auto**motion** ^{11.18}

The B&R Technology Magazine

Human-track collaboration

Hand in hand
with the transport system

Mobile equipment A partner for automation

Intelligent transport systems Fast track to a fast Trak

PERFECTION IN AUTOMATION
A MEMBER OF THE ABB GROUP

editorial

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Dear reader,

Collaborative robots – robots that can safely work alongside humans – are a big trend in the automation marketplace. In applications such as machine tending on a production floor and order picking in a distribution center, robots can improve efficiency, but only if people can also operate in the same environment. In the same way, there will continue to be a need for manual tasks and other human interventions in otherwise automated environments – such as adaptive assembly or packaging machines based on ACOPOStrak technology.

As the technology leader in both safe motion control and intelligent track technology, it only makes sense that B&R would be the first to introduce the concept of human-track collaboration. That's what visitors to the B&R booth at the 2018 SPS/IPC/Drives fair in Nuremberg will experience.

In a demo that's both live and automated, it presents the workplace of the future – a collaborative workplace. The human-track collaboration demo will feature a workstation where an operator will interact with both an ACOPOStrak system and a pick-and-place robot in a safe zone. Shuttles do not need to stop when an operator is nearby, they simply need to respond within a few milliseconds by assuming a safely limited speed (SLS) and force (SLF).

These now-familiar B&R SafeMOTION technologies offer advantages over conventional track designs, which rely on synchronous motors to limit speed, and mechanical devices such as spring friction to limit shuttle force. These solutions are not adjustable and can only operate at a fixed, slow speed even when no operator is present, limiting productivity.

Still other track systems have no means of collaborative operation at all, and must shut down entirely using safety relays – just as machines did before the advent of safe motion.

There are so many potential uses for ACOPOStrak, and even more will become practical through human-track collaboration. Some processes are just too complex or costly to automate. Others can be performed manually until an automated solution is developed, to avoid delaying time to market. And, as these adaptive machines adapt to unforeseen future production requirements, the flexibility to combine manual and automated tasks will become more important than ever.

Happy reading!

John Kowal
Director of Business Development, B&R USA

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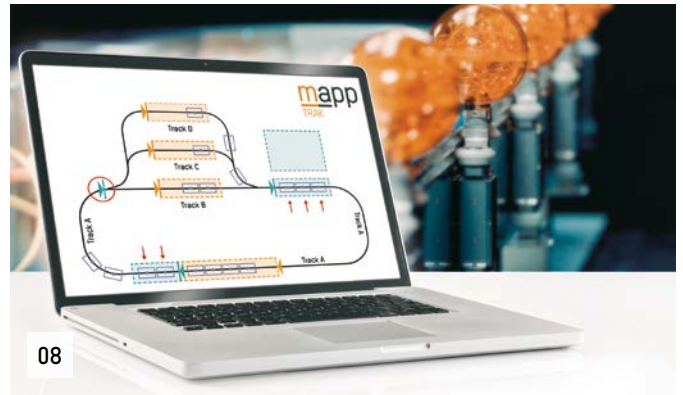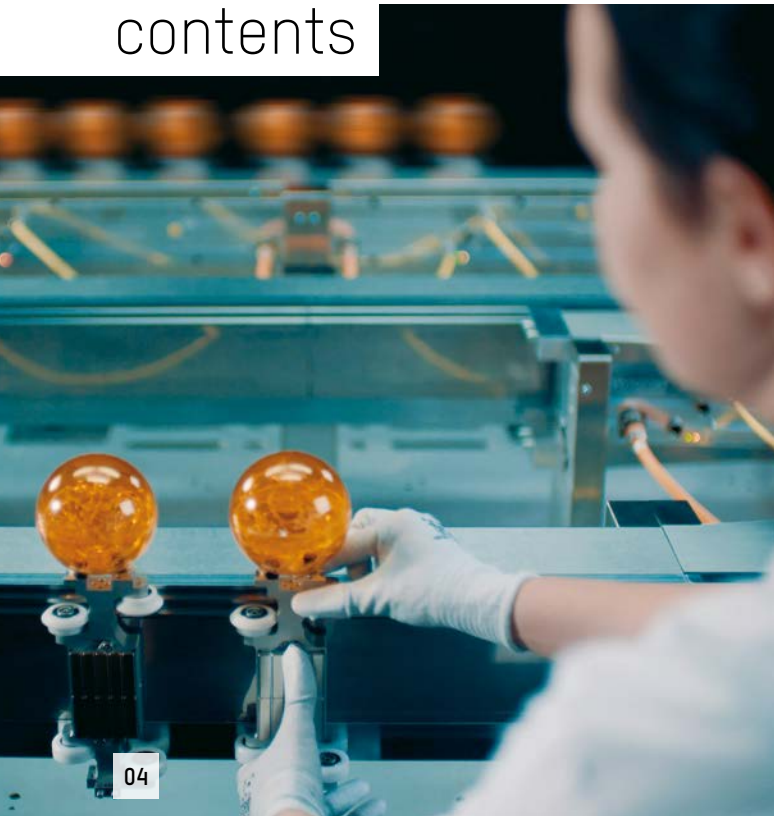
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➜   **news**

4 m/s

0.2 m/s **SLS**

The safety functions provided by mapp Trak are applied only where humans are actually working in the vicinity of the track.

Hand in hand with the transport system

Photo: B&R
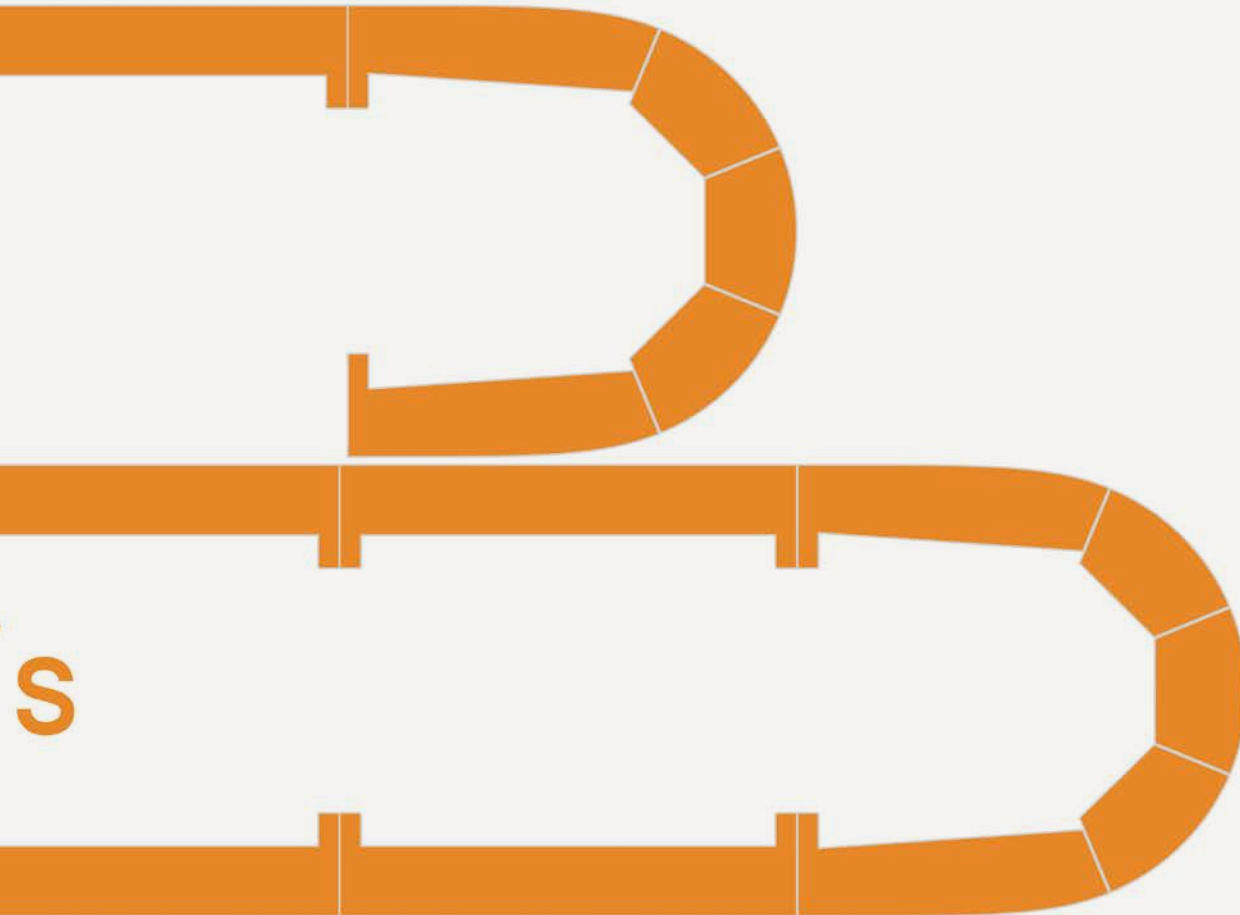
The time of safety cages in manufacturing lines is over. In the factory of the future, machines, robots and humans work freely, hand in hand.
To enable the same level of seamless interaction between humans and intelligent transport systems, B&R is the first manufacturer to introduce the concept of human-track collaboration.
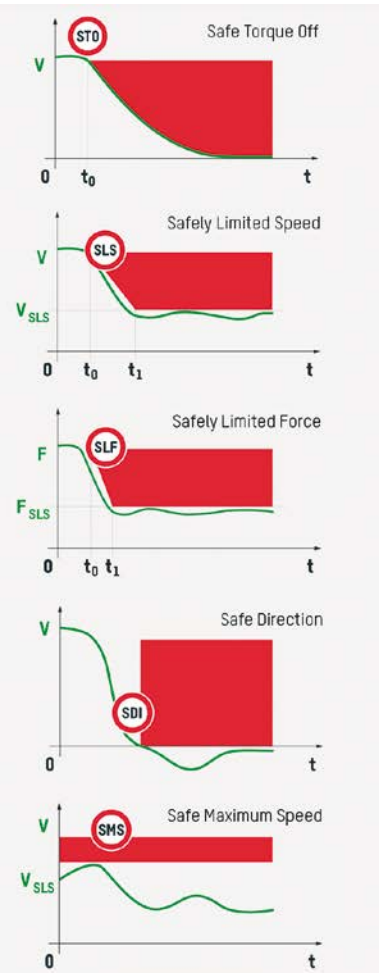
ACOPOStrak features five core functions that ensure safety in human-track collaboration: Safe Torque Off (STO), Safely Limited Speed (SLS), Safely Limited Force (SLF), Safe Direction (SDI) and Safe Maximum Speed (SMS).

Humans continue to play an indispensable role in many production lines. Even in the age of Industry 4.0, manual workstations are the best option for handling many assembly and testing tasks. Humans' intelligence and fine motor skills allow them to quickly learn and carry out complex new tasks. "This was the motivation for defining 'human-track collaboration' as a requirement," says Robert Kickinger, mechatronic technologies manager at B&R.

Whenever humans work hand-in-hand with machinery, safety takes top priority. While there are established safety standards and recommendations for human-robot collaboration (HRC), human-track collaboration (HTC) has yet to be addressed in the same context. This is not surprising. After all, as Kickinger points out: "We are pioneering new territory in this field" To ensure safety at manual workstations along an ACOPOStrak system, B&R makes use of limit values that have been defined for human-robot collaboration in technical specifications and type C standards from related fields.

