automotion

The B&R Technology Magazine

Special Edition

Change Packaging

Software Customize machines without redeveloping software

Packaging industry Warning: Paradigms may shift in transit

Motion control Modular machinery gaining momentum

PERFECTION IN AUTOMATION
www.br-automation.com

More than 200 packaging machine manufacturers already rely on B&R

ray TEC VISION · MACHINE BUILDERS and Design · mariani · LOGIK Technology · ANTARES VISION · makro labelling · THEEGARTEN PACTEC The smarter solution in packaging.
Sidel Cermex · PDI Proven Designs Inc. · ULMA · T2 Maschinenbau GmbH · SIG · Spanpak Systems · Fratelli Beretta · 1BLOW
G. MONDINI S.p.A. · AETNAGROUP · ALBAGNAC · tecnomeccanica · Stoppil
HASTAMAT PIEPENBROCK GROUP · PANOTEC the art of packing · sitma · INEVER · Ketan Automated Equipment, Inc. · pkb · YK
MBF TECNOLOGIE PER L'IMBOTTIGLIAMENTO · TECO · HASSIA-REDATRON · MEDISEAL · KHS · HayssenSandiacre
ESS Technologies, Inc. · Uhlmann · REDA Food Processing Plants · PSG PackSys Global · FT System control & inspection · WOLF · Modular
LOMA SYSTEMS · Elliott Manufacturing · TMG Automated Packaging · DE LA RALLINA · PAGO For your success! · Graphic Packaging International, Inc. · PKT TECHNOLOGY · Zitalia
INMERO · ILAPAK PACKAGING MACHINERY · EXTREME · ESSE GI · PEP Fördertechnik · LANFRANCHI
Hoonga · coesia GROUP · TMC · buhmann pac solutions · OYSTAR Gasti · OYSTAR Hassia · CHEMOSVIT CHEMPACK · general system pack srl
OMEGA DESIGN CORPORATION · Hudson-Sharp Converting Equipment · TAVIL · VIPOLL · Thimonnier · ISO 9001 · acme MOVING IDEAS
Barry-Wehmiller · ASTRO Vlašim · UNIVISION INSPECTION TECHNOLOGY · MECA SYSTEME · PAKER · Sidel · IMA Sharing Passions
CARUGIL · KRONES · novopac implanti S.r.l. · B&B MAF · PERRIER bottling machines · KOCH · GEA
MediSeal Pharma Packaging Technology · PACK PROCESS & PACKAGING TECHNOLOGY · AppecAstro · KOSME · ADS · Logics & Controls · BIEFFE HANDLING AND CONVEYING

editorial

Publishing information

automotion:
The B&R technology magazine, Volume 13
Online version:
www.br-automation.com/automotion

Media owner and publisher:
Bernecker + Rainer Industrie-Elektronik Ges.m.b.H.
B&R Strasse 1, 5142 Eggelsberg, Austria
t +43 7748 6586-0
automotion@br-automation.com

Managing Director: Hans Wimmer

Editor: Alexandra Fabitsch

Authors in this issue: Craig Potter,
Walter Burgstaller, Yvonne Eich,
Olivier Rambaldelli, Franz Joachim Roßmann

Graphic design, layout & typesetting:
Linie 3, www.linie3.com
Printing: VVA Vorarlberger Verlags-
anstalt GmbH, Dornbirn
Published at: B&R Strasse 1
5142 Eggelsberg, Austria
Cover photo U1: B&R

All articles published in this magazine are protected by copyright. Translation, reproduction and duplication are prohibited without the expressed permission of the publisher. B&R assumes no liability for any errors they may contain.

The packaging world is evolving –
Are you fit enough to survive?

Individually and as a society, we are increasingly concerned about the future of our natural environment, asking ourselves what changes we need to make in order for that future to be one where we – and our children – can thrive. The CPG industry faces a climate shift of its own, as a number of trends promise to dramatically reshape the market landscape. Manufacturers of packaging equipment are asking themselves how best to adapt in order to thrive under these new conditions.

By 2025, the continuous growth of the world's consumer class will bring about a tremendous shortage of natural resources. The resulting rise in cost of living, together with green consumption trends, will force packaging strategies to take large steps in the direction of sustainability and affordability. These steps will follow a path that leads us to fundamentally rethink the role of packaging. Yet as we redesign and simplify production methods, we will also have to keep pace with new demands such as product individualization and increased human safety.

As a leading global provider of packaging solutions, B&R is ready to advance side-by-side with its partners to meet these challenges head-on. We're constantly investing in new automation technology that makes our customers more energy efficient while helping them achieve whole new dimensions of productivity and flexibility.

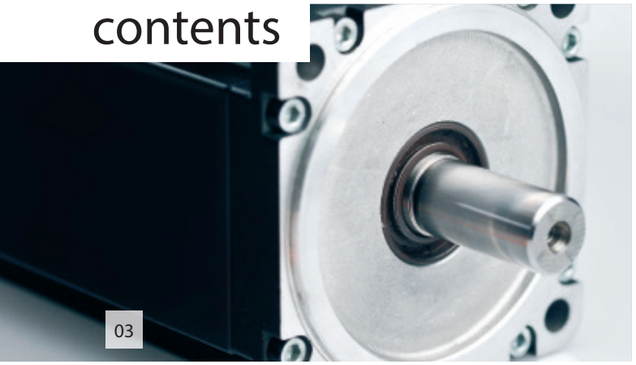
In this special edition of automotion, you'll learn about companies who are innovating their way to the top of their segments. You'll read about how B&R's integrated approach to automation incorporates advanced technologies – like safe robotics, vision inspection, in-line digital printing and IT systems – to deliver solutions that are far greater than the sum of their parts.

We look forward to seeing you at Interpack 2014 in Düsseldorf.

Happy reading!

Maurizio Tarozzi
Global Technology Manager, Packaging Solutions

contents



→ technology

03 If you can't stand the heat, get out of the motor
B&R's ACOPOSmotor is the only servo drive on the market that doesn't require derating and can handle an entire machine module on its own

23 A turn for the better
POWERLINK is particularly immune to electromagnetic interference typically encountered when transmitting large volumes of data via slip rings

→ interview

12 Do you speak PackML?
Standardized machine language allows machines, operators and higher-level systems to communicate with unprecedented clarity

26 Pushing packaging to new levels
Fundamental challenges compounded by emerging trends are prompting a paradigm shift in packaging automation

→ report

08 Far greater than the sum of its parts
Integrated software modules and fully scalable hardware from B&R help Mediseal build custom machines without unnecessary redevelopment

15 Speed baking with POWERLINK
Fully automated De La Ballina baking line processes 18,000 baguettes per hour

17 Salad made simple
Pro Pack Systems takes unique robotics approach with RoboLoader, made possible by B&R's fully scalable portfolio

20 Modular efficiency – Integrated performance
GEA builds exceptionally efficient machines with minimal development overhead thanks to B&R's fully scalable portfolio

30 Modularity: The lead time killer
Virtually zero time is spent on programming during construction and commissioning of a Seidenader CS-series inspection machine

→ news

07 New generation of robotic hand
Research team Poitiers University develops new robotic hand with 16 joints and 16 motors able to perform complex human-like movements

34 Real solutions in action
Automation up close: 1,000 bottles per minute and other records

Motion control

If you can't stand the heat, get out of the motor

Photo © B&R

The ACOPOSmotor unites all of the key components, including the motor, encoder, high-precision gearbox and servo drive, into one extremely compact unit.

The larger a machine, and the more flexible options it offers, the more it stands to benefit from hardware and software composed of modular, mechatronic units. The complexity that arises from incorporating large numbers of axes and safety technology further intensifies the demands on the automation solution. B&R has added the ACOPOSmotor to its portfolio to handle precisely these types of applications. This system is the only motor-mounted servo drive on the market that doesn't require derating and can handle an entire machine module on its own.

Antonio Mosca
Electrical Department Manager, OCME

"The motor-mounted drive system ACOPOSmotor is a huge step forward for us. We're boosting productivity – and saving energy and money while we do it."

The automation experts at B&R have developed an exceptionally compact motor-drive combination – the ACOPOSmotor – that is able to provide the same dynamic performance as a standard drive and adds the convenience of a single supply cable. This latest step in the company's continued expansion of an already impressive motion portfolio seeks to address the evolving needs of today's modular machinery.

Another B&R innovation, the longstanding ACOPOSremote, was also geared towards this growing market segment. Nevertheless, certain applications require an even more compact solution. Fillers with actuators mounted directly on the rotary plate highlight the challenge of making the most of extremely limited space. In addition, an ultra-compact motor-drive solution is just as important in many other applications that require integrated safety functions and a local POWERLINK hub for additional I/O components. In the Italian city of Parma, the ACOPOSmotor turned out to be just the answer that a customer was looking for.

The Parma region is known by gourmets the world over for its delicacies. For nearly 60 years, it has also been home to OCME, one of the largest manufacturers of packaging and filling systems.

OCME machines are exceptionally versatile and exhibit a high degree of technological sophistication, with more than 25 patents testifying to the company's innovative prowess. With its new end-of-line system, it is therefore no surprise that OCME was looking to push the envelope – particularly in terms of machine footprint and energy consumption. As a result, a key requirement of the DryBlock system became clear early in development.

Customer requirements – The only true measure
For its new DryBlock system, OCME needed a more compact drive unit than any available on the market at the time. OCME's electrical

The DryBlock system has revolutionized the way a packaging line is developed, built and managed.

department manager, Antonio Mosca, brought the situation to the attention of Davide Beviglieri, key account manager at B&R. "We're looking for a way to combine the motor and the servo drive into a single compact unit," explained Mosca.

After all, OCME had ambitions of revolutionizing the way a packaging line is developed, built and managed. This would include new technology to make product handling more flexible, allow handling of individual bottles and prevent contact between products. The individual modules – the labeler, shrinkwrapper and palletizer – would be operated from a single multi-touch panel and would take advantage of OMAC's PackML standard to optimize machine control, communication and synchronization. This approach would rely on full modularization with distributed I/O and motion control. Beviglieri contacted Alois Holzleitner, manager of B&R's Motion business unit, and described the application requirements. "We've been working on a solution for just such an application," Holzleitner replied, outlining the project and the current status of product development.

