montanari SpA of Rozanno, a tradition-based Italian company employing around 200 people, was set up almost 100 years ago (1907) and specializes in the production of confectionery and packaging machinery. Carle & Montanari’s customer base includes practically all the well-known international confectionery manufacturers.

The HFE-518 refining machine for processing and refining bulk chocolate makes on-going quality monitoring possible. Any deviations in relation to quality are automatically corrected during the manufacturing process by changing certain settings. Once the raw mixture has gone through the HFE-18, it turns into an interim product – the finest powdered chocolate.

Highest Quality Requirements
The raw mixture comes into the refining machine via a hopper and is refined as a result of the crushing action of five parallel rollers, which are arranged vertically one above the other. Each of the rollers is located at a certain distance from the next one so as to accommodate a defined quantity of the raw mixture. As the rollers rotate they gain speed, the speed increasing from the first through to the fifth upper roller, which may achieve a speed of 400 rpm. The rotational movement transports the product between the five rollers as if it were a film. As it passes through the rollers the mass is dried and ground to a fineness of 15 – 30 microns.

The HFE-518 is capable of processing 1,000 to 1,200 kg of bulk chocolate per hour. The individual parts of the machine are simple to erect and dismantle and this makes for a considerate reduction in maintenance work. Pressure, speed and temperatures can be controlled and programmed by means of an electronic control via a remote monitoring PC.

The refining machine can be fitted with a patented independent (closed loop) control system and these control devices ensure that it is always in a position to produce a consistent finished product. Should the characteristics of the raw mixture deviate from the specifications during processing, the control system will automatically adjust the refining
Sequence of Chocolate Production

1. Mixer – Dispenses and stirs ingredients such as cocoa and powdered milk to form a viscous mass.

2. Refining machine – For processing, refining, drying and grinding to form powdered chocolate.

3. “Conca” (Trough) – It is here that the final ingredients are blended into the powdered chocolate. These include cocoa butter to make the powder into a fluid mass once more. This is used to manufacture filled chocolates, bars of chocolate and many other popular chocolate items.

High-performance pneumatic components for the food industry

The machine is fully equipped with pneumatic components from Rexroth. Here special emphasis should be placed on the pressure regulating system in the pneumatics circuit, which is fitted with Series ED05 electro-pneumatic pressure regulating valves. These are renowned for their high dynamics, their reliability based on field testing and their high throughput capacity of 800 l/min.

Generally speaking, there is not only a demand for high performance component technology in the food sector, but also for compact designs, which can be accommodated in confined spaces. “The reason we have opted for Rexroth Series HF03 valve units is to enable us to meet requirements in relation to quality and construction”, explains Piero Facchini from Carle & Montanari’s technical department. The valves in this series are characterised by their compact nature, the fact that they are low-maintenance, their plug-in construction and low energy consumption. In addition, the use of HF03 valves units means considerable savings, since it has been possible to considerably reduce the number of valves needed in the machine by comparison to earlier machine series. “The Rexroth engineers were there right from the start. They did not just supply the components, they also provided us with support in other technical respects”, says Facchini.

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Beverage Packaging: Take It Easy

Realizing complex packaging solutions with maximum throughput but without compromising on flexibility – this is the demand placed on systems in the packaging industry. The branch meets these requirements with technology from Rexroth.

It all depends on the packaging. Where the quality of two products is identical, the packaging can be the distinguishing feature – and thus decisive for the customer. The packaging should offer the customer a clear additional benefit – ‘Convenience’ is the magic word. We have here the example of beverage packaging supplied with a carrying feature in the form of a handle, signaling to the customer: Take it easy!

In a hard-fought market, it is especially important for the beverage manufacturer and filler to be flexible and able to fit different types of packaging with these handles. KHS AG of Kleve, Germany, is a specialist in packaging machinery for the beverage industry. The company has developed a system, by which the handles can easily be fixed onto a range of different packaging types used for the beverage packs. The name of the system: Handle Applicator Innopack Carry Strip Master, abbreviated to Innopack CSM. In order to ensure safe, fast and flexible production, technology from Rexroth is used.