Five integrated safety functions
ACOPOStrak features five core functions that ensure safety in human-track collaboration: Safe Torque Off (STO), Safely Limited Speed

(SLS), Safely Limited Force (SLF), Safe Direction (SDI) and Safe Maximum Speed (SMS). In addition, the maximum safety response time of six milliseconds is very short. All together, this makes it possible for the shuttles to slow down to a safe speed and exert a safely limited force when in the vicinity of humans. In other areas of the track, or when no one is around, the shuttles travel at full speed and full power.

What really sets the B&R solution apart, however, are the details. "The limit values for safe speed and safe force are not fixed values, but can be calculated dynamically by the safety application at runtime," explains Kickinger. This allows shuttles of different weights to travel at their respective maximum speeds without posing a danger. "We are the first to support manual on-track workstations at this level," says Kickinger.

Safe setup
The safety functions of ACOPOStrak also enable implementation of a safe setup mode. In setup mode, the speed and force limits apply to the entire track. Once people have left the danger zone, the restrictions are lifted. "This is a significant advantage over all other available track systems," emphasizes Kickinger. Other systems
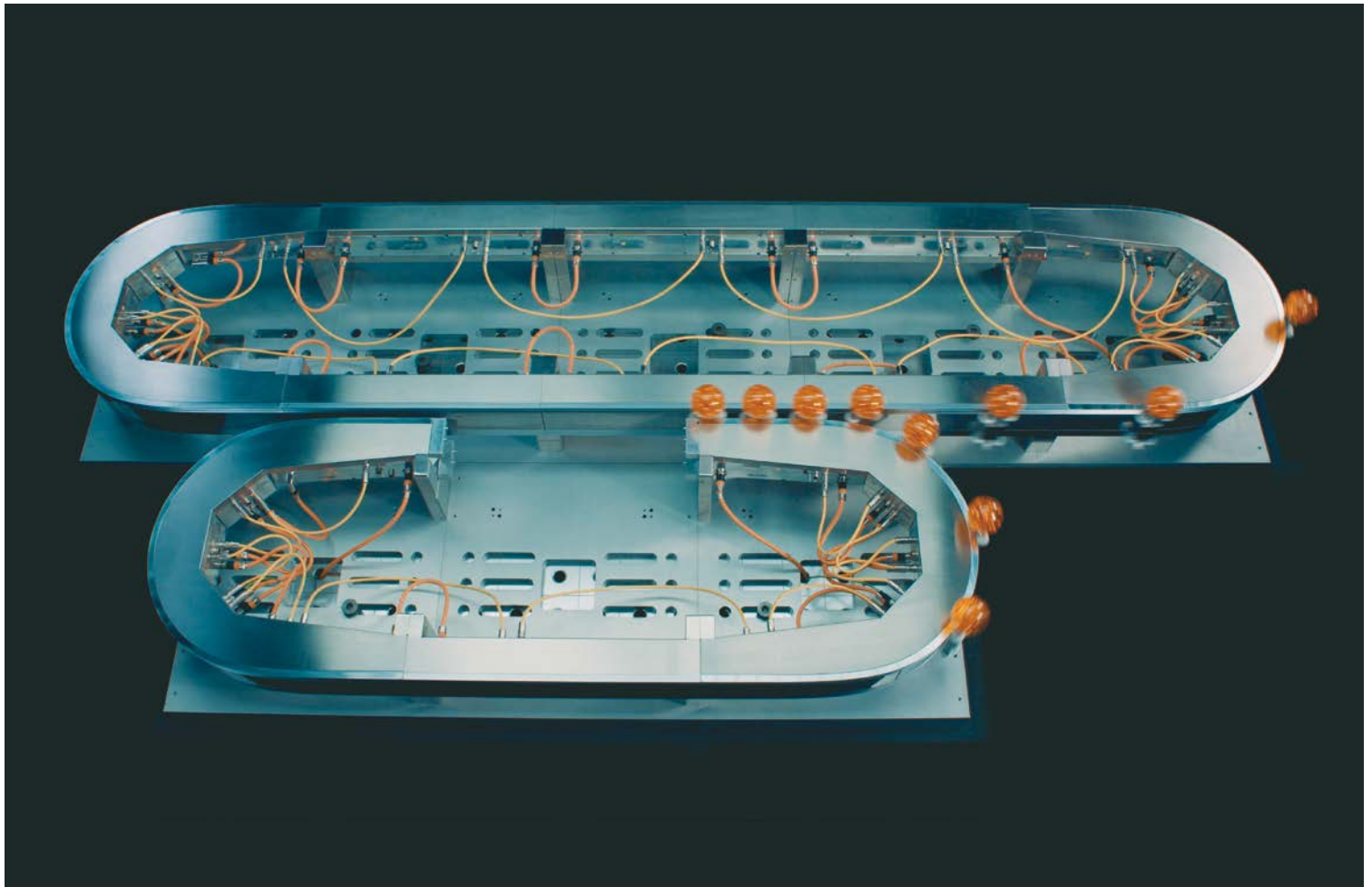
B&R's intelligent ACOPOStrak transport system opens up new possibilities in manufacturing.

have track elements whose construction allows safely limited speed, but this limitation cannot be changed. It is not possible to switch between safe and high-speed operation.

Efficiency and profitability

The extremely short response time make it possible to reduce the size of safety clearances. Even with manual workstations and safe set-up mode, the machine surrounding the track can be kept to compact dimensions.

With the introduction of HTC, B&R expands the range of applications for its intelligent ACOPOStrak transport system and enables short time to market (TTM) with an attractive return on investment (ROI). Leaving complex activities to humans rather automating them allows a machine to be engineered more quickly and ultimately less expensive than a fully automated system.

B&R's safety solution also improves overall equipment effectiveness (OEE) compared to conventional rigid solutions by allowing production to continue even while an operator is working at the manual workstation. With this development, B&R is pioneering a collaborative new future for manufacturing. ←

ETHERNET
POWERLINK

ACOPOStrak

B&R presented its intelligent ACOPOStrak track system for the first time at the 2017 SPS IPC Drives exhibition. At a speed of more than four meters per second, workpieces travel from processing station to processing station on independently controlled shuttles. In between are electronic diverters that divide and merge product streams. This gives machine builders and manufacturing companies countless possibilities to set up a fully automated manufacturing systems especially for individualized products.

Fast track to a fast Trak

Intelligent transport systems with independently controlled shuttles pave the way for mass production in batch size one. The only way for that to truly work, however, is if you're able to drastically reduce the development overhead for programming the shuttle movements – using intelligent system software like B&R's mapp Trak.

Photo: B&R

mapp
TRAK

↓

Products with a personal touch are more than just an eye-catcher: they awaken in consumers a deep desire to own them. More and more manufacturers are looking to secure their share of mass-customization profits by equipping their plants with intelligent, track-based transport systems. Mass customization is only profitable, however, if the track system is flexible enough to accommodate product variants or completely new pro-ducts quickly and inexpensively.

The intelligent ACOPOStrak transport system from B&R does exactly that. The system has a modular structure – with four basic track elements and diverters that allow it to morph into virtually any layout and be easily adapted or expanded at any time. The electromagnetically driven shuttles can be controlled independently – even when located on either side of a diverter.

The highly scalable system architecture allows for layouts with track lengths in excess of 100 meters and populated by hundreds of shuttles. And yet: "Despite the complexity of the track system, it is easy to handle," explains B&R's mechatronic technologies manager, Robert Kickinger. B&R has simplified the process of engineering ACOPOStrak solutions to help both machine builders and manufacturing companies get their products to market as quickly as possible. "When you minimize the amount of engineering work and associated costs, you can also achieve an attractive return on investment," adds Kickinger.

Collision impossible
To do that, what the OEM or machine operator need is the mapp Trak system software that accompanies the ACOPOStrak system. "This software is the work of our masterminds in development," explains the mechatronics specialist. They have mastered the complex mathematical tasks behind key

ACOPOStrak functionality, including collision avoidance, dividing and merging product flows at full speed and calculating optimal routes.

Freed from having to worry about these tasks, application developers save valuable engineering time. Even with products of different sizes and weights, there are no collisions. Product size can be configured manually or measured with sensors, and mapp Trak automatically adjusts the shuttle controls to prevent collisions.

Process-oriented programming
A second factor that substantially simplifies the engineering process is process-oriented programming. With mapp Trak, the application software engineer describes rules for how the shuttles should behave on the track. The rules become active when shuttles pass virtual trigger points. This simple methodology based on state machines makes implementing motion sequences extremely efficient. With ACOPOStrak, there's no need to program axes and motion profiles for each shuttle individually – a prohibitively time-consuming task in cases with hundreds of shuttles and many possible routes. A further benefit of process-oriented programming is that shuttles can be taken off the track or added without requiring any changes to the application software.

Simulation for efficient operation
The simulation capabilities integrated in mapp Trak provide clear visual confirmation that the system will run smoothly. Developers can test with how many shuttles and at which speed the application will deliver the highest productivity. "They can play through many scenarios on their office PC without the constraints and risks of a real system," says Kickinger. The software running on the computer in the developer's office is identical to the system software later used on the

controller. It's possible to switch back and forth between simulation and real operation at any time.

B&R's Scene Viewer tool can also be used to visualize how shuttles interact with additional mechanical elements such as screwdrivers, labelers or robots. All you need to do is import a STEP file of the respective machine element and model its movement in space over time. This allows the developer not only to simulate the track, but also the interaction with additional machine elements. "It is this practical orientation of mapp Trak's simulation power that our customers appreciate so much," confirms Kickinger.

"And the interaction with external mechanical elements works so well," he adds, "because ACOPOStrak carries the genes of the ACOPOS servo drive family." The ACOPOS family has sophisticated functions for operating single or multi-axis systems, as well as extensive options for axis coupling. The shuttles can therefore be tightly coordinated with axes driven by ACOPOS servo drives using PLCopen commands, and displayed as digital twins in Scene Viewer.