Keeping the proven, innovating the rest
The goal was to leverage as much of the existing ACOPOSremote concept as possible. Through conceptual design, simulation and experimentation, it was soon evident which components could fundamentally remain the same. Managing the temperature in such a confined space, on the other hand, proved to be quite a challenge. The electronics would be mounted on a housing that reaches 110°C during normal operation. No conventional component would last long under these conditions without additional measures. After all, the rule of thumb says that every 10°C increase in temperature doubles the rate of failure.

With less surface area to dissipate the thermal energy there would be an increased load on the motor as well. Various conventional approaches to resolving this conflict were considered. When water coolers, Peltier coolers and additional fans proved costly and unsuitable, however, B&R's developers initiated a more extensive series of trials in search of the optimal solution.

Extreme demands on motor and electronics
A test motor prepared to emulate the thermal characteristics of the final product was subjected to extreme operating loads. The temperature distribution in the windings, bearings and especially the encoder were analyzed in detail. The outcome? Without modifications, existing motors would not produce acceptable results.
The operating and limit temperatures of every single electronic

Well-known Italian beverage producer San Benedetto puts its trust in OCME packaging systems.

Photos © ocme (2), B&R (2)

OCME took advantage of OMAC's PackML standard to optimize machine control, communication and synchronization. The DryBlock system's HMI has also been standardized with PackML and runs over a B&R Multi-Touch Automation Panel.

component – far over 1,000 in total – were measured. It quickly became clear which options were available. While the power electronics handled the higher temperatures well, the highly integrated digital components were much more sensitive. The same applied to many of the passive components, in particular the DC bus capacitors, which would also need to be very small in order to meet the dimensional requirements. The small size and corresponding low capacitance meant additional risk of resonance in the DC bus.

"One of our primary goals remains ensuring the interoperability of all B&R components," explains Holzleitner. "This gives our customers the freedom to decide on a project-by-project basis whether their application calls for an ACOPOSremote or ACOPOSmotor. Our customers need to be able to scale their solutions at any time."
By skillfully arranging the components, partitioning the device into various temperature zones and getting the manufacturers of critical components involved, the development team was finally rewarded with a breakthrough.

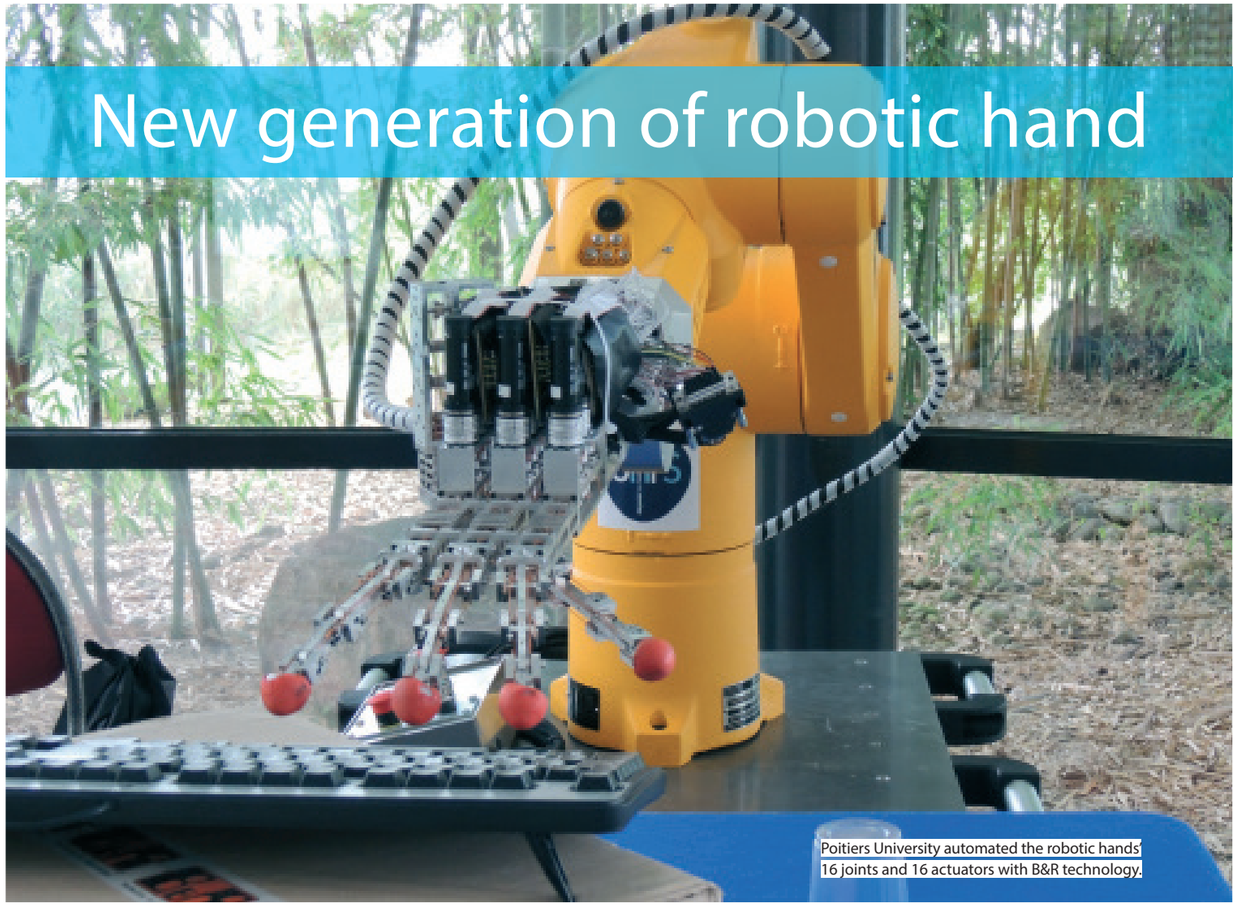
Putting ACOPOSmotor to the test
The results blew all expectations out of the water. B&R was able to ensure full compatibility with the rest of its ACOPOS drives and motors without any derating whatsoever. A single hybrid cable carries both POWERLINK communication data and power from the ACOPOSmulti DC bus directly to where it is needed. IP67 connections accommodate modules from the X67 I/O series – including the safety components – while the SafeMOTION functions defined in IEC 61800-5-2 are available as an option. A remote axis can be brought safely to a stop – independently of the STO signal on the hybrid cable – or operated at a safe speed during setup or maintenance.
Standing with B&R's Davide Beviglieri in front of DryBlock, OCME's head of development looks proudly on the fruits of their labor. The ACOPOS devices are installed, and the system has been running at top speed for days with ambient temperatures of nearly 50°C. "This drive is a huge step forward for us. We're now well on our way towards reaching our goal of boosting productivity while reducing energy consumption by up to 36 percent," concludes Mosca. ←

The advantages

> Remote servo actuator available in three sizes from 1.8 to 17 Nm
> Can be delivered with or without an add-on gearbox
> Seamlessly integrated into the ACOPOSmulti drive system
> Reduced wiring

Photo © ocme/B&R

New generation of robotic hand



Poitiers University automated the robotic hands' 16 joints and 16 actuators with B&R technology.

Poitiers University and B&R bring robots to life

The Robioss robotics research team based at Poitiers University has developed a new generation of dexterous robotic hands with 16 joints and 16 actuators that reproduce complex human movements such as grasping and fine manipulation. Mounted on a Stäubli robot arm and controlled by the B&R Automation PC 910, this hand is capable of performing a wide range of tasks, including complex packaging tasks as the manipulation of delicate food elements or flexible sacks. Due to POWERLINK, both the hand and the Stäubli robot are controlled with perfect synchronization. Moreover, the Automation Studio 4 software tool from B&R allows researchers to handle the control software as a bundle of reusable modules, thus making cooperative development easier within the team.

A strong partnership
In the 10 years of its existence, the partnership between Poitiers University and B&R has grown stronger and stronger. The mechatronics department and its students benefit from the advantages of the education support program B&R offers worldwide. Beyond the B&R education support program, this partnership has also contributed to highlighting the pioneering projects of the Robioss robotics research team. Based at Poitiers University, this team belongs to the P Prime Institute operated by the French National Center for Scientific Research (CNRS).

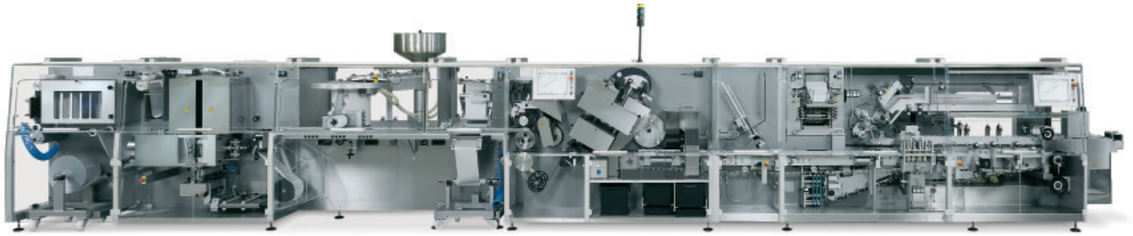
Robots and humans working hand in hand
One of the current areas being focused on by Robioss researchers involves allowing humans and robots to work hand in hand in a safe way. Being able to integrate robots that cooperate with human operators into production lines has now become a key factor for competitiveness for many consumer goods companies. At the latest event organized by Poitiers University and B&R last November, over 150 participants – including many packaging machine builders and users – could see for themselves that B&R systems and the bus-independent safety standard openSAFETY not only allow easy and safe integration of robots into production lines and medical applications, but also open up entirely new ways for humans to work with robots. ←

Photo © B&R

Far greater than the sum of its parts

Working with a single, all-inclusive project is not always the best way to manage the monstrous task of engineering control software for machines whose design requirements vary greatly from customer to customer. According to Ulf Leineke, R&D manager at Mediseal GmbH, there is a better solution. With a pool of thoroughly tested software modules and B&R as an automation partner, the packaging machine manufacturer has greater agility to deliver new solutions with minimal cost and risk.

Photo © Mediseal GmbH (1)



High-performance blister packaging line from Mediseal GmbH. Encapsulated, reusable hardware and software modules minimize the cost and effort involved in the customer-specific modifications frequently required in the pharmaceutical industry.

"For our customers in the pharmaceutical industry, product quality and system reliability are absolute priorities," explains Mediseal's R&D manager, Ulf Leineke. "Nevertheless, the substantial variations in requirements mean that up to thirty percent of each machine is either modified or newly developed."