Absolute Flexibility
With the Innopack CSM system, two belts control the exact movement and accurate intervals between the packs. In order to fix the handles a patented, extremely lightweight application head comes down, positioning itself precisely between the packs. This realizes horizontal as well as vertical movements and combines all the advantages of modern servo drive technology. It attaches pre-laminated and pre-fabricated handles to different types of packaging, in particular shrink packaging and cardboard. Unusual packaging forms and shapes therefore present no problem. Laminating within the machine is also possible. It is also possible to fix paper or plastic labels, and printed or blank labels to the carry strip. Further advantages of the system: when attaching the handles the height is freely selectable. All the settings are called up simply by pressing a button. This reduces the waiting times and allows for flexibility. Indramotion for packaging, the automation system from Rexroth, fulfils all axis-relevant motion and positioning functions as the control and drive solution for packaging machinery. The
made into either a carrying strap or a loop by way of two mini-carriages. A pressure stamp on the short stroke cylinder fixes a label onto the adhesive tape. In addition to this, Rexroth supplies proportional pressure valves for the control of the adhesive tape store. The total solution is completed with the use of Rexroth components for compressed air preparation. Thanks to this technology, the handle applicator offers high power and simultaneous lower-motion speed, as this is required for transporting the products carefully. Up to 100 cycles per minute are attainable. Dirk Langanki, Manager of Electric Construction and Development at the Competence Center Packaging, recognizes the advantages of the complete solution from Rexroth: “The mechatronic overall concept of the Innopack CSM using servo technology guarantees a high level of flexibility in the production of handles for different sized multi-packs. With the shortest setting time for the different shapes and sizes, combined with high availability, these meet the requirements of the beverage industry.”

**Technology**

“In a hard-fought market, it is especially important for the beverage manufacturer and filler to be flexible.”

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Photos: KHS AG, Germany (2), Bosch Rexroth AG (2), Private (1)

**Complete Solution from Rexroth**

Using a range of different technologies Rexroth supplies a total solution: Rexroth pneumatic components move a knife attached to the closed profile cylinder. This knife cuts the sticky tape on the handle to the required length for every package. The handle is then made into either a carrying strap or a loop by way of two mini-carriages. A pressure stamp on the short stroke cylinder fixes a label onto the adhesive tape. In addition to this, Rexroth supplies proportional pressure valves for the control of the adhesive tape store. The total solution is completed with the use of Rexroth components for compressed air preparation. Thanks to this technology, the handle applicator offers high power and simultaneous lower-motion speed, as this is required for transporting the products carefully. Up to 100 cycles per minute are attainable. Dirk Langanki, Manager of Electric Construction and Development at the Competence Center Packaging, recognizes the advantages of the complete solution from Rexroth: “The mechatronic overall concept of the Innopack CSM using servo technology guarantees a high level of flexibility in the production of handles for different sized multi-packs. With the shortest setting time for the different shapes and sizes, combined with high availability, these meet the requirements of the beverage industry.”

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Photos: KHS AG, Germany (2), Bosch Rexroth AG (2), Private (1)
Packaging Machinery:

How Iron Gets into the Bag

The world’s biggest manufacturer of metal powder has achieved a 50 percent increase in productivity with a new mobile packaging machine. This installation was built by Danish manufacturer C&H System A/S – with technology from Bosch Rexroth.

Iron dust has often lit the way for us: In the filament of a light bulb, as the sparks of a sparkler and in a chemistry lesson for example – every child is familiar with the closed field lines formed by iron filings on a sheet of paper when a magnet is placed under it.

In industrial applications, iron dust is also indispensable. Particularly in the production of metal molded parts in the sintering process, whereby the powder is pressed under high pressure into a hardened mold and then aged by heat. Sintering is used wherever stable components with a complex geometry need to be produced in large quantities, for example in electrical equipment, in household appliances and also of course in the automotive industry. Between 7 and 15 kilograms of sintered metal dust are to be found in a single automobile – used in filters, drive wheels and bushings. There is a huge demand for metal dusts. The world’s major manufacturer, Swedish company Höganäs AB, produces millions of tons of this dust each year. Now, with a fully automated packaging machine from Danish manufacturer C&H System A/S, this company has achieved an increase in capacity of up to 50 percent. The installation was realized using technology from Rexroth.

Asynchronous operation

“...then the complete process begins: From filling and sealing the bags right through to palletizing.”

Firstly the bags are produced in the machine from these plastic hoses...
Höganäs processes more than 50 different types of powders on this machine, fed from several silos. The machine therefore needs to be mobile, flexible, and able to be moved. In fact a complete changeover from one silo to the next takes a mere 30 minutes. In order to afford the system the greatest possible stability and to guarantee ease of maintenance, C&H System and Rexroth designed all guides to be a Size 30. In addition, the rails were also fitted with special sealing facility. This is designed to ensure safe and reliable operation even in the vicinity of the production plant, where the air contains iron-dust.