Maximum flexibility

Customers have already confirmed that ACOPOStrak is easy to handle. Kickinger reports that one customer who had extended an existing machine with additional linear motor segments using ACOPOStrak had only fifteen minutes of software development work before the machine was back up and running. This is an impressive display of the strength of ACOPOStrak's programming concept, which is decoupled from the hardware. With the mapp Trak system software, product data can be clearly linked to the shuttle on which the respective product is currently located. "That gives you the highest degree of flexibility," says Kickinger. A product-specific data record on a pharmaceutical production line, for example,
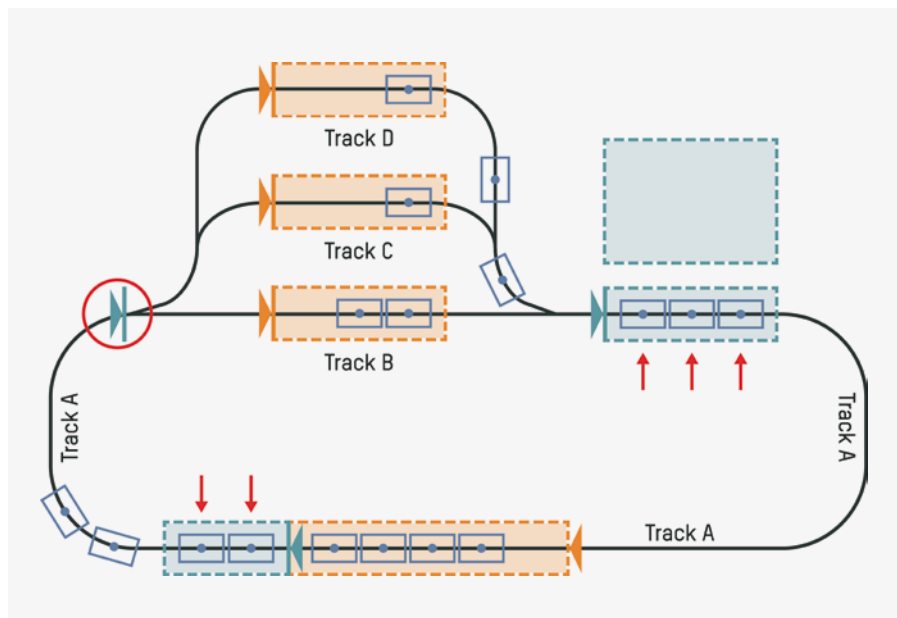
The application engineer sets the rules for how the shuttles should behave at defined trigger points. mapp Trak then calculates the optimal movements of the individual shuttles.
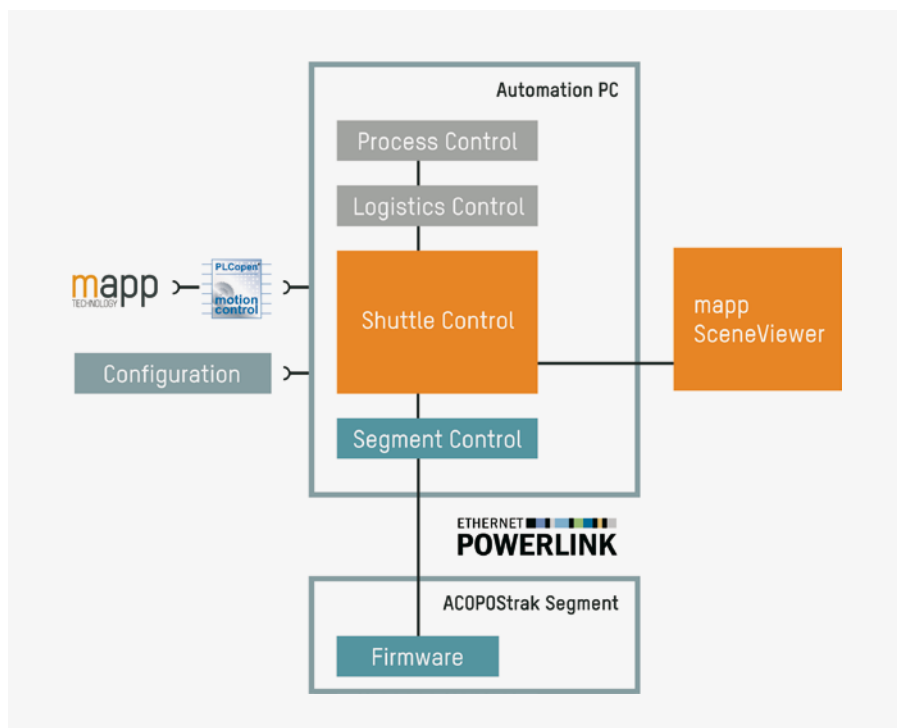
ACOPOStrak's decentralized software architecture makes it very easy to expand with new track segments.

Robert Kickinger
Manager - Mechatronic Technologies, B&R

"mapp Trak makes it easy to master complex track systems."

can contain the exact composition of the active ingredient and a unique product ID. It is also possible to store the date and time each product passes through each processing station. This makes it easy for application engineers to implement FDA-compliant tracking.

Manageable complexity

mapp Trak guarantees three things: that the shuttles do not collide, that they do not cross virtual barriers and that the configurable speed limits are adhered to. With these guarantees, the process-oriented programming and the simulation included in the software, B&R has made the complexity of the flexible ACOPOStrak transport system very easy for the user to handle. This also makes it possible to implement new products on ACOPOStrak lines in any batch size with little manpower and short time-to-market. This is a crucial aspect for winning new production orders on short notice.

The mapp Trak architecture

The software architecture of mapp Trak is divided into four basic levels. The lowest one, the segment control level, controls the movement of the shuttles located on the respective segment. The next layer up, the shuttle control level, is where things like the position setpoints for the shuttles are calculated. If the application engineer wants to couple the shuttles to an external axis or to another shuttle, for example using PLC function blocks, that happens at this level. This is also the level that handles shuttles being added to and removed from the track – for example when ACOPOStrak is used in combination with conventional conveyor belts or if shuttles are added and removed by humans or robots. Software elements on the third level, logistics control, provide automated routing from processing station to processing station. The fourth level is dedicated to process control. This level also represents the programming interface for the software engineer to describe the process flow. ←
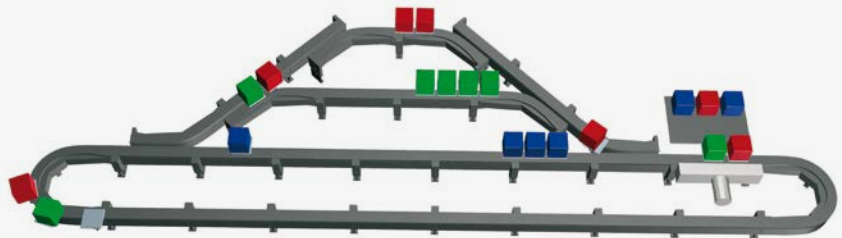
Having a simulation that behaves exactly like a real ACOPOStrak system greatly accelerates the development of new machines.
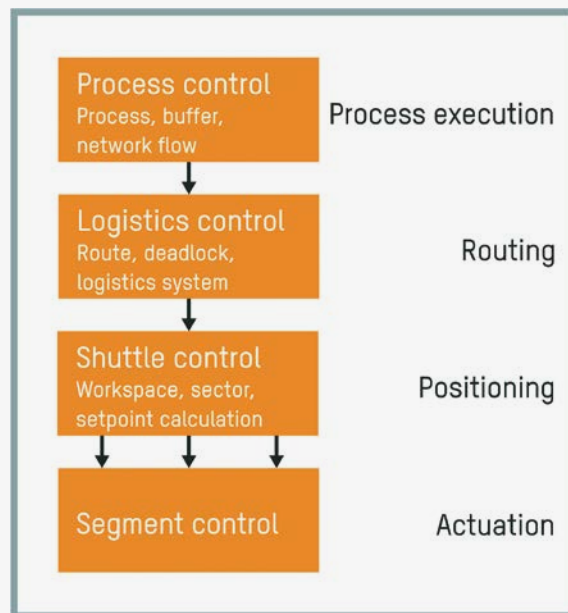
mapp Trak is based on a four-level architecture that makes programming motion sequences as easy as possible.
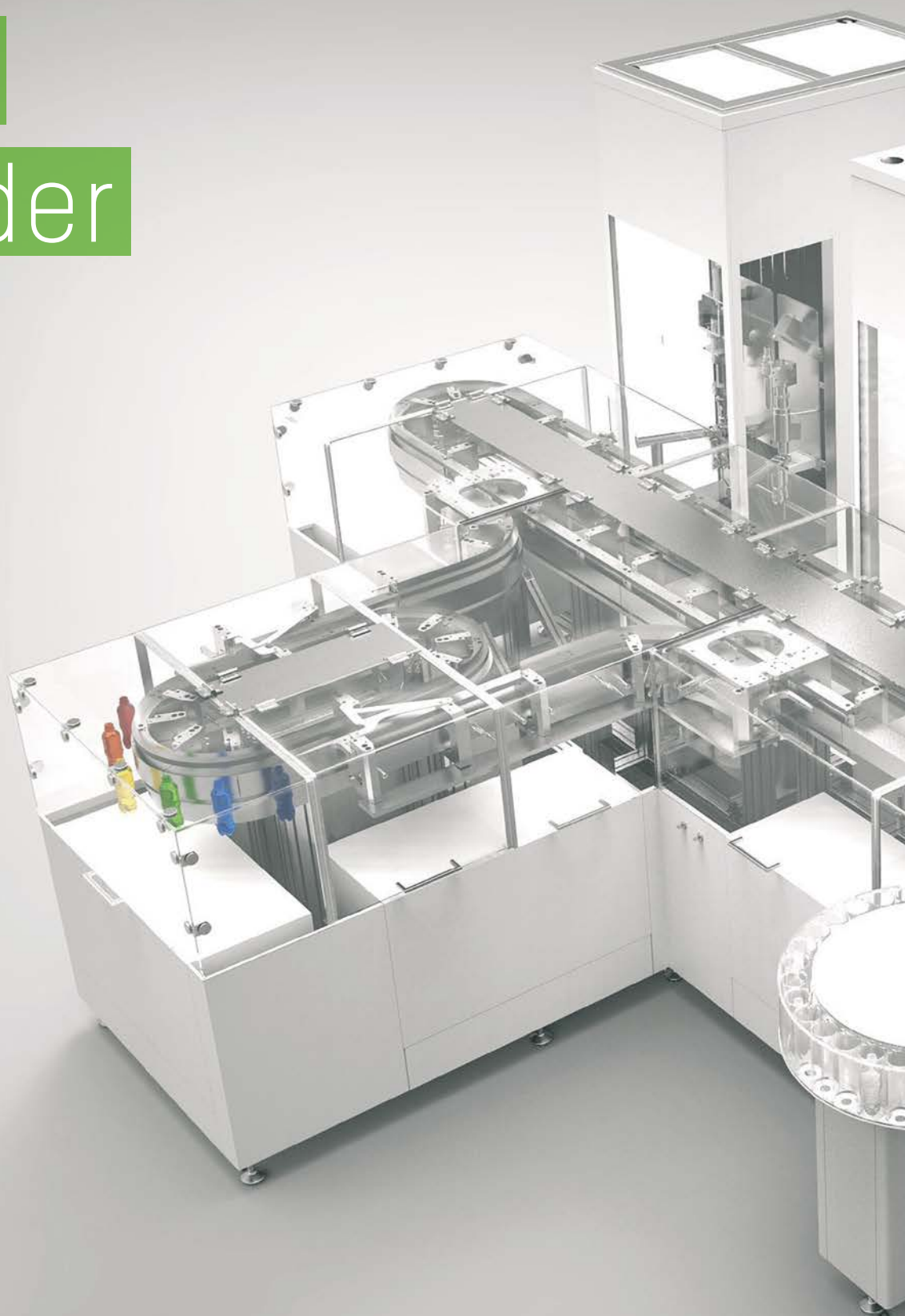
Filled
to order

The conceptual study "Bottling on Demand" produces individualized beverages that are filled to order.

Photo: Krones AG

Once the undisputed hub of the purchasing process, retail stores are playing an increasingly secondary role. Today's consumers prefer to take shopping into their own hands – with the PC on their desk, the tablet on their couch or the smartphone just about anywhere else. They are not bound to brick and mortar buildings, nor are they restricted by business hours – the Internet is always open.

Yet, it seems that not even the virtually endless selection offered by online marketplaces is enough. They want personalized products made just for them – and they are willing to pay a premium to make that happen.