Leineke argues that the approach frequently taken by manufacturers of series-produced machines – maintaining a single software project that incorporates multiple machine series and all of their options – would not have the same benefits for a company like Mediseal. "Considering the number of custom modifications that we deal with, an all-inclusive project would quickly balloon to unmanageable proportions. It would also result in us carrying a unnecessary load of disabled modules in every project or having to decouple parts of the main development line." Leineke also believes that customer acceptance would be problematic. "Our users in the pharmaceutical industry expect state-of-the-art custom solutions and updates, but they don't want to have to test and validate the entire project after every modification."

Pool of tested software modules

Mediseal draws from a pool of software modules with clearly defined interfaces to create the bulk of each new machine. "Since this part is not modified in any way, only the newly added components and any interdependencies require testing and validation. This saves a great deal of time and effort for both us and our customers," says Leineke.

Mediseal's software modularization has been even easier since switching to version 3 of B&R's Automation Studio engineering environment five years ago. "Encapsulating the software in reusable modules accompanied by corresponding libraries is a very simple matter," says Leineke. "Plus the projects are available as ASCII text, not just binary files." Leineke considers this to be one of the most important factors, as it allows efficient use of a source control tool to manage the various software modules. Once a version has been tested and released, it can be frozen and reused over and over.

Not forced to change products

It was because of these clear advantages that Mediseal became an early adopter of Automation Studio 3. "Whenever we see a new technology take a significant innovative leap, we're quick to implement it to our own advantage and to the advantage of our customers. We expect our automation partner to incorporate our feedback and inform us promptly of any issues – and B&R does an exemplary job of this," reports Leineke. It is important to him that he is never forced to change products, but rather is free to choose whichever time is most convenient. He appreciates that his development team is able to continue using earlier versions of Automation Studio with B&R providing updates long into the future. "Another huge advantage is that we hardly ever have any issues with firmware incompatibility," says Leineke, noting that Mediseal can rest assured when it comes to product availability as well: "Even B&R's oldest products are generally still available." And he ought to know – after all, Mediseal has relied on B&R automation technology as standard equipment on all of its machines for over seventeen years now.

An open solution, an open partnership

Mediseal originally switched to B&R in order to implement an innovative machine architecture based on distributed drive technology and flexible motion control. "Even back then, B&R had a control solution with integrated servo technology that allowed us to change cam profiles at runtime as well as unifying PLC and motion functionality in a single system," recalls Leineke. "These factors, plus the openness of the solution and B&R's readiness to accommodate our special requests, were the foundation of our decision to work with B&R as our automation partner."

This kicked off a long series of innovative machine developments, as demonstrated by the CP600. This was the first Mediseal blister packaging machine to be equipped with digital servo drives, and with an output of 600 blisters per minute it is among the fastest on the market.

Mediseal has more experience than any other company in the world when it comes to the implementation of digital servo technology. As a result, its users profit from an unparalleled level of flexibility and production efficiency. Direct drives replace mechanical moving parts and reduce the time for format changeovers between PVC/ALU and ALU/ALU blisters to under 35 minutes. The modular construction and clearly delineated zones make it easy to implement optional function modules – with optimal support from open B&R technology. The full performance of the CP600 can be best utilized by pairing it with a Mediseal cartoning machine.

As a manufacturer of packaging machines for the pharmaceutical industry, Mediseal develops or modifies up to thirty percent of each machine to accommodate its customers' needs. Thanks to B&R's Automation Studio engineering environment, Mediseal has been able to reduce the amount of software engineering this requires to an absolute minimum. In particular, Mediseal values Automation Studio's ability to encapsulate software into reusable modules and add the corresponding libraries.

Ulf Leineke
R&D Manager, Mediseal GmbH

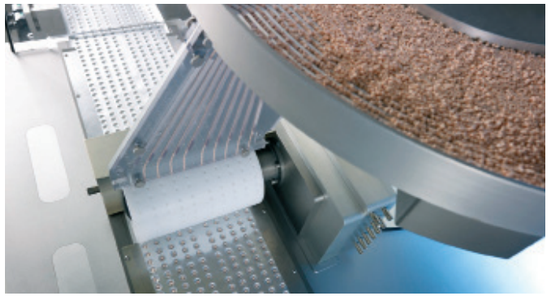
"B&R provides excellent single-source support to accompany its products and solutions. This helps us minimize engineering expenditures for our highly customized machines and still be able to respond quickly to new trends."

The operator console for the CP600 blister machine is based on a decentralized Automation Panel, which B&R modified according to Mediseal's design requirements to fit directly into the console housing.

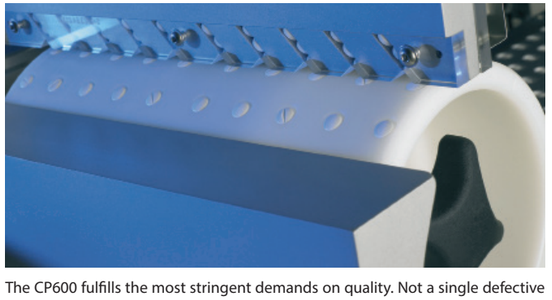
Development and commissioning in parallel

Each machine in a Mediseal line is controlled by a CPU module from B&R's X20 system. "This decentralization makes it easier for us to develop the software in parallel and commission a line's machines independently, which is much more efficient than dealing with a single centralized controller," says Leineke. "We're currently evaluating Automation Studio 4, which would allow us to work concurrently on a single controller. If that pans out, it's possible that we may soon move to an architecture with a central controller." This step would also eliminate the need for cross-communication between the line's controllers – a welcome side effect.

Communication between the controllers and the distributed servo drives, as well as networking of the local and remote I/O stations from B&R's X20 system, is all provided by POWERLINK. "The B&R solution gives us virtually unlimited possibilities for integrating other bus networks and 3rd-party systems, as well as complete freedom for selecting the type of motor to use. With Automation Studio, we can control linear, servo or stepper motors using the same software interface," says Leineke. "Yet even though we use B&R technology across the board – from control and I/O to HMI – what's more important to us is that B&R provides excellent single-source support to accompany its products and solutions. This helps us minimize engineering expenditures for our highly customized machines and still be able to respond quickly to new trends."



Fully equipped with POWERLINK and B&R servo technology, the CP600 produces up to 600 blisters per minute



The CP600 fulfills the most stringent demands on quality. Not a single defective blister is permitted to leave the machine undetected. B&R technology makes it easy to integrate external inspection equipment such as cameras and scales.

Photos © Mediseal GmbH (4)

Interview

Do you speak PackML?

The common machine language defined by the PackML standard allows packaging machines, their operators and higher-level information systems to communicate with unprecedented clarity. Machine builders, system integrators and end users alike are already experiencing the benefits. Developed by OMAC and following in the footsteps of the S88 standard on which it is based, PackML is experiencing near exponential growth in acceptance. Recently, OMAC Chairman Bryan Griffen explained to automotion why PackML has been so successful and who stands to benefit. He also shared his vision of a not-so-distant future where there is only one answer to the question "Do you speak PackML?"

Bryan Griffen
OMAC Chairman

Photo © OMAC

Can you start by explaining the concept behind PackML as an open standard?
In creating the standard, we're defining a consistent way of controlling discrete machinery. If we define things like the state model, the modes of operation and the information that is exchanged between machines, then any two machines that apply these definitions can communicate with each other, regardless of who built them and what control technology they used.

And as an open standard, PackML is not tied to a particular technology or a particular company. It's freely available to anyone in the industry. Any machine that complies can communicate with any other machine that complies, and we no longer need large systems in-between doing translation.

So are we just talking about communication at the machine-to-machine level or also on a machine-to-MES or SCADA level?
We're looking in both directions. Let me be clear that what we're not talking about is standardizing the network protocol used internally in each machine. What we are specifying is how those machines are going to talk to each other across a common Ethernet-based network protocol. Which specific protocol is used for any given line is a decision that can be made by the end user. The idea is that the machines can put information out on that network in a format that all the other machines can pick up.

The second step is then to get that information up into an ERP system so we can get recipe information down into the machines and reports from production back up into the ERP layer based on events in the line. This lets us record stoppages, for example, and use that stoppage analysis to determine what's causing the most downtime over a specific period of time. This new communication lets us target efficiency improvements not only at the machine level, but for the entire line as well.

So it's not just the communication layer that is standardized, but also the information to be exchanged?
Yes, the information is contained in PackTags – packets of information with a specific format and a specific function. So if we take a speed tag for example, everybody knows that it's called "CurMachSpeed". They know it contains information in the format "primary units per minute" of whatever it is that's being made, and they know it's going to be a 32-bit number. Every machine in the line knows these things, so when they get something that says "CurMachSpeed", they don't have to figure out "Now is that feet per second or meters per minute?" because they know exactly what they're dealing with.

Why are these standards so important for an end user?
As an end user, the problem you have when you build a line is that you buy a filler from one company, a coupon inserter from somebody else, a labeler, a caser, a palletizer and they're each made with a different engineering methodology. So when everything arrives at your factory, you face the task of making the machines work together.

You spend a lot of money with a system integrator who has to go talk to each machine builder and get into the inner workings of each machine. It gets very expensive and very difficult. And where do most of the problems pop up during commissioning? Not in any individual machine, but in making the machines work together.

With a standard methodology in place, the task of integrating the machines becomes much easier. Rather than spending all this time down in the guts of the PLC code aligning bits and bytes, the system integrator is focused on higher-level applications – making the line more efficient and providing tools that make the operator and supervisor more effective.

The end user benefits from having the system integrator and OEM each focusing on what they do best. If you dictate to the machine builder what technology to use, you're guaranteed a suboptimal machine. That's like going to Ford or Volkswagen and telling them how to build an engine. You don't do that. You specify the functionality and performance, you specify PackML and say, "OK, give me your best machine that complies." Then you get exactly what you really want, which is a best-in-class machine with the best possible performance.

Are there already end users supporting OMAC's initiative and using PackML?
There are quite a number of end users who are direct members of OMAC such as Nestlé, Procter & Gamble and PepsiCo. Then there are other large end users who, while not members of OMAC, are still specifying PackML as a requirement for machines coming into their factories, such as Arla Foods, Mars and others.

So the end user saves on system integration, gets a smoother commissioning process and sees overall improvements in line performance. **What's in it for the OEM?**
There are typically three areas of benefit that we see. The first is improved development time. Say, for example, that two end users are both buying a case packer from the same company. One comes in and says it must use Technology Provider A, and the other says it must use Technology Provider B, so the OEM has to develop the same machine with two different platforms just to

service multiple customers. They also need technicians who understand both platforms. This is not only expensive and difficult, it bogs down their capacity to innovate, because they're spending their time keeping the technology platforms and technicians at the same level instead of enhancing performance.