**Extremely harsh conditions**

The complete machine was constructed especially for use in the extreme conditions of an environment containing iron dust. To check their suitability under these conditions, C&H System subjected the ball rail system and pneumatic cylinders to special tests: Two years of continuous operation were simulated in 16-hour shifts in a closed system with an environment permanently containing iron dust – every component withstood the torture without any visible damage to the moving parts. “Poul Larsen, Managing Director of C&H System A/S and Project Manager Preben Madsen were really pleased with the test results”, reports Kruse. “In order to complete the thorough tests on the system and to achieve an optimum solution for this type of special machine, C&H System developed a completely new test system for the individual machine functions, in co-operation with Rexroth. The results of this test and development work are impressive: The packaging machine is, in the meantime, in continuous operation at Höganäs, offering a throughput of up to 30 tons an hour. The system is self-emptying and no cleaning is required when changing between the different powder silos. Kruse is able to weigh up the project in a positive fashion: “Besides the product quality, our customer also really appreciates the fact that, even for a range of services from the various Rexroth business units, there was only one central point of contact.”
“But things have gone pretty well for them all the same,” he says, and laughs.

The elderly gentleman turns out to be Nils Gyllensvaan, founder of Gyllensvaans Möbler and father of siblings Mats, Erik and Karin, who currently run the company.

Gyllensvaans was founded in the late 1940s and is now Ikea’s oldest active supplier. Ikea is their only customer, and the company produces mainly bookshelves and office furniture. The Billy bookshelf is the company’s biggest product, and Gyllensvaans is the only company in the world that makes it in white, anthracite and silver.

With the new line, the company has made the move from traditional furniture maker to process industry. The new production line has tripled the rate of production. The 25 people who work on it turn out as much as the 150 who work on the other production operations at the plant. 320 metric tons of particle board pass through the plant every day.

**High Production Rate**

Once the 2.5 x 5 meter lengths of particle board have been laid on the belt, sawing, foil-wrapping, packing and final plastic-coating on shipping pallets take place entirely automatically. The only manual labor that occurs during the production is when the truck operators move the pallets from the production belt to the packaging belt.

“We are the first to have such a modern, automated plant, but I’m certain that more furniture makers will follow in our footsteps and automate their production. It’s essential if we are to be able to cope with competition from low-wage countries,” says Mats Gyllensvaan.

The plant operates at an incredibly high rate of production, producing a Billy bookshelf every six seconds. About fifteen fully-loaded semis leave the plant every day. The high production rate naturally places heavy demands on the packaging solutions. Österbergs Förpackningsmaskiner AB built the packaging machines, which are part of the entire packing line.

**Better Packing**

To cope with the high production rate, Österbergs has abandoned the traditional type of packaging in which the box and lid are made from the same piece of cardboard, the so-called five-sided box. In conventional packaging machines the box is folded at the start of the packing process and placed lengthwise on the conveyer belt with the lid standing straight up. This method requires very high speeds, which in turn entail major risks when the 30 kilo loads are started or stopped quickly.
Österbergs instead uses a type of packaging in which the box and lid are separate. At the start of the packaging line, there is a tray erector, and another machine at the end that glues on the lids. Both of these machines are driven by Rexroth’s pneumatic and electric drives components. Because the boxes have no lids, they can lie with their short sides facing the robots. This shortens the conveyor distances between the various packaging stations, resulting in a lower belt speed and a substantial increase in production capacity. The robot arms have more time for loading and can work low over the boxes with no risk of striking the lids. Once a box has been filled, it arrives at the second packaging machine, the lidding machine. Lids are glued onto the boxes during continuous operation at a rate of 75 meters per minute. The boxes then move on for labeling and plastic-coating on shipping pallets before being shipped out into the Ikea world.

**Drive and Control**

Österbergs Förpackningsmaskiner, who are responsible for the packaging machines, make capacity and operational safety and reliability their top priorities. The packaging machine is driven pneumatically and using electric drives motors, and is controlled by a PLC system that communicates via an ASI (Activator Sensor Interface). The advantage of this serial communications system over a parallel system is that it eliminates a good deal of cabling, simplifies the documentation and is also simple to place into operation.

Pneumatic cylinders are used to feed the cardboard through the machine. The AC motors are used wherever there is a need for stepless positioning, e.g. at the lidding machine. AC motors enable flexible adjustment, which makes it possible to run different packaging through the same machine. Resetting for a new format occurs automatically.