Individualization in the beverage industry

"We in the beverage industry have felt this urge for more individualization in our market as well," says Andreas Gschrey, head of digitalization and data technology at Krones AG. "And so we asked ourselves: Is there an economical way to implement small-batch production – even batch size one?" To find the answer, Krones built a conceptual study called "Bottling on Demand". The bottling line allows for the production of custom beverages that are made to order. Each beverage can be tailored to the customer's needs in terms of content, bottle type, label, cap – or all of the above.
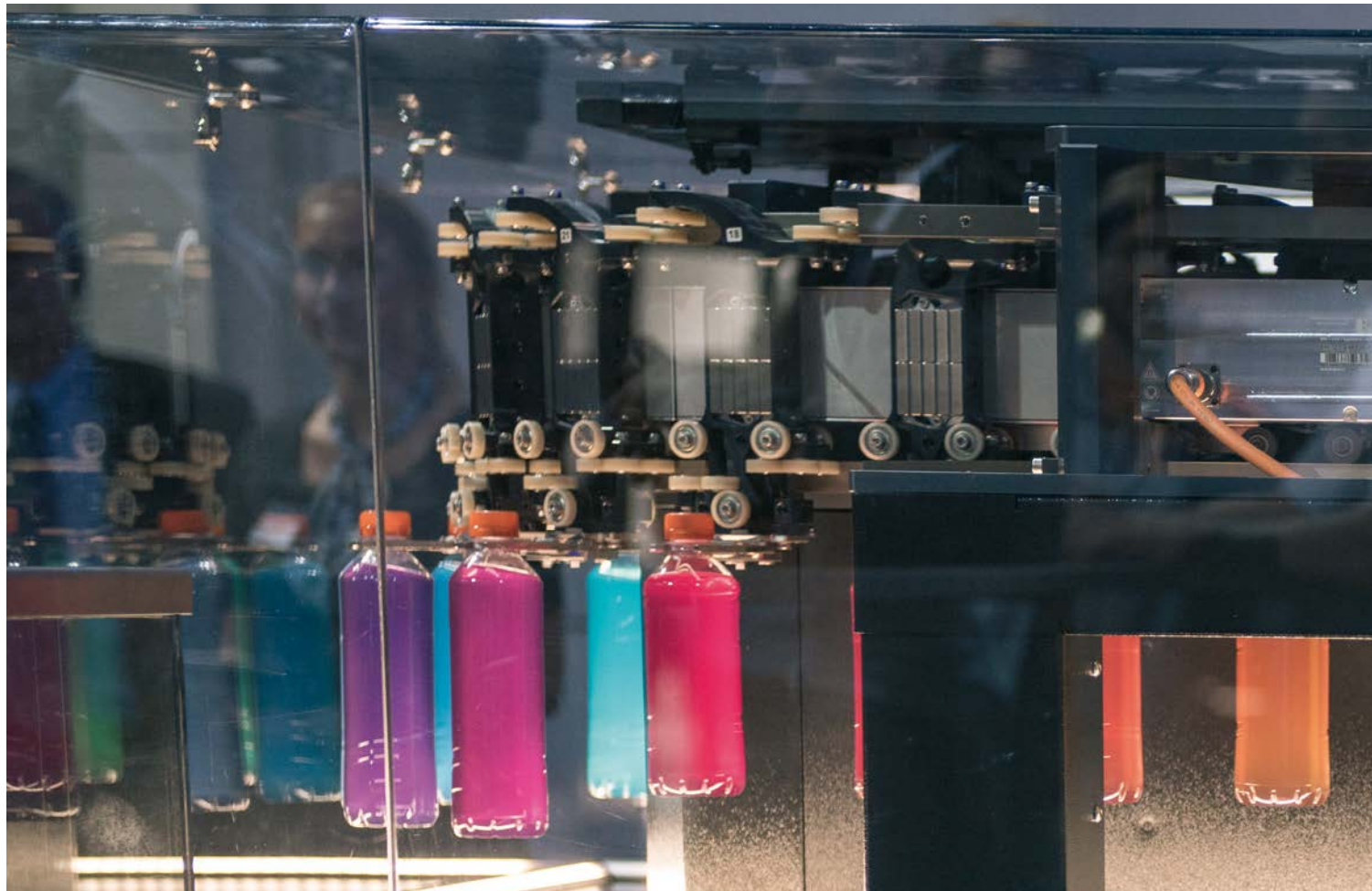
The intelligent ACOPOStrak system transports each bottle through the line independently.

Independently controlled shuttles

"Bottling on Demand" is built around B&R's intelligent transport system, ACOPOStrak. Independently controlled shuttles move the bottles from one processing station to the next as they are filled, capped and direct-print labeled. The shuttles are servo controlled and are held on the track by magnetic force. The modular track segments offer virtually limitless flexibility and scalability in the design of the machine. Traffic control and collision avoidance are executed autonomously by the intelligent system software. "This is a completely new approach compared to the rigid timing of conventional conveyors," explains B&R's mechatronic technologies

manager, Robert Kickinger. "It allows you to implement mass customization without any downtime for changeover. To fill a different recipe, you simply change how the shuttles and valves are controlled – physical retooling is a thing of the past."

At top speeds in excess of four meters per second, ACOPOStrak offers the potential to produce personalized products in mass-production quantities.

25 years of cooperation

Krones is one of B&R's largest customers. Over the past 25 years, the two highly innovative companies have often joined forces to expand the limits of what is feasible in the field of bottling line automation. "Krones was one of the very first customers we approached with an ACOPOStrak prototype," recalls Kickinger. "We were confident that Krones would recognize the enormous potential of this technology and be able to do something amazing with it."

"In terms of bottling line design, ACOPOStrak opens up a whole new realm of possibilities for us," Gschrey agrees. "With the combination of electromagnetic diverters, independent shuttles and virtually unlimited layout freedom – we're able to implement parallel processing stations, buffer zones and anything else we need."

Andreas Gschrey
Head of Digitalization and Data Technology, Krones AG

"With ACOPOStrak, small-batch and even batch-size-one bottling can be implemented economically."

Photo: Krones AG
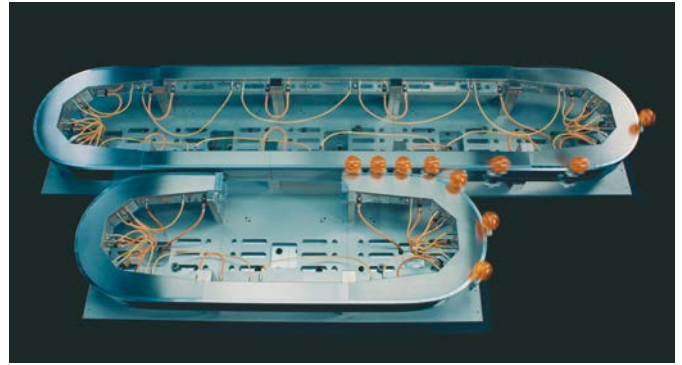
The electromagnetic ACOPOStrak diverters divide and merge product flows at full production speed.
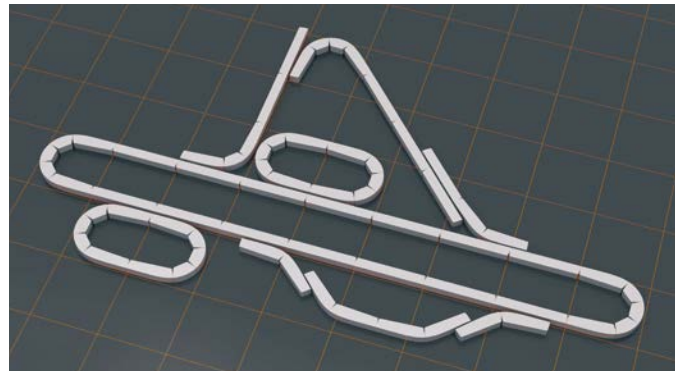
ACOPOStrak offers virtually limitless design freedom for laying out a machine.

Modular plants

"Bottling line requirements can vary greatly from customer to customer," reports Gschrey. "And sometimes those requirements even change during operation." The great flexibility afforded by ACOPOStrak makes it easy to implement modular machinery that each customer is able to arrange and rearrange on their own. For its conceptual study "Bottling on Demand", Krones uses two oval ACOPOStrak circuits to test various approaches as they reinvent the bottling line for the future of individualized production. The goal is clear: "We want to build smart factory bottling lines, and we want to do it on a large scale," says Gschrey.

New business models

"The waves that ACOPOStrak is making will reach beyond the manufacturing process," emphasizes Kickinger. It will also revolutionize warehouse logistics. In the future, consumers will configure and personalize their products online and schedule just-in-time delivery – either for in-store pickup or right to their door. ACOPOStrak opens the door to entirely new business models in e-commerce. The same principle even works in traditional retail logistics. A supermarket could have restocking orders triggered automatically, for example, as soon as a certain number of products has been scanned at the checkout. In effect, the production order goes straight from the cash register to the production line. The desired item is then produced in a precisely defined quantity and shipped immediately. "Inventory costs are reduced to an absolute minimum," says Kickinger.

For now, Bottling on Demand remains a conceptual study, yet implementation in a series-produced bottling line could very well be in its future. "ACOPOStrak-based bottling lines certainly have serious potential," Gschrey is convinced. "One thing's for sure – our question of how to implement small-batch and batch-size-one bottling economically has already been answered: with ACOPOStrak." ←

Robert Kickinger
Manager - Mechatronic Technologies, B&R

"ACOPOStrak opens the door to entirely new business models in e-commerce."

Photovoltaic systems

The synergy of sun and wind

When clouds roll in and block the sun, the feed-in power of a photovoltaic system can drop by more than fifty percent. And when the air is calm, there's no wind power to be generated, no matter how urgently it is needed. So what could be more natural than to combine the two systems in a way that each compensates for the other's weaknesses to feed our power grid a reliable supply? The developers at Belectric in Dresden, Germany, recognized this and now offer sophisticated hybrid power plants. Additional battery storage together with B&R automation technology and POWERLINK communication provide the required stability.

As sources of energy, the sun and wind are both a blessing and a curse. They are inexhaustible resources which – thanks to continuous technological advancements – now play a crucial role in providing the world with an environmentally sustainable supply of energy with an acceptable balance of cost and efficiency. At the same time, however, they are highly volatile and not responsive to fluctuations in demand. For utility companies, this means considerable infrastructural investments to stabilize the grid. In the event of an oversupply of feed-in power, generation plants must be throttled or even taken offline. This is frustrating for the operators of these plants, because if they don't feed anything in, they don't earn anything either. In the opposite case, any energy deficits must be compensated for very quickly by what are called peaking power plants. These operate primarily with gas generators and sometimes take a few minutes to switch on, which can be problematic with increasing feed-in from photovoltaic systems in weak grids.

Hybrid power plant ensures stable energy supply

Having recognized these problems, the developers at Belectric Solar & Battery implemented a very clever idea. "The basic idea was to combine our competencies in the fields of solar energy generation and energy storage and thus stabilize the power grid," reports Lars Fallant, who supervises implementation of battery projects. This is achieved by combining a variety of sourc-

View of a hybrid power plant with a PV system and two battery storage units.

Control cabinet for the energy management and battery control system in Somaliland – featuring a controller, safety components and a SiteManager.

es, such as wind and PV systems as well as combined heat and power units together with a high-performance battery storage system. These systems are coordinated by an energy management system that uses B&R control technology and POWERLINK communication. In combination with local consumers, this results in a local power grid that, if appropriately designed, operates autonomously for long periods of time – storing excess energy and feeding it into the grid on demand.

Research project: The PV plant of the future

This approach is vital to achieving sustainable energy targets, which is why eight partners – six companies and two research institutes – have joined forces to develop comprehensive technical solutions that

equip inverters and other plant components to handle the heightened requirements. It is no coincidence that Belectric's engineers are taking the lead in the research project to develop the photovoltaic plant of the future. "With this project, we also want to initiate the transition from generator-based to inverter-driven networks," explains Vincent Ackermann, who is responsible for the sale of battery storage systems.