There's also an improvement in terms of after-sales support. No longer do they send out a technician who ends up sitting there scratching his head because he knows there was something different about this machine but can't remember exactly what. With standards in place, service calls become much less of a headache. Yet it seems to me that the biggest benefit is in the retention of intellectual property. When the end user buys a line that integrates equipment from multiple OEMs, the system integrator has to go down into the PLC code of each machine to make them line up and communicate. The OEM is forced to give away intellectual property to a system integrator, which of course nobody likes to do.

With PackML it can be a black box. The permissives are encapsulated in specifically-coded pieces of information, the PackTags. The system integrator knows what the state model is, so he doesn't need to know the inner workings; it's practically plug-and-play. It's a huge improvement for a machine builder to keep that intellectual property locked up.

So for the OEM, PackML brings improvements in development, support and protection of their intellectual property. What about the system integrators?
One of the things that a system integrator struggles with is bidding on a project involving a large number of machines. You just never know how long it will take to get it working. So if we can take that out of the equation with a standard, the bidding process becomes much easier and they can focus on higher-level functions.

Also, instead of everything being one-off, they can start making standard packages. They can make a middleware package for reporting line efficiency to a plant manager, for example, and they know they can use it in any factory because it is built on an accepted standard.

If we're talking about line integration, safety communication is going to come into play. Are there any PackML developments that deal with the issue of safety?
There are several active subcommittees within the OMAC packaging workgroup. One of them is focused revising the standard itself to make it more usable. Another is PackSafety, who is working on providing the same functionality as PackML at a safety level to communicate information between machines about safety events.

What is OMAC's strategy for deploying these standards on the market?
Right now, we're in the final phases of a revision to the PackML standard aimed at improving clarity and usability. We're working with various technology providers to make sure libraries are available for all the different types of PLCs. At PACK EXPO 2013 we had a PackML meeting with 8 different technology providers showcasing PackML tools already implemented in their programming software. Beyond that, we have the push from OMAC members such as Nestlé, Procter & Gamble and PepsiCo, who are establishing PackML as one of their fixed requirements. That's certainly going to drive the industry, and with technology providers also making it easier to implement, the adoption will move even more quickly.

Some of the larger OEMs like ProMach and Bosch Packaging are also adopting PackML as their standard.

How does a company become an OMAC member, and what are the benefits?
One of the primary benefits is having input on what's happening with the standard. It's a very active community. Getting involved now puts a company on the forefront of that wave, allows them to help define the future, gives them a first look at what is going to be required to comply and helps them get a step ahead of the competition.

Membership is pretty straightforward, ranging from $1,000 to $3,000 per year depending on the size of the company. For us, the most important thing is the participation. It's the ideas that come out of the member companies. This collaboration makes the standard stronger and more applicable across the board.

All of the details for joining can be found at OMAC.org.

Sounds like you have an exciting future ahead of you. We wish you all the best – thanks for your time! ←

Speed baking with POWERLINK

Photo © iStock

Based in the Rouergue province in southern France, De La Ballina develops, builds and installs fully automated packaging lines for raw, baked, fresh or deep frozen industrially produced baked goods and pastries. Requirements for performance and flexibility have risen sharply in recent years, making computer-aided quality assurance systems more important than ever.

"The rising cost of raw materials is driving our customers to lower their production costs," explains De La Ballina CEO Benjamin De Chilly. "Europe's overall production volume is growing every year, so they need to be able to accommodate higher production rates while at the same time eliminating manual tasks. Under these conditions, fully automatic lines like ours are no longer a luxury – they're a necessity. In the future, we expect the market to require even higher production rates as well as a continuously growing variety of bread products." In preparation for these challenges, De La Ballina's technical manager Thierry De Lazzari and his team revamped the entire automation architecture of its quality control system – using B&R technology across the board. The goals were to boost performance while making it easier to configure changes, as well as reducing the cost of implementation and maintenance.

18,000 baguettes per hour
The result of the system revamp with B&R technology is a whole new generation of machines that count, convey and monitor quality at a rate of 18,000 baguettes per hour. Products pass through a 3D vision inspection system before being transported by an array of suction cups to the packaging conveyor. The machines are equipped with a complete automation solution from B&R consisting of a PC-based Power Panel 500 that serves as the primary control and HMI platform, connected to a POWERLINK network of ACO-

ETHERNET POWERLINK

The high performance of the real-time POWERLINK network makes it perfectly suited for providing data transfer and synchronization for an image processing application. The most important criteria for the network technology were that it should be deterministic (precision <1 ms) and especially powerful. With a precision of 10 ns, cycle times of 100 µs and response times well under 1 ms, POWERLINK is more than up to the task.

When it designs a new line, De La Ballina uses only the most advanced technology – which explains its selection of B&R when it came time to implement an integrated automation solution.

POS servo drives for axis control and XV modules for valve control. According to De Lazzari, the decision to switch to B&R was based on some key advantages offered by its solution. These include the high performance of the POWERLINK network as well as the distributed X20 I/O system, which allows distances of up to 100 meters between stations. Other decisive factors were the ease of integrating the valve terminals into the automation system using XV modules, as well as B&R's comprehensive range of products, including mixed I/O modules. The countless integration features offered by Automation Studio 4 and the variety of communication protocols supported by the X20 system – including TCP/IP and Modbus – make it easy to directly integrate multi-vendor systems.

POWERLINK – Powerful network technology

The selection of POWERLINK-based B&R technology proved to be just as advantageous for the 3D vision inspection system as it was for the control system. The optical scanners and image processing components used here demand absolute precision with very fast response times. In the past, these requirements drove De La Ballina to hardwiring and basic fieldbus solutions. Familiar with POWERLINK's capabilities, vision systems manager Emmanuel Dumas was convinced that the real-time network would be perfectly able to handle data transfer and synchronization for the 3D inspection system. The most important criteria for the network technology were that it should be deterministic (precision <1 ms) and especially powerful. With a precision of 10 ns, cycle times of 100 µs and response times well under 1 ms, POWERLINK is more than up to the task. "When you design a new machine architecture, selecting a network is an important strategic decision," emphasizes Dumas. "Our choice of POWERLINK harmonizes perfectly with our vision of an integrated automation solution. Open-source technology eliminates the risk of hidden development deficiencies you face with a proprietary solution. That's the great advantage of the white box principle behind open-source products." Every machine that De La Ballina has installed all over the world since 2010 has been based on POWERLINK technology. POWERLINK easily handles even the most demanding requirements and has paved the way for the new machine generation's fully integrated and highly efficient automation architecture. With the open POWERLINK solution, integrating the existing image processing system was not only inexpensive, but also increased its performance significantly. The next step for De La Ballina will be so convert its image processing system to FPGA technology. This is no problem for the compact POWERLINK solution – and a single FPGA can handle both the image processing algorithm and the POWERLINK connection. B&R technology and the POWERLINK network help keep De La Ballina highly responsive to its customers' ever-changing requirements. The new machines allow quicker configuration changes and increased production volume. The new developments from De La Ballina will ensure that its customers will move into the future ready to meet the competition head on. ←

Emmanuel Dumas
Vision Systems Manager, De La Ballina

"Our choice of POWERLINK harmonizes perfectly with our vision of an integrated automation solution. Open-source technology eliminates the risk of hidden development deficiencies you face with a proprietary solution. That's the great advantage of the white box principle behind open-source products."

Photos © De La Ballina (2)

Cartoning machine

Salad made simple

Photo © iStock

The allure of packaged salads remains strong. The convenience of this healthy food option makes it accessible and attractive to many, but consumers are also price sensitive. Like others in the food processing industry, packaged salad producers often devote a large portion of their time and financial resources to packing their products by hand. While this may have worked in the past, increasing pressure to maintain low prices and improve production efficiency is motivating packaged salad producers to embrace new technologies in order to remain competitive.

David Zurlinden
President of Pro Pack Systems

"Using Automation Studio helps us substantially improve integration of machine and robotic control across the line. It makes life easier not only for Pro Pack engineers but for the machine operator as well."

California-based Pro Pack Systems used this knowledge as an opportunity to offer a more efficient case packing solution to packaged salad producers. Pro Pack has delivered advanced end-of-line packaging machines since 1991, with current customers including Taylor Farms, Fresh Express, Earthbound Farm and Dole Fresh Vegetables. Among its specialties are robotic case packers that incorporate state-of-the-art package handling technology.

Innovation with ease

Pro Pack knew that a new case packing solution would have to provide the innovative automation technology that customers have grown to expect, including advanced features for label inspection and package orientation. Yet the machine would also have to be especially flexible and intuitive to operate while remaining price competitive. And so the RoboLoader™ was born. The RoboLoader's extremely robust frame and conveyor are constructed from corrosion- and stain-resistant powder-coated or electropolished stainless steel, offering trouble-free operation and a sleek, hygienic design. A delta robot from Codian Robotics – powered by a B&R control system – runs the case packer and is the key to the machine's flexibility. The robotics platform can handle a wide variety of package styles, pack patterns, payloads and speeds, reducing the time and cost of production changeovers. Whether the operator is running a bag line or a clamshell line, the case packing equipment is very similar in operation. Pack patterns can simply be selected from a drop-down recipe menu on the HMI. Changeovers involve nothing more than switching out guide rails and require no tools whatsoever. All of these features greatly ease the training burden on machine operators and maintenance staff.