The packaging machine is one of the first to use Rexroth’s new Plug-in valve with AS-i communication. The built-in AS-i nodes in the valve ramp provide a highly compact solution. This valve ramp is supplied via common air/electrical connections and is expandable up to eight bistable valves per ramp.

Rexroth supplied:
- Pneumatic cylinders: 133 – Mini clean profile cylinder and 168 – Euromec cylinder
- Valves: Plug-in ISO1 and Plug-in 20, Version 75 with AS-i communication
- Universal servo drive for low-cost automation: ECODRIVE 03 Servomotor MKD

**Photos:** Bosch Rexroth AB, Sweden (9), private (1)
Aseptic Filling Machines:

Drinks – The Safe Way

It was essentially for filling bottles of milk and fruit drinks that SIG Asbofill, of Neuss in Germany, in close co-operation with packaging experts from Rexroth, designed an aseptic filling machine Type ABF 610 for plastic bottles (PET, HDPE) in sizes ranging from 100 to 750 ml.

SIG Asbofill, since 2003 part of the SIG Group, is a globally operating manufacturer of aseptic filling machines for non-carbonated drinks. The ABF linear filling machine family forms a major part of a complete aseptic filling line – from manufacture of the bottle and intelligent linear guides right through to the final packaging stage.

With the latest, extremely compact Machine Type ABF 610, this is the first time that a screw cap applicator has been integrated into a linear aseptic filling machine. The innovative automation concept from Rexroth offers, amongst other things, forward-looking safety technology.

This ABF 610, which operates intermittently as a runner rail at a rate of 25 cycles per minute, consists of five functional drive units. A total of 13 controlled servo axes operate the conveyor to ensure that the bottles are guided with precision when entering and leaving the machine and when passing through the sterilization and sealing stations.

Once in the aseptic zone the bottles are first of all sterilized. Servo-driven lances spray the bottles with hydrogen peroxide, immediately after which they are hot-air dried. The screw caps are also sterilized before the bottles are filled.

The control technology of the modular ABF 610 permits flexible filling to cope with different bottle designs and without needing to retool. The travel profiles (cam plates) are automatically changed depending on the production speed and other process-relevant parameters.

Drives with certified safety technology

The Rexroth drive system IndraDrive with Safety on Board offers the machine operator new possibilities for more efficient operation of the ABF 610, in addition to the safety aspect. Downtime can be considerably reduced: The operator is able to safely tool the machine and rectify faults, whilst continuing...
The highest level of flexibility and uncompromising aseptics are the main characteristics of the ABF filling machine series from SIG Asbofill to operate at a safe, reduced speed. The high speed of the ABF 610 demands the shortest of response times in the event of a fault. The safety technology integrated into the Rexroth IndraDrive realizes all essential safety functions on a decentralized basis and without requiring any additional hardware or having to divert via the open loop control system.

All this means that with the ABF 610, in comparison with conventional safety concepts, the use of safety cut-outs can be saved in motor supply lines, as well as considerably less wiring being required in the control cabinet. "The result is increased safety, yet with simplified assembly, reduced component wear and considerably more flexibility with respect to machine maintenance", emphasizes Thomas Niehr, Design and Development Manager at SIG Asbofill.

Furthermore, Rexroth also offers consistently scalable open loop control technology, which makes the ABF machine concept right for leaner and more efficient implementation.

IndraMotion for Packaging
The Rexroth IndraMotion for Packaging automation system fulfils all axis-relevant motion and positioning functions as the optimum drive and control solution for filling machines. Core element of the system is the merging of highly sophisticated motion control technologies with the standardized PLC to form integrated total solutions. Common factor with all solution variants of IndraMotion for Packaging is the embedded core module of IndraLogic, the PLC programmable and logic control system.

IndraMotion for Packaging offers three different solutions for a wide range of machine concepts. In addition to the system variants for drive-based and PC-based applications Rexroth offers a controller-based solution, which is used with the ABF 610 and which offers a high level of overall functionality for operating up to 64 servo axes. As well as complete and powerful logic functionality to IEC 61131-3 and PLCopen, specialized technology modular components are also available to the design engineer. The functional groups are co-ordinated by a PLC, the input/output of user-relevant data taking place at an operating station. The open architecture of the automation system supports all commonly used fieldbuses and is therefore easy to integrate into systems. In this specific application example communication is via Profibus-DP.

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