Redundant control system is a fundamental requirement

Even in the earliest stages of the project, it became clear that a standalone power plant is very demanding on its control system. "With this approach, we are entering the field of system services," says Fallant. "Here, you need to switch to a redundant system within a few CPU cycles if the main controller fails.

When the hybrid system is responsible for the entire grid supply, every millisecond counts." At this point, the advantages of B&R's X20 controller range play a decisive role, because controller and network redundancy have long been part of their standard portfolio.

Integrated safety and security must not be an afterthought

It goes without saying that reliability and safety take high priority in the development of a power plant. On the one hand, the batteries must be safely ventilated and monitored, which requires safe control components for at least SIL 2. Furthermore, the fieldbus between the central and block controllers must be not only strictly deterministic, but also secure against external access. The developers found the components they needed for this in the B&R portfolio. The

Lars Fallant
Battery Project Manager, Belectric

"Our plants operate fully autonomously without any personnel on site. B&R's Secure Remote Maintenance solution lets us forward all error messages directly to a service provider and access the system through a web-based HMI interface."
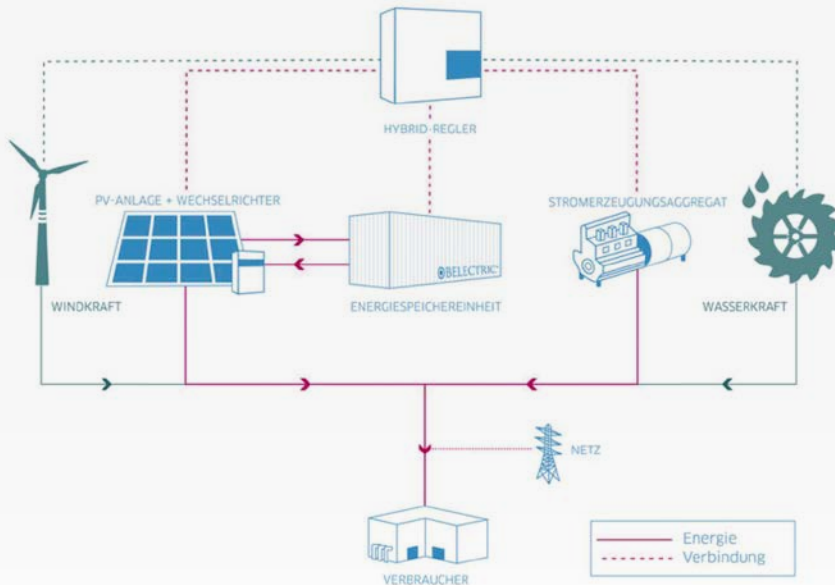
The combination of multiple energy sources and a battery storage unit ensures a stable supply for the power grid.

Web-based remote diagnostics of a hybrid plant in Somaliland.

safety modules can be easily integrated into the functional system as required, and POWERLINK communication is fast, virtually jitter-free and – above all – secure.

Secure Remote Maintenance replaces on-site personnel

"Our plants are completely autonomous and operate without on-site personnel," explains Fallant, outlining another requirement. "That means we need to maintain a stable and, above all, secure data link to our plants." That's no problem with B&R's Secure Remote Maintenance solution, which is often used by Belectric. Via an encrypted, certificate-protected VPN connection, data is transferred securely between a SiteManager unit at the plant (with an integrated firewall) and a GateManager unit at the operator's site. "This lets us forward all error messages directly to a service provider and access the system through a web-based HMI interface," adds Ackermann.

94 MWh battery capacity installed with B&R
In addition to numerous battery projects implemented throughout Europe, one of the first hybrid plants is now up and running in Africa. There, Somaliland's ministry of information produces all the power it needs to operate its radio and TV station using a PV system with an output of 500 kWp and a 1,000 kWh battery. The auxiliary 300 kW diesel generator is used only at night and when the energy stored during the day is insufficient.

"With our next project – a combination of four 175 kW fast-charging columns with PV system and battery storage – we want to enhance the e-mobility infrastructure with a solution that reduces the load on grid connections," says Ackermann, providing an outlook toward future projects where B&R systems will continue to be the preferred choice. ←

The smart barn
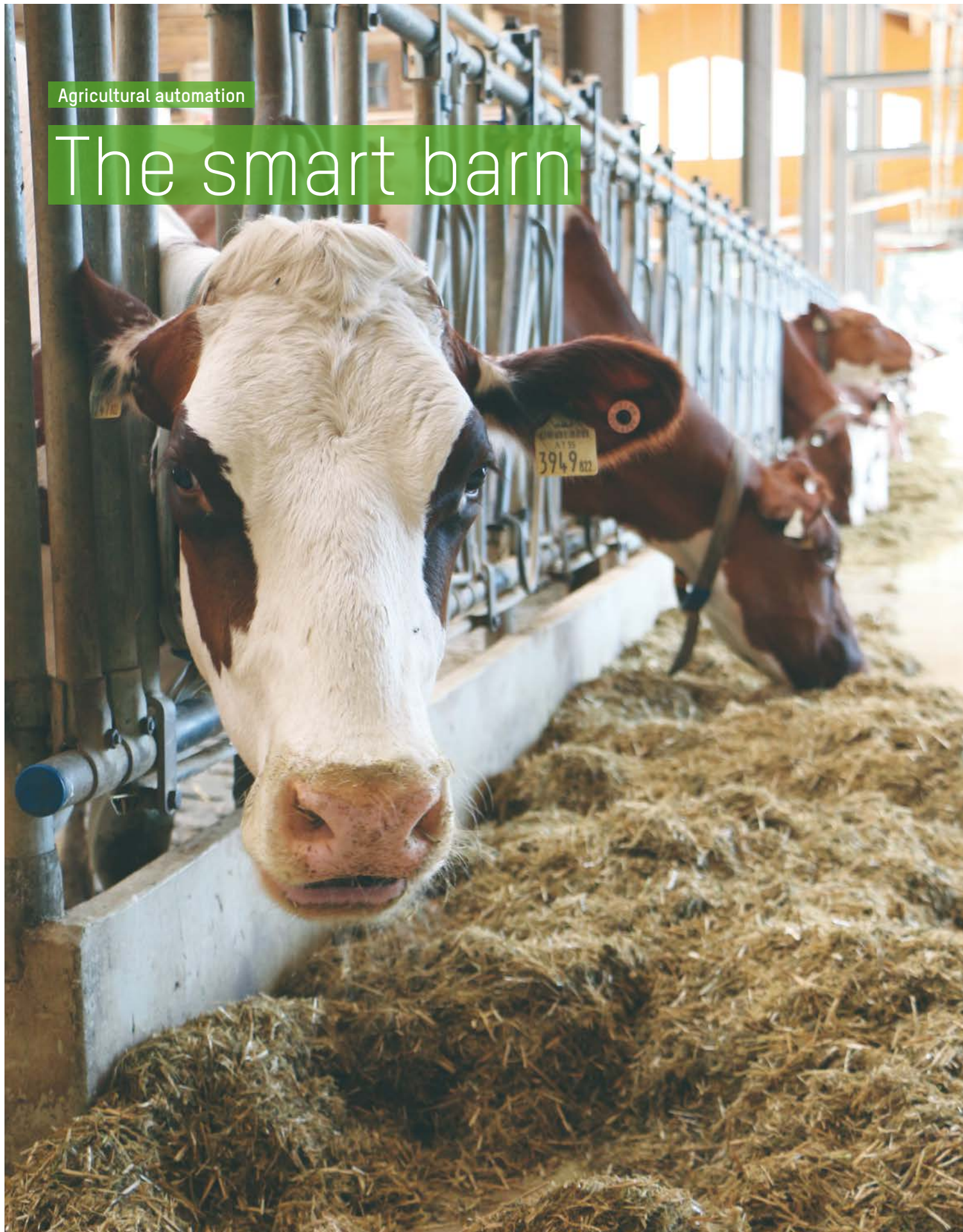
The Simmental cattle owned by farmer and Hetwin Managing Director Josef Hetzenauer clearly lead a well-fed and comfortable existence. The barn is large, bright and airy, strewn regularly and supplied with fresh feed twenty-four hours a day. The digital transformation has reached the dairy farm, bringing with it enormous benefits. Tasks that used to cost farmers hours of manual labor – and often their health – are now being taken over by robots. Hetwin develops integrated solutions for innovative barn management. To implement its most innovative solutions, the Austrian feed technology manufacturer relies on experience and technology from B&R.

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Raised on his parents' farm, Josef Hetzenauer had a career path all laid out for him – but, following his parents' advice, he first completed a mechanical engineering apprenticeship at the Tyrolean energy supplier TIWAG. "Twenty years ago, you could make a good living with thirty dairy cattle and selling firewood. My parents realized early on, though, that there would come a time when the business would have to be either expanded, supplemented with additional income or abandoned altogether," says Hetzenauer.

Given these three options, he chose option number four. For him, remaining profitable was first and foremost a matter of making the daily work easier to manage. He would also need to find a way to increase milk yield with the help of concentrate feed made from sources such as cereals or rapeseed. At the time, however, it was customary to serve concentrate feed manually twice a day, which led to the cows developing a metabolic disease called acidosis. To avoid this, Hetzenauer developed the first concentrate feed robot. With the help of specially programmed software, it calculated each cow's precise requirements for feed concentrate. The robot then stopped at each cow and dispensed the appropriate ration, depending on the amount of milk given. This prevented strong

fluctuations in the pH value of the cows' rumen, which was reflected in the good general health of the animals and also led to a higher milk yield.

While the feed robot was initially designed and used only for Hetzenauer's own farm, other farmers soon began expressing interest in getting one of their own. Although it was difficult to gauge the actual demand for the robots, Hetzenauer decided to give the business a try. In 2004, he founded the feed technology company Hetwin – a portmanteau of his own surname and that of his then business partner, Winkler.

"In the beginning, we did practically everything ourselves – we formed the sheet metal and produced every-thing in our shop at the farm. Then we hired our first employees. Eight years ago, we started renting a factory building in Langkampfen, Tyrol – and five years ago we bought it," recalls Hetzenauer.

Technology increasingly replacing manual labor
Over time, farmers began looking to expand the use of feed robots into other applications. In addition to concentrate feeds, they also

The fully automatic feed robot performs five operations: weighing, cutting, mixing, dosing and conveying.

wanted to automate the supply of hay and silage. Thus was born the idea for the Aramis II feed robot, among the first of its kind in Europe. After less than nine months of development, the first device had been installed in a barn. In addition to one other Austrian manufacturer, Hetwin's main competitors are to be found in France, Holland and Scandinavia.

Hetzenauer sees the strength of Hetwin particularly in his own experience as a farmer. Every machine is tested in his own barn before it enters the market until it functions absolutely smoothly. "When we look at the products of our competitors, we're often reminded what an enormous advantage that is," notes Hetzenauer. "Products designed in theory while sitting at a desk tend to run into problems when they come up against real-world challenges." The next device on the market was the Stallboy feed pusher, which pushes feed up to the feedbunk where the cows can reach it. The arduous and repetitive task of pushing tons of feed into place is now completed fully automatically. Every two hours, the Stallboy slowly travels the length of the feedbunk, pushing the fodder two centimeters closer to the cows. Apart from eliminating the physically strenuous task of manual feed push-up, this has the advantage that the feed cannot be salivated on by other animals, so every cow always receives fresh feed. The premium version, Stallboy feed, offers an optional fixture that can be used to serve supplementary feed, such as yeast, in small amounts of approximately 100 grams per cow daily. This not only has the effect of enticing

the cows to eat more, but also increases the number of visits to the milking robot.