Freedom of choice

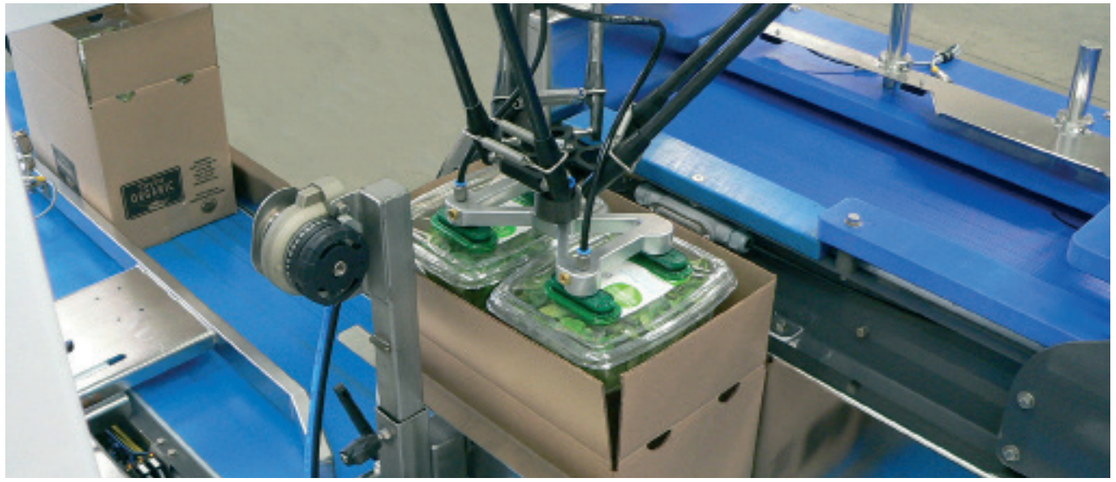
The RoboLoader takes a unique approach when it comes to robotics. The open architecture of the Codian robotic solution allowed Pro Pack to choose control components according to specific design needs rather than being bound to proprietary products – as is the case with most off-the-shelf robots. Based on its long track record of innovative solutions, B&R was selected to provide machine control for the RoboLoader. "In the four years that Pro Pack has worked together with B&R," says David Zurlinden, president of Pro Pack Systems, "we have built the full spectrum of secondary packaging machines – including servo and pneumatic case erectors, conventional and robotic case packers and case sealers – all using B&R technology. When this project began it was clear that the new machine would benefit greatly from their expertise."

Pro Pack selected a B&R Power Panel to unite PLC and HMI functionality in a single device. The Power Panel allows integration of the RoboLoader's motion control technology into the same system used for the rest of the machine. Since Pro Pack uses robotics to handle a range of tasks throughout the line, this not only greatly simplified the design but the troubleshooting process as well. Compact, multi-axis servo drives from B&R control the machine's motion and communicate via the real-time industrial Ethernet POWERLINK protocol. RoboLoader's architecture requires less wiring and cabinet space than traditional solutions, affording significant cost savings in hygienic environments such as salad processing.

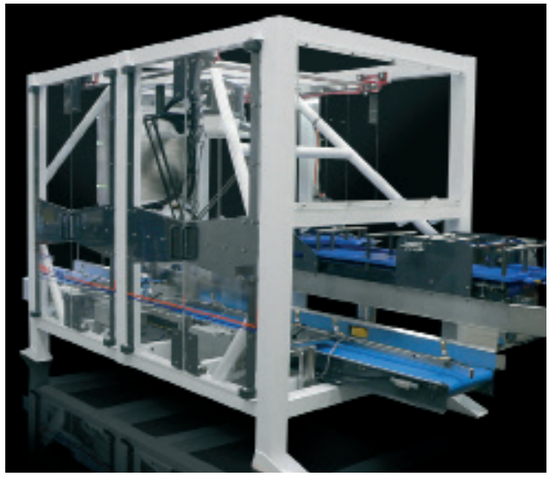
Enhanced programming and diagnostics

Using B&R's Automation Studio development environment, Pro Pack creates highly modular code that makes manufacturers in the food industry even more efficient when using the RoboLoader. This approach produces higher quality software with vastly improved long-term sustainability, thereby decreasing the instances of programming errors, preventing machine downtime and reducing the time and expense of software development. "Using Automation Studio helps us substantially improve integration of machine and robotic control across the line," explains Zurlinden. "It makes life easier not only for Pro Pack engineers but for the machine operator as well."

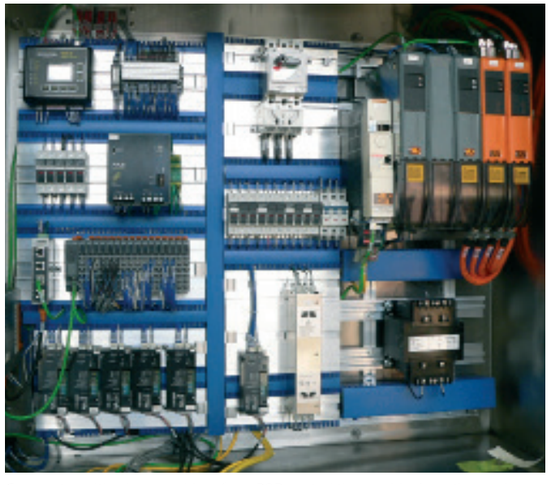
When a standalone robot is placed in a work cell, the level of integration is often very limited and may entail multiple electrical cabinets with various electrical components and a dedicated robot HMI. This limits the developer's ability to provide operators with useful diagnostic information. With a truly integrated approach, on the other hand, alarms and errors associated with the robot are handled in the same way as any other axis for consistently simple diagnostics across the board. "Our next venture will be robotic palletizing for the salad industry. That market poses challenges for conventional palletizers due to the spatial limitations of their existing production lines, but we are confident that, with B&R as our partner, we'll soon be shaking things up with an innovative solution," concludes Zurlinden.



A delta robot from Codian Robotics – powered by a B&R control system – runs the case packer and is the key to the machine's flexibility. The robotics platform can handle a wide variety of package styles, pack patterns, payloads and speeds, reducing the time and cost of production changeovers.



The RoboLoader's extremely robust frame and conveyor are constructed from corrosion- and stain-resistant powder-coated or electropolished stainless steel, offering trouble-free operation and a sleek, hygienic design.



Compact, multi-axis servo drives from B&R control the machine's motion and communicate via the real-time industrial Ethernet POWERLINK protocol. RoboLoader's architecture requires less wiring and cabinet space than traditional solutions.

Photos © Pro Pack (4)

Modular efficiency – Integrated performance

Many machine builders share a common dream. They dream of a day when they can react to their customers' requests with absolute flexibility, with a diverse range of machine solutions that is nevertheless built from a consistent set of hardware and managed in a single software project. Not GEA Food Solutions. For GEA, that day came more than ten years ago – with an automation solution from B&R. Since then, this supplier of secondary food processing and packaging equipment has been quick to market with efficient solutions – from standalone machines to complete processing lines – all with minimal engineering effort.

GEA's PowerPak NT is a high capacity form-fill-seal machine that delivers outstanding investment protection and process reliability. Thanks to B&R technology, it is also exceptionally easy to integrate in a line.

"Particularly when it comes to bringing machines together to form a line, our B&R solutions are still bringing us significant savings," says Stefan Krakow, head of product management and sales support at GEA Food Solutions Germany GmbH. Among its many products, the company develops and produces thermoformers for the food and pharmaceutical industries. "In one recent example, our close cooperation with a well-known sliced cheese producer from the Netherlands yielded six-digit savings."

Process data pays dividends

These immense savings were preceded by a detailed analysis of the timing of processes in the production line responsible for slicing and packaging the cheese. "In addition to a few mechanical modifications, the challenge here was a matter of shaving off a few tenths of a second to achieve the desired performance," explains Rolf Rein. Rein leads the software and electrical development teams at GEA's Biedenkopf location and was around back when GEA (at the time called CFS) switched to B&R control technology. "These differences aren't visible to the naked eye, so we needed data to come directly from the machine with the necessary temporal resolution. B&R controllers do just that. They provide high-speed access to all types of process data recorded at millisecond intervals, which they are equipped to handle internally."

The analysis of this data indicated that one of the machines in the cheese production line was waiting for the "Done" signal from the preceding machine before it started. Doing so resulted in an unnecessary delay of several tenths of a second. The solution? The timing of the signal is now advanced to ensure a seamless transition between the processes with no delay. What may seem at first glance to be a mundane optimization meant a four percent boost in output for this cheese manufacturer, which adds up to several hundred thousand euros per year.

On-the-fly optimization

Thanks to B&R's fully integrated automation solution, machines from GEA Food Solutions are capable of much more. Finely tuned, intelligent communication between machines allows operators to optimize the system in real time – for example, by switching out cam profiles on the fly. When replacing cheese blocks creates a gap in production that can't be compensated by a buffer, the packaging machine simply adjusts its speed accordingly. This prevents empty packages, which in extreme cases threaten to bring down the whole line.

With B&R's uniform HMI design, operators can easily master a single, highly intuitive operating philosophy and are able to react more quickly to errors. From any given GEA machine, operators are able to not only monitor, but also operate, every GEA machine in the line.

To empower its customers with the means to objectively measure and optimize the productivity of their systems, GEA offers various tools – such as GEA CostFox – built around the wealth of data provided by its B&R controllers. The operator uses this software tool to perform an on-site performance analysis in real time to obtain key quality data. This is made possible by GEA's across-the-board B&R solution – from motion and I/O to control and HMI – that ensures seamless communication without the system disruptions that otherwise hinder comprehensive analysis.

In the cases where the user does require outside assistance, B&R controllers offer remote maintenance options that make the process remarkably painless. "Remote machine communication has proven extremely helpful in practice," says Rein. "Using the diagnostic options provided by B&R controllers, our technicians are able to perform a detailed line analysis right from our local offices."

Easy-to-use software for both developers and users

Between the highly reliable hardware and the easy-to-use software, however, outside help is rarely required. "Intuitive operation is a key requirement not only for HMI design, but for the engineering environment as well," stresses Rein. "After all, we don't just use the tool to plan and develop the automation architecture, but also to commission and service the machines and lines on-site, so we need it to accommodate users with very diverse backgrounds."

Rein values the careful attention to ergonomic design that clearly went into the development of B&R's Automation Studio engineering environment. As a particularly key benefit he points out the high degree of integration: "This makes a noticeable difference in the amount of time and effort spent on engineering. Having a single environment where you create the entire software solution, including motion control and HMI, makes things easier for both developers and users."

GEA has taken particular advantage of Automation Studio's ability to design control software that mirrors the modular structure

GEA Food Solutions used Automation Studio to create a uniform HMI application for all of its machines.

Photos © GEA Food Solutions (4)

Stefan Krakow
Head of Product Management & Sales Support,
GEA Food Solutions Germany GmbH

"Particularly when it comes to bringing machines together to form a line, our B&R solutions are still bringing us significant savings."

of the machines themselves. "This is particularly convenient for commissioning engineers, helping them quickly find their way around even complex systems such as thermoformers," says Rein. "The individual modules are also highly encapsulated with well-defined software interfaces, so it's safe to change the code of one module without worrying about any negative impact on others."

A single software platform for all machines

The real secret of GEA's solution is that all of the company's thermoformers share a common software platform. When they put together a new machine for a customer, all that's left to do is adapt the configuration to match the layout. For GEA, the tedious task of reworking the software for each new machine is nothing more than a faint memory. This is one of the main ways that GEA is able to keep such tight reins on its engineering costs. "This is especially important to us since thermoforming is a very price-sensitive market with very stiff competition," says Krakow.

The customer not only profits considerably from the performance of the B&R hardware, but also from the sophisticated software architecture that GEA developed in close cooperation with B&R's expert developers. "All application data is stored on a standard CompactFlash card. During commissioning and maintenance, there's no need to load the software onto the controller or any other components since they all draw their data from the central CompactFlash card. Hardware is changed out quickly and easily without having to call in an expert." The openness of B&R hardware and software also makes it extraordinarily easy to integrate third-party equipment. "B&R's commitment to open standards for both hardware and software, as well as the full-featured software library, provides optimal support when networking machines from different manufacturers," says Rein.

Simulation accelerates engineering

Further benefits of B&R's openness can be found in other areas. Integrated interfaces for MATLAB and Simulink allow complex motion algorithms to be easily developed and simulated. GEA's future plans involve more than simply increased use of this efficient approach to engineering. "We will also be using the interfaces between Automation Studio and E-Plan to prevent transcription errors and eliminate the need to make redundant entries in two different development systems," concludes the GEA software and control expert. ←

An industrial PC from B&R's Automation PC 910 series offers enough computational capacity to integrate all of the software for machine and motion control in a single device.

Using Automation Studio, GEA Food Solutions established a standardized software solution for all of its machines so that each customer's particular arrangement of machines requires nothing more than simple configuration. Since then, the company has all but forgotten what it's like to have to tediously rework the software for each new machine. B&R's engineering environment is built around open standards and provides extensive software libraries – allowing GEA to integrate in-house and externally developed machines as though they were old friends.

Photos © B&R (2)

Industrial communication

A turn for the better

When it comes to designing bottle fillers, PET blow molders, label applicators, machine tools, printing presses and even wind turbines – the best solution often involves a rotating carousel. The stationary part of these machines serves as the frame, while the machines' main components are found on a rotating structure that must somehow be supplied with power and electrical signals. This is achieved using slip rings.

Slip ring application with POWERLINK

Slip rings with brush contacts are a popular and well-proven technology. In motors and generators, a brush provides a sliding contact to carry electrical signals to the commutator or slip ring on the rotating part of the machine. Industrial machinery generally requires a 24 VDC power supply for the controller, I/O modules and sensors, and in some cases an additional 400 VAC supply. Often, servo drives are provided with 560 to 750 volts of DC power through the slip ring, rather than the 400 volts from the DC bus.

Industrial Ethernet with slip ring technology

Communication has historically been provided using traditional bus systems such as CAN, Profibus, DeviceNet or other technology from this generation. These systems generally operate at 125 kbit/s (CAN and DeviceNet) and up to a maximum of 500 kbit/s (DeviceNet), 1 Mbit/s (CAN) or 12 Mbit/s (PROFIBUS). One of the challenges is ensuring reliable contacts, which is relatively easy to manage with the low speed of 10 to 100 rpm at which the carousel rotates. Another is meeting EMC requirements. Today's machines rely on industrial Ethernet solutions to provide communication at 100 Mbit/s. When you put this next to a DC power line carrying 560 or 750 volts, electromagnetic interference can produce errors within the data frames. The protocol detects this with a CRC, and the faulty frame is retransmitted. Motion control applications will allow a single retransmission without negatively affecting the machine. If electromagnetic interference causes a second invalid frame, however, the machine will automatically shut down and production will stop.

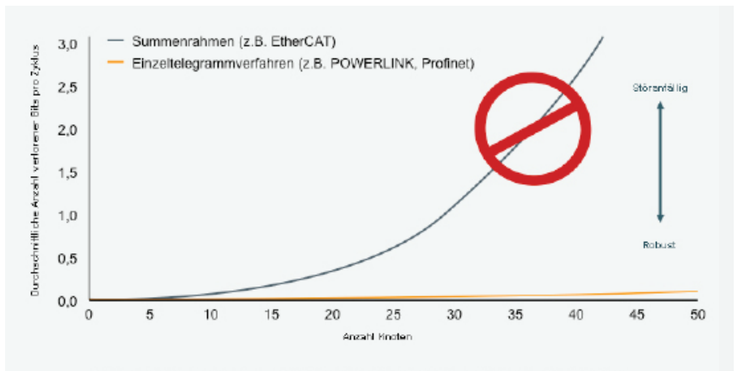
Maritial Favret
Technical and Quality Manager, COBHAM Sliprings

"Our engineers were impressed by the robustness and electromagnetic compatibility of the POWERLINK protocol."

Transmission method affects immunity

Passing industrial Ethernet communication through a slip ring is especially susceptible to interference since each individual wire in the cable must be transmitted via a separate brush track. Twisted pair cables provide protection against alternating magnetic fields and electrostatic interference. Every time you open and untwist the cable or add a connection, the system becomes more vulnerable. Yet a system's immunity to interference is determined not only by the physical components, but also by the communication protocol being used. The main differentiation made here is between single frame and summation frame methods. As defined in the standard Ethernet protocol, single frame methods can offer up to fifty times greater immunity to electromagnetic interference than summation frame methods.

With a summation frame method, there is also an exponential increase in susceptibility to interference as you add nodes to the network. The basic rule of thumb is that the summation frame method is more susceptible to interference than the single frame method by a factor of 1.25 times the number of nodes. For a machine with 5 nodes, this equates to a factor of 6.25, whereas a machine with 40 nodes is 50 times more susceptible.



Slip ring demo with single frame method

Photos © B&R (4), COBHAM (1)

One of the advantages of the single frame method is that the frames are shorter and only contain data for a single node. If a frame is compromised, the machine as a whole is not directly affected. With the summation frame method, however, a single disturbance means the loss of an entire network cycle and the data for all of the nodes in the network.

Costly downtime

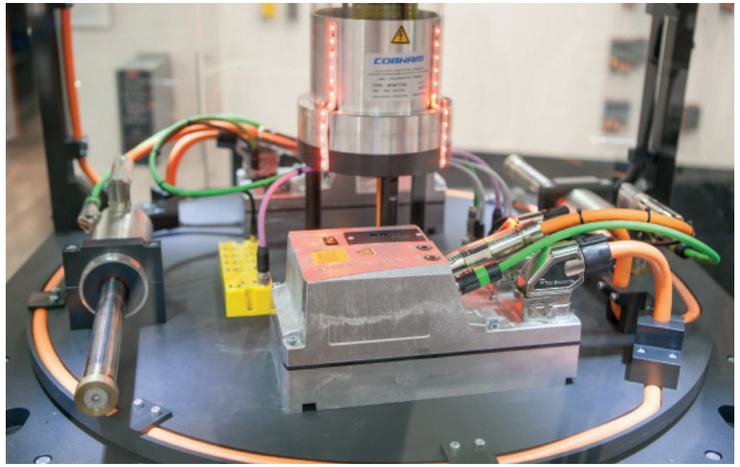
The errors produced by EMC interference are sporadic in nature. As a result, the possibility of electromagnetic interference is often overlooked at first, with investigations primarily centered around defective hardware or an error in the software.

Engineers who have dealt with EMC errors know how difficult it is to identify the source. Poorly assembled contacts, improper shielding or grounding or even minor wiring modifications made in the field may be to blame. Testing equipment can provide clues, but not an exact location. Part of the problem is often that the error cannot be reproduced in a clean development lab, and the investigation must be performed on-site at the end customer's location. Not only does the resulting production downtime come at a high price, the long drawn out search for an error can mean cashing in reputation capital as well. With or without a slip ring – the selection of a bus system plays a decisive role in the robustness of a machine or system.

Recommended reading:
"EMC and Errors" – Mathematical analysis of data framing methods; Industrial Ethernet Book.

Walter Burgstaller
International Sales Manager at B&R

"Many large machine builders put their trust in the reliable POWERLINK and openSAFETY protocols for slip ring applications."



Certified solution, demonstrated at trade fairs by the EPSG (Ethernet POWERLINK Standardization Group), transmits 24 VDC, 750 VDC, POWERLINK and openSAFETY through a slip ring.

Holger Steffens
Data Transmission Team Leader, Data Transmission Schleifring und Apparatebau GmbH

"Intensive EMC testing has shown that single frame methods offer significantly higher immunity to electromagnetic interference compared to summation frame methods of Ethernet-based communication."

Pushing packaging to new levels

Photo © B&R

Machinery for the packaging industry faces four fundamental demands: it must deliver outstanding performance and premium quality while also ensuring high availability and maximum flexibility. As if this weren't challenge enough, the advent of new requirements for individualization and serialization is transforming the industry and prompting a paradigm shift in the automation technology involved. Maurizio Tarozzi, Global Technology Manager for Packaging at B&R, explains how B&R became a leading automation supplier in the packaging industry and why B&R's integrated automation is ready to take on future challenges.

As a leading supplier of automation for the packaging industry, B&R is clearly doing something right. What's the secret?

In today's consumer packaged goods industry, a product's packaging plays a crucial role in its success – and the success of a packaging machine depends on how quickly and easily it can adapt to new trends. B&R has become a leading automation supplier for its partners in the packaging industry by following a concept of integrated automation that best answers the challenges faced by the global market. B&R provides solutions with the performance and scalability to cover all the needs of the industry and grow as these needs evolve. B&R solutions push packaging machines to new levels of performance, flexibility and availability. This is the natural outcome of B&R's commitment to perfection in automation being applied with an in-depth understanding of the market – which it has earned through close cooperation with end users around the globe.

From primary and secondary packaging through to end-of-line solutions, B&R consistently leads the way with innovations that shape the market. Only automated packaging machines that synergize all the benefits of state-of-the-art motion control, robotics, safety, image processing and IT connectivity can achieve a sustained edge on the competition.

What's the one thing an OEM needs in order to get the most out of their equipment?
For today's packaging machinery a modular mechatronic design is indispensable. Consequently, the best performance can only be achieved through perfect synchronization of centralized and decentralized automation components – all seamlessly orchestrated by comprehensive automation software. POWERLINK and B&R Automation Studio 4 were developed exactly for this purpose; they are the backbone of our success in the most advanced packaging machines. But this alone is not enough. There is no "one thing".