Hetwin has delivered Stallboys to 16 countries worldwide and is one of the two market leaders in this field. 70% of the systems are deployed in existing barns. The smallest farms have around fifteen cows, the largest a few hundred. Up to 500 cows can be supplied with one device – after that, a second system becomes necessary. "The Stallboy is also popular for sheep and goats," explains Hetzenauer, "because they otherwise tend to quickly pick out the concentrate and leave behind the hay or silage."

B&R technology used in strewing and feed robots

Hetwin has been working with B&R for over five years. The decisive factors for the cooperation with B&R were the proven quality of B&R's Made in Austria technology and the rapid on-site support. The first application of B&R technology was the Aramis II feed robot. The feed robot, which can perform five operations – weighing, cutting, mixing, dosing and conveying – is virtually unrivaled on the market. The B&R hardware used for the Aramis II includes a 10" Power Panel C70, a compact X20 controller with integrated I/O and a frequency inverter. In the feed kitchen, where the feed is mixed and precisely dosed, an X20 controller with integrated I/O and a frequency inverter are also used. The two X20 controllers communicate with each other via WLAN. "The integrated weighing technology was of particular importance, as exact amounts of feed

Astor, the company's mobile strewing robot, distributes bedding material throughout the stalls as well as course fodder and silage.

From left to right: Bernhard Schmidthammer (Sales, B&R) and Josef Hetzenauer (Managing Director, Hetwin) in front of the Aramis II – a feed robot specially developed for small and mid-sized livestock operations.

had to be delivered to the respective animal," says Bernhard Schmidthammer from B&R's sales team in Austria.

In the second joint project, both the Athos feed robot and the Astor strewing robot were equipped with B&R technology. The Athos – a more economical variant of the Aramis II developed for small and part-time businesses – uses a 7" touch screen panel, an X20 controller with integrated I/Os and an ACOPOSinverter frequency inverter from B&R. The same B&R components can also be found in the Astor. Both Athos and Astor are managed with B&R's Automation Studio software and use the same software components. The great advantage of this was that it substantially reduced the development time of the Athos. "For smaller companies, such as those

Josef Hetzenauer
Managing Director, Hetwin

"The decisive factors for the cooperation with B&R were the proven quality of B&R's Made in Austria technology and the rapid on-site support."

common in South Tyrol, Athos is the best choice," says Hetzenauer. "We sell about 15 Athos robots a year in that region alone."

The latest addition in the fall of 2018: Aranom
In the fall of 2018, Hetwin will be presenting its latest innovation at the EuroTier agricultural trade fair in Hanover: the Aranom, a further development of the Aramis II feed robot. A special feature of the device is that it moves without rails. The Aranom has two axes, which are operated without electricity by means of a rechargeable battery. The battery technology used is currently unique on the market – it runs on high voltage, allowing Hetwin to use the same motors as for the Aramis II. Like the Stallboy, the Aranom is built on a chassis that moves autonomously using magnetic induction sensors in the ground as reference points. The fact that the Aranom can use all the 400-volt motors of the Aramis II makes for a considerable cost ad-vantage – also because existing components can be used. "This year, we have set up a photovoltaic system at our development barn that provides the electricity charge the batteries, which serve simultaneously as energy storage units. That will be our next innovation," says Hetzenauer. The plan is to offer two different battery sizes. One battery charge can supply an operation with 500 cows.

An outlook into the future
More projects are already being planned for the future. For example, the Stallboy will be adapted and equipped with a B&R controller. "Everything else is all trade secrets, though," laughs Hetzenauer. ←

Collect and present machine data

The mapp Report software component can be used to automatically generate PDF reports based on any machine data.

mapp component automatically generates PDF reports

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The mapp Report software component can be used to automatically generate PDF reports based on any machine data. The data, layout and design of the reports can be customized. The user can freely define the language and units used.

mapp Report collects all statistical machine data as well as information from other mapp components and presents it in the form of PDF reports. The content and layout can be customized as desired.

For all audiences
The design options offered by mapp Report make it possible to customize reports for the needs different users, such as service technicians and management. Graphical elements such as images and tables can also be included in the reports. To protect against unauthorized access, it is possible to encrypt the files with a password.

Send reports automatically
The reports can be sent automatically via e-mail at a defined time or triggered by a specific event. In addition, reports can be saved to external storage media such as a USB flash drive or sent directly from the machine to network printers. ←

Photo: B&R

Precise control of temperature processes

B&R's temperature control component covers every requirement with maximum flexibility and scalability.

New software component for easy access to temperature control

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With mapp Temperature, B&R offers temperature control that combines maximum usability and powerful control algorithms. Integrated simulation capabilities allow virtual commissioning in minutes. mapp Temperature also provides heating current monitoring.

With mapp Temperature, it is possible to define zones and groups for temperature control. A zone is a unit consisting of an actuator, a temperature process and a sensor for measuring the temperature.

Multiple zones can be combined into a physical group and controlled and optimized together. This gives the user maximum flexibility and scalability to meet any temperature control requirement.

Autotuning and integrated simulation

If applications cover a wide temperature range, simple tuning is often not sufficient to optimally adjust the parameters. mapp Temperature therefore includes a multi-stage autotuning process. The user can define several operating points and optimize them individually. The integrated simulation capability enables simple virtual commissioning without any hardware. This option makes it possible to test the application's logic, error handling and HMI system in advance to significantly accelerate on-site commissioning.

Heating current monitoring

B&R's temperature control system also offers heating current monitoring to enable early detection of faults through predictive maintenance. By monitoring the current of the heating elements, it is possible to react to a fault at an early stage without stopping the entire process. This ensures a high level of operational reliability and helps prevent extended downtime. ←

The eye of the machine

B&R has incorporated machine vision into its automation system with an unprecedented level of integration. The cameras, intelligent image processing algorithms and innovative lighting portfolio are an integral part of the B&R control system. Automation engineers are now able to implement a large portion of machine vision applications on their own.

Photo: B&R

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The core of the vision solution are the intelligent cameras: Smart Sensor and Smart Camera. Smart Sensor is designed to implement a single machine vision functionality, such as QR code reading or position detection. Unlike many other devices in its class, there is no need to install dedicated hardware for each function. Instead, the user simply configures the desired Smart Sensor function in the Automation Studio development environment. OEMs only have to stock a single camera type and are nevertheless able to support a wide range of applications.

Scalable hardware

In cases where more than one functionality is required, it is easy to switch to the more powerful Smart Camera. The existing application software, parameters and models can continue to be used. Whichever camera type is selected, installation could hardly be easier: Simply hook the camera up to the machine network, and it automatically obtains all the settings it needs from the controller.

Full flexibility

If desired and enabled in the user management system, all variables and parameters can also be adjusted in real time during operation. It's also possible to add new models for object recognition or code types and other search criteria at runtime.

Both camera types feature multi-core processors and integrated FPGA image preprocessing. This enables sophisticated functions such as text recognition based on deep learning algorithms.

Optimum image quality

Each hardware variant can be equipped with one of three image sensors, ranging from 1.3 to 5 megapixels. All three sensors are characterized by their large pixel size, high light sensitivity and low noise. This guarantees optimum image quality – even in high-speed applications. Housing variants are available with either an integrated lens or a standard C mount. The C mount supports lenses from B&R or third parties – for example when telecentric lenses are required.

A special cover is available for C-mount lenses from B&R to retain IP67 protection. The integrated lenses have electronic focus adjustment and are available in focal lengths from 4.6 to 25 mm. All B&R lenses are specially optimized for the image sensors used to achieve maximum sharpness and optimal imaging performance.

One cable is all you need

Integrated into the machine network via an M12 hybrid connector, which also supplies the necessary 24 VDC power, the camera only needs a single cable. A second hybrid connection enables daisy-chain cabling with lighting elements.

B&R's cameras are also available with integrated LED lighting.

C-mount lenses

B&R's machine vision portfolio includes five C-mount lenses that cover a wide range of focal lengths from 12 to 50 mm. The lenses are specially optimized for the image sensors used and offer an excellent price/performance ratio. The lenses have exceptionally low distortion and high detail contrast (modulation transfer function – MTF). This enables high resolution all the way to the corners of the image.

Optimum lighting for every situation

B&R has developed and patented an innovative lighting system for its vision solution. Lighting control is synchronized with the automation system in the sub-μs range. The modular barlights and backlights ensure optimum results even in difficult lighting situations.

As integral parts of the automation system, both cameras and lighting are easy to synchronize with other sensors, motor positions and events in the machine application. Lighting control with microsecond precision is even guaranteed when synchronizing multiple cameras and light sources.

Each light has an integrated flash controller, so no external hardware is required. The controller ensures a precise pulse current supply to the powerful LEDs. This enables light pulses of at least one microsecond duration at maximum intensity. The B&R vision system can therefore also be used for high-speed applications without any problems.

Photos: B&R

B&R offers five C-mount lenses that cover a wide range of focal lengths from 12 to 50 mm.

Just the right light

The flexible barlights are available individually or arranged as ring-lights in groups of 4, 6 or 8. There are also two different sizes of backlights. Each light can feature up to four different LED colors. The spectrum ranges from white and various visible colors to infrared and ultraviolet. This makes it possible to achieve just the right contrast, color, illumination and intensity for any application. Many machine vision applications require very precise alignment of the light source to achieve good results. B&R's barlights are therefore available in a version with electronic angle adjustment from 0° to 130°. When producing multiple products on the same machine, the lighting angle can be optimized between batches – simply set it once and save it as part of the batch recipe. Ringlights with electronic angle adjustment make it possible to optimize the light cone to avoid scattered light.

Configuration at runtime

Just like the angle of the barlight, all other lighting parameters can be configured at runtime to adapt to new products. Combining LEDs of different colors makes it possible to adjust the wavelength at runtime to optimize contrast. Diagnostic data can be read from the lights at any time thanks to their network connection.

mapp Vision

The full range of mapp Vision functionality is available with the upgrade to Automation Studio 4.6. When the Technology Package is installed, the correct firmware is automatically installed on all required components. This simplifies configuration considerably and prevents errors.

B&R has integrated the HALCON machine vision library from MVTec into mapp Vision. The algorithms have proven themselves over many years to enable robust, high-performance solutions for detecting position, checking completeness and evaluating quality as well as measurement and identification. ←

mapp Vision functions include:

mapp
VISION

→ Identification – more than 40 different code types
→ OCR reading – Character recognition with deep learning algorithms
→ Blob analysis – Model-based surface detection with comprehensive analytics
→ Matching – Flexible object recognition
→ Metrology – Powerful, precise measurement instrument

Industrial laundry systems

Keep the
wash cycle going

While they may be taken for granted by guests, a hotel's laundry facilities are a core element of daily operations. It's crucial that they stay up and running while occupying as little of the busy staff's time as possible. As one of the United States' largest manufacturers of industrial laundry systems, Ellis recognized the importance of comprehensive diagnostics and preventive maintenance accountability. Together with B&R, they developed their next-generation Side Loading Washer Extractor and Whisper Dryer with a focus on increasing uptime.

It is a sticky summer day, and the laundry staff at a local hotel is under pressure to keep their machines running and guests supplied with fresh linens. As is the case in most lean facilities, operators need clear direction for troubleshooting and real accountability to keep their equipment properly maintained and in prime condition.

When the hotel staff needs to get a machine back up and running, simply having a fault number or a one-line description is woefully insufficient. With this in mind, industrial laundry system manufacturer Ellis began asking its customers: "How can the machines better assist operators and facility maintenance personnel?"