Every core automation component – the control system, servo drives, I/O and HMI units – makes an essential contribution to the overall performance. The B&R product portfolio offers a wide range of integrated and highly scalable solutions that perfectly fit every requirement of the most advanced packaging systems and push machine performance to its physical limits.

What technologies does B&R offer that push machine performance to its physical limits?
With B&R's reACTION technology, programs are executed directly on distributed I/O modules – eliminating internal data transmission to achieve response times as low as 1 µs. This reduces the load on both the network and controller and optimizes performance to match demands. The result is an immense increase in performance without added costs.

Then there's NetTime, which provides real-time clock synchronization over POWERLINK with an accuracy in the nanosecond range, allowing you to synchronize multiple encoder positions and distributed I/Os. Together, reACTION and NetTime represent a new paradigm in control performance.

Another essential aspect is motion control. B&R's intelligent ACOPOS servo drives work with very short scan times and communication cycles of 400 µs – or only 50 µs in the control loop. This allows very fast, event-driven cam transitions that satisfy the requirements of the most advanced packaging machines. Electronic cam profile deviations are automatically calculated every 400 µs – independently of the number of real and virtual axes used in the application and unaffected by the network or the control system.

What does this mean in terms of real-world packaging applications?
Primary packaging is the most challenging. On these machines the packaging material meets the product at the highest possible speed, so the level of precision directly influences both product quality and raw material consumption. In filling machines, for instance, both gravimetric and volumetric filling processes can use reACTION technology to operate valves and sensors with an unrivaled precision of 1 µs.

Other high-speed machine functions like glue shooting, code stamping and bad product rejection can combine B&R's reACTION and NetTime technology to synchronize motion control with distributed I/O. Digital output patterns can be controlled with a resolution of 125 ns, and fast input edges such as registration marks or product detection are recorded with a timestamp of 1 µs.

NetTime technology can also be used to replace expensive intelligent sensors like the ones found on rotary labelling machines to detect bottle orientation. Analog input modules with a sample time of 50 µs can scan the bottles and provide the data for precise bottle alignment at up to 80,000 bottles an hour.

Product and package changeovers, registration mark correction, cut-and-seal functions, belt-tracking and product handling are just few packaging tasks that require on-the-fly motion profile changes. The B&R Cam Profile Automat allows machine operators to change motion profiles dynamically without requiring any new calculations on the controller. B&R's Safe Motion Control can drastically increase the uptime of any packaging machine. You can remove a product jam or make mechanical adjustments while keeping the whole machine under control. A safer machine results not only in improved operator security but also in higher productivity.

Why have POWERLINK, openSAFETY and the open source approach been so successful for B&R?
Aside from delivering remarkable performance, these standards are an extremely sound investment. This is due to their openness, as well as technical characteristics such as hot plugging, easy diagnostics, free choice of network topology, cross-traffic and integration of CANopen mechanisms, which give users considerable added value.

The system represents the only real-time Ethernet standard on the market in the true sense of the term – an open source, purely software solution that relies on standard hardware components and fully standard-compliant Ethernet frames.

Utilized and supported by a rapidly growing community of leading packaging OEMs, technology providers and global end users, these technologies are guaranteed an ongoing process of standardization and broadening acceptance – keeping them future-proof long down the road.

Packaging machine builders are clearly favoring a modular mechatronic design strategy. How does B&R's integrated automotion contribute to this approach?
The best way to accomplish mechatronic design with true modularity is to have modular hardware working in perfect harmony with modular software. From a hardware point of view, you've got B&R's motor-integrated and machine-mounted ACOPOS drives, which bring the power out of the cabinet directly to where it's needed. Distributed HMI and I/O modules can be connected directly to machine modules, giving you the added speed and flexibility of decentralized intelligence. And with a record 10 control systems and 728 axes synchronized over POWERLNK at 400 µs, B&R has proven its knack for coordinating multiple controllers and safety systems – an essential aspect of a modular solution.

What benefits does Automation Studio 4 offer for packaging OEMs?
Automation Studio 4 provides all the team development functions you need to develop modular software that is completely independent of the real hardware. Moreover, it offers a complete suite for simulating the tasks performed by every automation component, including simulation of the motor load. This means that machine builders can know how the machine's performance matches up to the customer's requirements before ever beginning mechanical construction.

With B&R's Generic Motion Control approach, the motion control solution is developed in complete independence of the actuators. That means that, in the next step, the machine builder is free to select whatever combination of synchronous motors, induction motors, stepper motors, DC motors and hydraulics is needed to meet the machine requirements without having to go back and modify software that has already been developed.

Why is robotics integration so important for packaging machine builders, and what solution does B&R offer in line with this trend?
Being able to integrate all types of robot kinematics into a machine is key to achieving maximum flexibility in production. SCARA and delta robots embedded in machines for sorting and placing need to be perfectly synchronized with the machine's I/O and motion control in order to significantly improve performance. Outside the machine, you've got palletizers with anthropomorphic or 4-axis kinematics. In this case the robot is a complete machine, and the key to boosting flexibility and performance is getting it fully integrated with your secondary packaging machine.

B&R has solutions for both types of requirements. By integrating a comprehensive set of transformations for all the different types of kinematics in Automation Studio, B&R has made it easy to synchronize robotic and motion control with IEC 61131 compliance using PLCopen Part 4. This once again highlights B&R's commitment to open standards and the flexibility that comes with them.

Among automation suppliers, B&R has taken a unique approach to vision system integration. Why is that?
Over the next few years, we're going to be seeing more and more cameras performing various tasks on every packaging machine. In order to guarantee total quality, maximize OEE and satisfy market requirements such as track-and-trace, serialization and food safety, you need an automation solution with eyes. Teaming up with Cognex allows us to offer our customers added benefits, with vision systems fully integrated and synchronized in a unified machine architecture.

What will be the next big technology challenge for packaging end users and OEMs?
Individualization and serialization trends are setting a clear path toward the conversion of printing and packaging technology. Only by enabling in-line digital printing can a machine builder push individualization to batch-size-one production. We've already seen some experimentation here from Nutella and Coca-Cola on their labels. These were not batch size one, but were big steps toward individualization. In the future, when you go online to place an order, you'll design your own custom packaging along with it. At Drinktec 2013 we saw the first machine builders using in-line digital printing technology as a substitute for conventional bottle labels. This is the kind of innovative combination of printing and packaging that will take over the field of packaging technology in years to come. As a market leader in both printing and packaging, B&R is perfectly situated to provide the integrated solutions to accompany the convergence of these two industries. ←

Photo © B&R

Inspection machine

Modularity: The lead time killer

Virtually none. That's how much time is spent on programming during the construction and commissioning of a CS-series inspection machine from Seidenader. The secret is the exceptional modularity of both the machine and its automation architecture. For Seidenader's customers in the pharmaceutical industry, this means spending more time in productive operation and less on qualification and maintenance. Did we mention the machines are also more flexible? Behind all of these advancements, you'll find a uniquely integrated automation solution from B&R that facilitates a modular machine design along every step of the way.

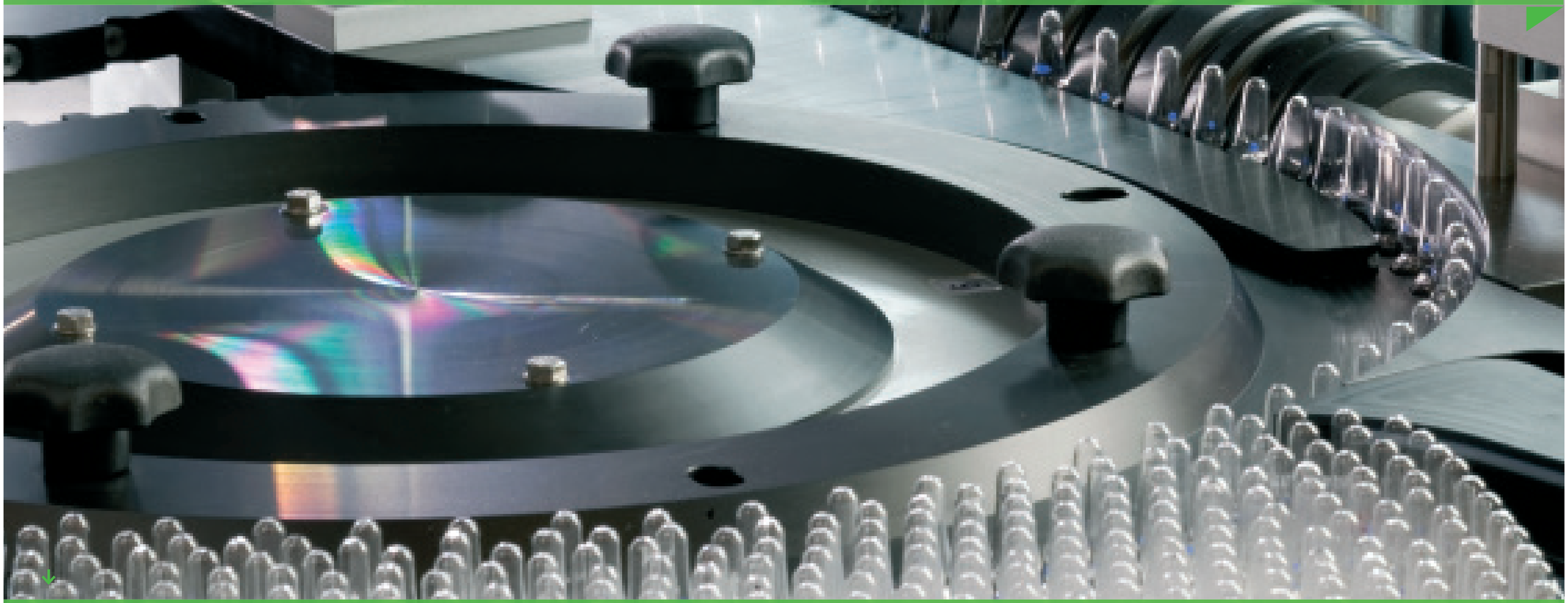
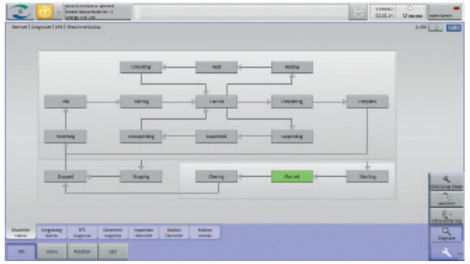


Photo © Seidenader

"Until very recently, we faced the same mountain of programming that many OEMs face when building and commissioning a new machine," says Herbert Grindinger, head of Seidenader's PLC programming department. "With our new series of CS inspection machines, we've finally leveled this mountain." For Seidenader this means a drastic reduction in lead times throughout production, commissioning and maintenance of its inspection machines for liquid and freeze-dried medication and nutrition provided in the form of infusions or injections – known as "parenterals". For the programmers, it means being able to focus on enhancing machine performance and adding new features. Switching to integrated automation from B&R was the first step toward these achievements. Seidenader now works with a single software project that covers the entire inspection machine, including every piece of optional equipment. "For us, this turns the creation of custom control software into a simple matter of configuration rather than tedious programming," explains Seidenader's controls expert. "And the best part is that, with B&R, this also includes the safety solution." This elevated degree of modularization and standardization allows Seidenader to produce and test its machine modules in advance.

A new level of functional safety

The end user has plenty to gain from this new machine design as well. Since the software has already undergone thorough testing on a fully operational machine and didn't have to be tweaked and adapted throughout construction and commissioning, it provides an unprecedented level of functional safety. When it comes time to add or replace modules down the road, the comprehensive standardization makes this much faster and easier as well. "If the requirements change and you need to swap out the infeed/outfeed unit, it's no problem at all – you just enable or disable the respective software modules and the rest of the code remains untouched," explains Grindinger. "This greatly simplifies the task of system qualification for the end user." Machine operators are supported at every step along the way by B&R's commitment to completely integrated automation. The new solution makes it easy for them to generate a complete list of components that can simply be checked off during qualification. Grindinger's team found B&R's engineering environment very helpful when it came time to create the machine's control software. "What we really like about Automation Studio is that it doesn't place any restrictions on the user



Seidenader uses PackML as an internal standard applied universally by all programmers, which makes the software easier to understand, diagnose and operate.

with regard to selecting a programming language," explains PLC developer Michael Grampp. "We went with Structured Text, for which B&R offers comprehensive and powerful libraries. The added support for pointers helped us manage the large volumes of data that come with modularization."

Transparency and user-friendliness thanks to PackML

B&R's support for PackML further added to the system's transparency. "We've implemented PackML as an internal standard that everyone must adhere to," says Grindinger. "It's not something we impose superficially just for the HMI benefits – we've broken it down to the level of each individual machine module. This makes the software more transparent and easier to use and maintain. Beyond that, it also simplifies the tasks of line integration and communicating with higher level systems." Another significant advantage of B&R's engineering environment is that it allows machine control and motion control to be handled on a single hardware platform. "The fact that we no longer need two separate platforms substantially simplifies programming," adds Grindinger. A powerful industrial PC from B&R's Automation PC 910 series handles the control aspects of the new CS machine. It is mounted in the main control cabinet on the central machine module along with up to five image processing PCs, which ensure that the CS is able to detect a wide array of contaminants and optical defects. The machine is suited for ampules, cartridges and vials up to 100 ml, covering a broad spectrum of product and container formats. To complement visual inspection, it is also possible to integrate modules for headspace gas analysis (HSA), near-infrared spectroscopy (NIR), polarimetric inspection (GSI) and high-voltage leak detection (HVLD).

Software cam switch for added triggering flexibility

"When you use cameras for visual inspection, the way that they are triggered has a direct impact on the quality of the results," says Grindinger. In the past, the company had to use a separate electronic cam sequencer, which only permitted position-based triggering. This also meant that a new recipe had to be created in advance for each new profile, or the cam switch software had to be modified, retested and requalified. "B&R offered a better solution," explains Grindinger. "The X20DS4389 module from their X20 series provides digital outputs that use the AsMcDcs library to allow triggering based on timestamps. Used in conjunction with a position-based trigger, this makes it possible to maintain consistent timing and achieve optimal inspection results – regardless of how fast the inspection carousel passes the containers in front of the camera and rotates them with the aid of small servo motors." Not only does the CS no longer require a separate cam switch, it also allows the same software to handle a whole range of speeds simply by tuning recipe parameters – so there is also no need for requalification. Operators set these parameter values in the same way they interact with every standard and optional module in the machine – using a custom Panel PC 820 HMI with an 18.5" display in 16:9 format, which communicates with the Automation PC 910 control computer via Ethernet.

ETHERNET POWERLINK

The IP65 rating of decentralized ACOPOSremote drive components allows them to be mounted directly on the machine without an additional control cabinet. Power runs through a single hybrid cable carrying both the POWERLINK and STO signals in addition to the 24 V supply. By using this standardized technology as the electrical interface between the various modules that make up its new CS-series inspection machines, Seidenader has taken its modular solution to a whole new level.

In developing its new CS series of inspection machines, Seidenader took advantage of B&R's commitment to fully integrated automation to drastically reduce lead times for its custom-built machines through improved modularity.

Standardized electrical interface between modules

Seidenader selected POWERLINK to network the up to twenty ACOPOS drives used in its new inspection machine. Between machine modules, a single standardized hybrid cable provides the power supply for the decentralized ACOPOSremote drives as well as two lines for the STO signal and POWERLINK. The corresponding remote connection boxes allow either a line or star topology. "The hybrid cable lets us take modularization to a whole new level," says Grindinger. "We now spend considerably less time and effort installing, commissioning and servicing the modules."

Integrated diagnostics for service technicians

Thanks to B&R's integrated automation solution, commissioning and maintenance were already pretty simple to begin with. "With the software for all of the automation components managed and distributed from the central control computer, installing or replacing a drive is child's play," confirms Grampp. "With B&R, there's no need to use a separate programming device or pre-install any software." No extra equipment is needed to perform diagnostics on the automation system, either. The diagnostic functions B&R provides, such as System Diagnostics Manager, can be called up directly on the HMI. Seidenader programmed all of the other tools needed for analysis directly into its HMI application. Grindinger has big plans for the system's yet untapped potential. "B&R's solution gives us so much capacity for growth, I expect we'll soon be able to push the specified output for the new CS series even higher than the current 400 containers per hour. We also designed the machines and the automation architecture in a way that allows us to easily scale the solution across our entire range of products, including our most powerful inspection machine. With B&R, we're confident that we have the right partner for the job."

The IP65 rating of decentralized ACOPOSremote drive components allows them to be mounted directly on the machine with-out an additional control cabinet. Power runs through a single hybrid cable carrying both the POWERLINK and STO signals in addition to the 24 V supply. By using this standardized technology as the electrical interface between the various modules that make up its new CS-series inspection machines, Seidenader has taken its modular solution to a whole new level. ←

Herbert Grindinger
PLC Programming Manager, Seidenader Maschinenbau GmbH

"We now work with a single software project, created in Automation Studio, that covers the entire CS-series inspection machine, including every piece of optional equipment. A new machine is a simple matter of setting parameters rather than tediously redeveloping code. And the best part is that, with B&R, this also includes the safety solution."

Photos © Seidenader Maschinenbau GmbH (2)

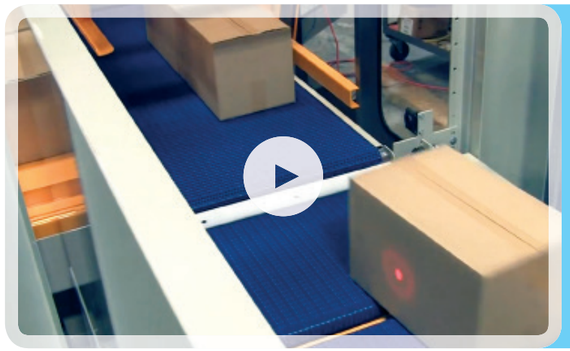
Applications

Real solutions in action

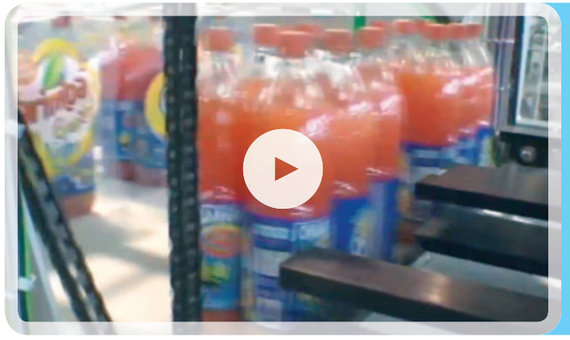
In the consumer packaged goods industry, a product's packaging plays a crucial role in its success. As the intermediary between consumer and product, packaging must strike a perfect balance between functionality and design, and it must do so within the constraints of technical and economic feasibility. Below are five examples of how industry leaders have tackled the requirements of the packaging industry in real-world applications.

Link:
B&R on Youtube

Sidel Cermex DIVIDELLA KÖRBER SOLUTIONS TOPTIER KRONES Zitalia

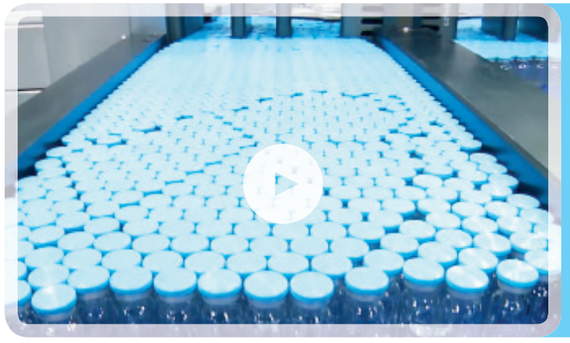


TopTier
TopTier's new L7 All Electric palletizer features PerfectPattern™ technology, guaranteeing precise placement of cases on the row-build section, as well as confirming case rotation and size. The modular B&R ACOPOSmulti drive system allows for easy configuration and the option to control up to 30 drives on a single Ethernet IP connection.



Cermex
The VersaFilm shrink bundler from Cermex reduces the need for corrugated material and achieves 1,000 bottle per minute throughputs with over 98% efficiency, using a new B&R automation platform.

Krones
Krones presents its award-winning EvoLite packaging machine. To provide safe, highly repeatable and reliable machine automation, B&R solutions are fully integrated with the machine automation system.



Dividella
Using one hundred servo axes, the modular, reconfigurable, GMP-designed Dividella cartoner from Koerber Medipak provides rapid changeover, recipe management, data access, detailed diagnostics, and simplified parameterization instead of programming, all from a graphical HMI.

Z-Italia
Z-Italia offers the only labeling machine on the market featuring safe motion, a unique capability provided by B&R networked safety technology.

Fotos © Youtube (5)