Rising to the challenge

The feedback was clear: Operators need to know not only what the problem is, but how to resolve it, step by step. When Ellis saw the advanced functionality available in B&R's mapp View HMI solution – like the ability to embed videos and display PDF schematics – they knew they were on the right track. Ellis ended up with a multi-tier diagnostic solution that shows a picture of where the problem is occurring on the machine or in the electrical cabinet. Where applicable, it also shows a video on how to resolve the issue and a schematic layout.

Another challenge, especially for smaller facilities, is that managers take the machine manual and its preventive maintenance schedule and place it on the shelf in their office, never to open it again. This does a huge disservice to such a critical asset.

To help, Ellis incorporated the preventive maintenance schedule into its machine control system, basing it on actual runtime hours. When a preventive maintenance notice appears, a facility engineer must log in with their employee ID number and sign off that the maintenance has been performed. This accountability ensures the equipment is properly maintained and continues to run at peak performance.

Designed for performance, built for dependability

The fresh-smelling sheets on your hotel bed and the pristine white tablecloth on your table at the luxury restaurant would not be the

B&R's mapp view technology allows for state-of-the-art user guidance, including embedded video and PDF schematics.

Bob Fesmire Sr. and President, Bob Fesmire Jr. mention that the success of Ellis Side Loading Washer Extractor and Whisper Dryer was due to B&R being "instrumental in providing additional resources, ideas and solutions."

Bob Fesmire Jr.
President, Ellis Corp.

"B&R has given our company the flexibility we need to continually meet our core value: servicing the customer."

same without Ellis laundry equipment. Based outside Chicago in Itasca Illinois, Ellis has flourished for over 120 years by building market-leading industrial washers and dryers. Using B&R enables Ellis to combine the industry's highest level of safety technology with a streamlined approach to HMI and diagnostics.

When Ellis designed its Side Loading Washer Extractor, safety was a top priority. B&R's integrated safety technology enabled them to achieve the same depth of diagnostics on their safety hardware as on the standard I/O. B&R's integrated safety technology also provides a much more intuitive and helpful set of diagnostic tools than with traditional hardwired relays, such as overcurrent faults or swapped wiring terminations. This makes it easier to commission machines on the floor and helps customers perform troubleshooting in the field.

For Ellis, B&R is more than just a technology partner. CEO and Chairman Bob Fesmire Sr. and President Bob Fesmire Jr. call B&R "instrumental in providing additional resources, ideas and solutions," noting that B&R's engineering support team, which is made up of highly knowledgeable and trained engineers, offers access to resources that quicken product improvements as well as development. "They have given our company the flexibility we need to continually meet our core value: servicing the customer."

Reliable, efficient and safe
From its roots in 1898 as a manufacturer of standalone laundry machines, Ellis has evolved to become a plant automation provider, moving laundry between machines and processes. Ellis has also expanded their Water Solution product offering to include recycling filtration equipment. Today, they are one of the largest manufacturers of industrial laundry systems in the United States. As the marketplace pressures their customers to reduce labor dollars and maintain uptime, Ellis provides effective new solutions to meet these goals.

The outlook for Ellis is a promising one. They will continue to expand B&R machine controls to their next generation of equipment, using a framework consistent with the washer extractors so they will have the same look and feel. In the future, Ellis' Water Solutions division will also be offering microfiltration and ultrafiltration technologies that will benefit from B&R's predictive maintenance capabilities. ←

The highest level of safety technology has been combined with B&R's streamlined visualization and diagnostics.

Safety was a top priority with developing the side loading washer; B&R integrated safety was the solution.

New functions in SafeDESIGNER
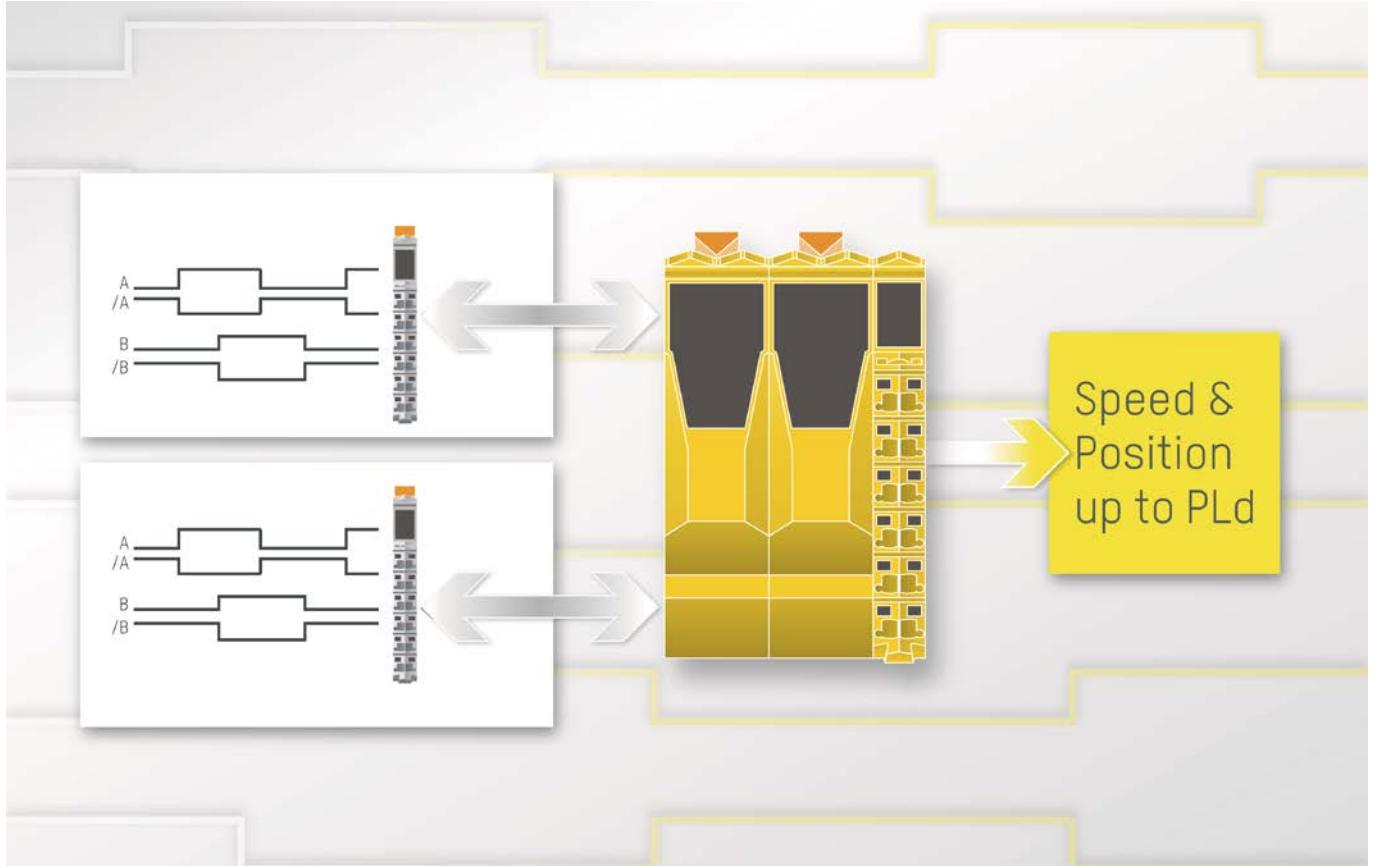
The new Data-to-SafeDATA function in SafeDESIGNER determines a safe speed and a safe position using data from the standard application.

Easier creation of safety applications

B&R makes it easier to create safety applications with a series of new mapp functions in SafeDESIGNER. It is also possible to use a combination of data from the standard application to generate safety-relevant data.

Safety data from standard (non-safety) signals

The Data-to-SafeDATA function determines a safe speed and a safe position using data from the standard application. This is done by comparing speed and position data from two standard (non-safety) X20DC1196 I/O modules with each other. With the help of the functions provided, the data can be used as the safe speed for applications up to PL d and the safe position for applications up to PL c.

Easily solve complex calculations

With advanced mathematics functions, B&R makes it easier to make complex calculations in an application. All data is calculated as fixed point numbers. The user does not need to worry about rounding, resolution or buffer overflow errors. ←

Photo: B&R

Easily in touch with your machines

The cloud application collects machine data around the clock and displays it in a clearly organized dashboard.

B&R cloud application powered by ABB Ability opens new opportunities for OEMs

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Asset Performance Monitor is B&R's first cloud application based on ABB Ability™, ABB's unified, cross-industry offering of digital solutions. By giving OEMs a reliable overview of all their machines in the field, it allows them to identify potential improvements, take service operations to the next level and unlock new business models and revenue streams. Around the clock, Asset Perfor-mance Monitor delivers data about production rate, energy consumption and tempera-ture. Users can define which information is required, and the application automatically calculates key performance indicators (KPIs) such as overall equipment effectiveness and provides opportunities for improvement. As-set Performance Monitor prepares the data and displays it in a clearly organized dash-board. OEMs can then use this data to imple-ment well-targeted machine upgrades and offer their customers next-level service.

Open architecture

An edge device is installed on site to collect data from a machine or production line. It receives data from the machine controller via OPC UA and passes it on to the cloud using the MQTT protocol. The edge device automatically establishes a connection to the ABB Ability cloud and installs the neces-sary software. Simply logging in with a user-name and password gives the OEM access to Asset Performance Monitor and all the fea-tures it has to offer.

ABB Ability platform

B&R's cloud applications run on ABB Ability. Security and data integrity are guaranteed by state-of-the-art security standards and transfer protocols. The Microsoft Azure infra-structure ensures reliable access to ABB Ability services all around the world, which includes all the prerequisites for future cloud applications featuring artificial intelli-gence and machine learning. ←

A partner for automation

Manufacturers of agricultural and construction machinery face the challenge of implementing intelligent (semi)autonomous machine functions quickly and maintaining them long term. The cost of developing such solutions in-house are prohibitively high, however. A technology partner with a comprehensive automation system is therefore a perfect fit for small and mid-sized mobile equipment builders.

Photo: B&R

Today's agricultural and construction machinery is equipped with advanced functionality that is very similar to what is found in industrial manufacturing. State-of-the-art technology like intelligently networked machines, cloud connectivity, digital process chains and integrated safety and security are growing increasingly important for mobile equipment as well. "Big-name manufacturers are driving these new functions forward in the area of agricultural and construction machinery," says B&R's product manager for mobile automation, Stefan Taxer.

To remain competitive, small and mid-sized manufacturers must follow suit. The question is: how? Establishing an in-house engineering department from the ground up to perform the necessary R&D is an enormous investment. The much easier alternative is to work side-by-side with an experienced technology partner to complete automation tasks.

Rugged control and HMI

"The situation faced by agricultural and construction machinery builders has prompted us to apply our automation expertise to mobile machinery," Taxer explains. "A great deal of the technology we've developed over the past 35 years for industrial use translates very well to agricultural, construction and municipal applications."

Essentially, all that remained for B&R was to make its controllers and HMI units suitable for mobile use. The result is B&R's rugged X90 control and I/O system. It can withstand temperatures from -40 to 85°C as well as shocks and vibrations and is resistant to salt, UV light and oil. The modular control solution is also fully interoperable with the rest of B&R's technology platform. As a result, it is programmed – like all other B&R products – using the Automation Studio engineering tool. It is also capable of hard real-time communication via the POWERLINK industrial Ethernet protocol.

The X90 control system enables mobile machines to be equipped with functions that make them compatible with the Industrial IoT.

Scalable hardware platform

B&R develops all of its hardware platforms to be exceptionally modular and scalable. For the X90 system, modular means that the machine manufacturer can select from a variety of option boards to implement the functions they need, including additional I/Os and interfaces. Scalable means they are able to choose from a range of performance classes – ensuring consistent solutions for basic to high-end machines.

Ready-made software components

"There is more to B&R's solution than the hardware alone," emphasizes Taxer. "With our mapp Technology toolkit, we provide more than 200 preprogrammed software functions in Automation Studio." mapp Technology provides solutions for web-based HMI, control, service, data monitoring and more. It also makes it remarkably easy to implement serial kinematic systems like those found in an excavator arm. Application engineers simply drag and drop the desired functions into the application and enter the corresponding parameters. There's no need for the programming work that would traditionally be necessary. All mapp functions are linked to one another and exchange data automatically. "This significantly reduces the development overhead for a new application," Taxer notes.

B&R has also designed its product platform so that once application software has been written, it can run on any hardware. This makes it easy to switch from a basic to a high-end machine. "For our customers, that means future-proof return on investment," says Taxer.

Integrated safety

Safety technology plays a key role in automation and should not be underestimated. Manufacturers can find helpful information on the topic in the Machinery Directive 2006/42/EC, which also applies to mobile machinery in the European Economic Area, Switzerland and Turkey. It also contains harmonized standards that apply internationally. Developing integrated safety solutions in-house is costly and complex, however. "We can relieve mobile machine manufacturers of this burden," says Taxer. With the integrated safety solution developed by B&R, safety applications can be created from pre-certified software blocks. "The user simply links the blocks together in our Automation Studio development environment, considerably reducing the programming overhead."

Smart machines

The X90 control system enables mobile machines to be equipped with functions that make them compatible with the Industrial IoT. "Our X90 system can collect data, analyze it locally and send it to an edge server or directly to the cloud via OPC UA," says Taxer. Condition monitoring and remote maintenance can also be implemented.

This allows both builders and operators to track the health and performance of tractors, excavators and other vehicles at all times. "As a technology partner, we help agricultural and construction machine builders of all sizes stay competitive," Taxer is confident. "With us at their side, they have all the benefits of state-of-the-art automation – including safety technology and cloud connectivity – easily within reach." ←

The X90 control and I/O system can be expanded modularly, using option boards for additional I/Os or interfaces.

Stefan Taxer
Product Manager - Mobile Automation, B&R

"With us as a technology partner, builders of agricultural and construction machinery have all the benefits of state-of-the-art automation – including safety technology and cloud connectivity – easily within reach."

Safety

Machine functionality
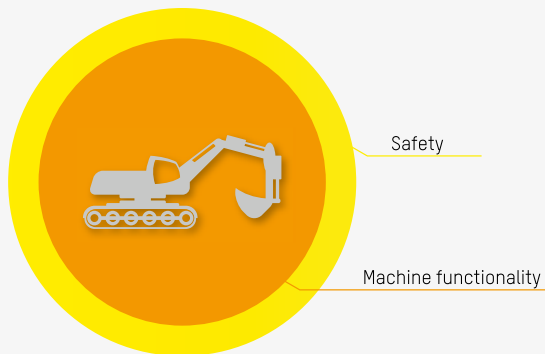
B&R's reliable safety technology monitors the standard (non-safety) application.

Putting the smart in smart factory

Manufacturers around the globe aspire to build a new generation of smart factories. India's producers are no exception, moving from evaluation to implementation of advanced technologies that will make them ready for the future. Plastech Solutions has emerged as a leader by combining these advancements into a fully integrated system. To achieve this level of integration, they needed a robust, modular and scalable automation solution. They placed their trust in B&R's APROL, as it was a perfect fit for all these requirements.

Photo: Plastech

Plastech Solutions has four manufacturing units at various locations in Pune, India, specializing in plastic components for the automotive, switchgear, aerospace and infrastructure industries as well as for consumer appliances. The company also has an automation division, which caters to the requirements of factories seeking to replace legacy controllers with the latest machine and motion control solutions or to upgrade machines for improved energy efficiency. As a hub of India's automotive industry, Pune provides a great platform for Plastech solutions. They are tier-two suppliers for various well-known Indian and multinational automotive manufacturers.

Capturing losses for improvement

Everyone seeks to increase profitability, and reducing losses plays a vital role in that equation. A factory can be plagued by a variety of losses, which, if permitted to go unnoticed, can impact profitability in a big way. "Our factory has been running for over 12 years, and we were pleased with its productivity," says Plastech Founder and CEO, Ajay Zod. "In our constant pursuit of improving our production processes, however, we implemented a robust loss monitoring solution."

The solution aimed to reduce losses incurred through production and inventory as well as the consumption of raw materials and energy. Plastech observed that, compared to planned production, the factory was running at only 60% efficiency – with the reason for wastage untracked. On many occasions, multiple motors were operational even when the respective machine was idle. Such instances lead to wasted energy and had a strong impact on profitability.
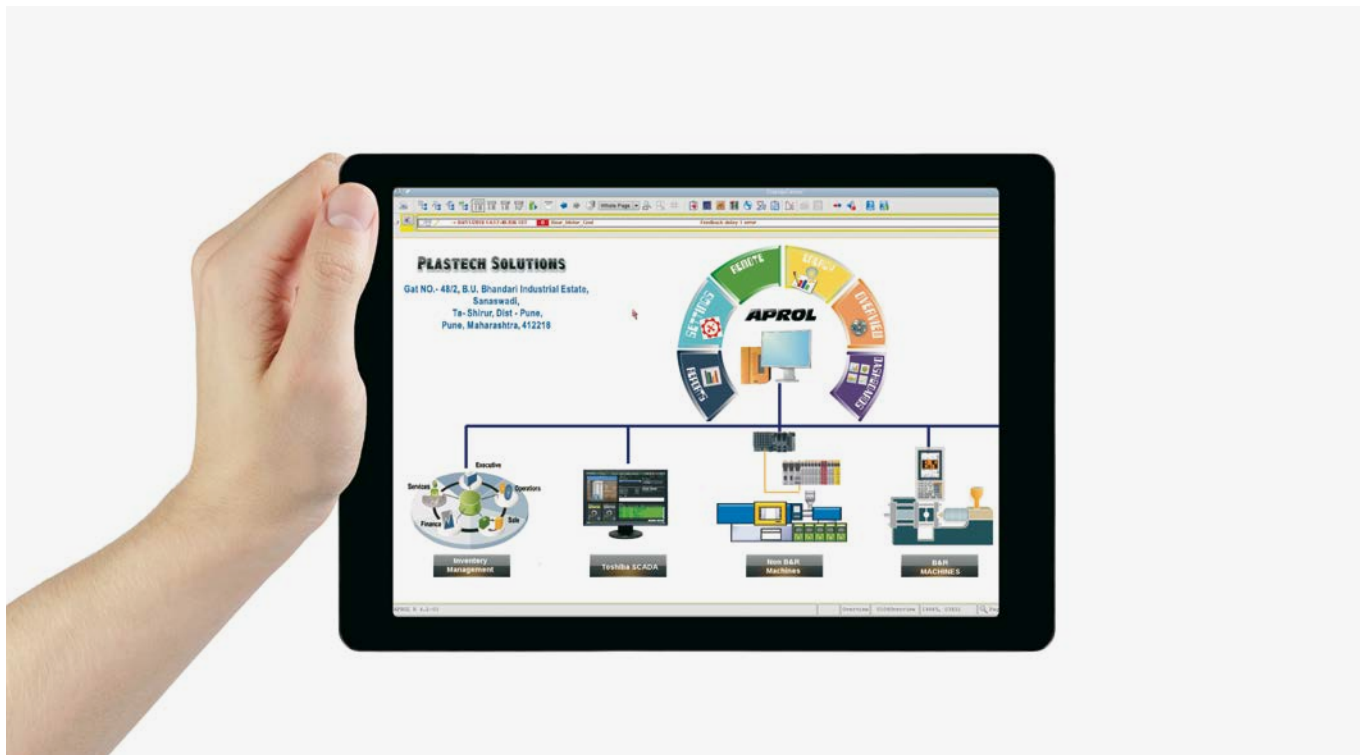
APROL dashboard provides details of overall equipment effectiveness (OEE).

Integrated plant

Plastech has since transformed its manufacturing unit into a true smart factory. The plant currently has 40 injection molding machines capable of manufacturing products and components from 40 different molds. Not only has Plastech integrated communication between these shop floor systems and its IT systems – they have also integrated utilities, inventory management, finance management, infrastructure automation, OEE, operations and sales into a single system. They also plan to connect and integrate four manufacturing plants at other locations. The factory automation system monitors every machine on the shop floor and connects it to a central system. The data gathered is utilized to calculate the overall equipment effectiveness (OEE) for each machine. Machine output is identified as either good or bad product and either rejected for scrap or selected for dispatch accordingly. A grinder on the shop floor converts rejected products into granules, which are reused for new products. This step saves a great deal of raw material.

The factory smoke and fire systems are also integrated in the same central automation system, enabling the detection of fire and in turn, controlling water. The cooling water needed for various machines is also monitored by the factory automation system, which maintains the water level as well as supplying the chemical additive for cooling. The cooling tower is monitored for both temperature and pressure. The main factory gate is monitored by an IP camera, and the footage is logged in the factory automation system.

Various trend charts provide a visual display of the monitored machines and utilities. "We have connected and integrated all possible components in our factory, and all of them are monitored 24/7. This has helped us achieve higher productivity and OEE while also reducing wastage, inventory costs and losses," says Zod.

APROL for better OEE

"When we initially started discussion of the project, we just wanted to monitor the energy utilization of our systems," recalls Zod. "During evaluations and discussions with B&R experts, however, we quickly realized many business benefits to be gained through having a single system for process control, data acquisition, monitoring, analytics and long-term storage." B&R's powerful APROL solution for factory automation now serves as a single system for

Ajay Zod
CEO, Plastech Solutions

"B&R's powerful hardware and software has impressed us. Support for open source solutions like Linux, POWERLINK and OPC UA helps us remain vendor independent at the machine, factory and cloud level. The out-of-the-box APROL solution, together with customizable reports, is a unique offering by B&R APROL."

B&R's powerful APROL solution for factory automation now serves as a single system for controlling and monitoring the Plastech plant, helping them achieve higher productivity and OEE while also reducing wastage, inventory costs and losses.

controlling and monitoring the Plastech plant. The production manager uses the APROL dashboard each day to assign operators to their machines on the shop floor and to select molds for production. This helps monitor the efficiency of machines and operators at the same time. Any variations raise warnings and are logged for analysis. APROL provides comprehensive reporting, trending and historical data. These reports can also be accessed using a smartphone or tablet. The data regarding availability, productivity and quality is converted by APROL into valuable information, such as OEE ratings for management.

Architectural marvel

The shop floor consists of machines from multiple vendors, making it challenging to gather data. APROL connects to B&R smart molds, multi-vendor machines and SCADA systems via Ethernet and OPC UA. Controllers without native connectivity options are connected using add-on X20 I/O modules and parallel wiring. Utilities are controlled and monitored via X20 I/O modules connected in a decentralized architecture.

An Automation PC 910 runs a Linux operating system, an APROL engineering server and a runtime server. It is connected to the operator station situated centrally in the control room overlooking the shop floor. The decentralized architecture helps in connecting individual machines and utilities to the central Automation PC 910. The X20 I/O modules are connected via an open source, deterministic, vendor-independent POWERLINK network. This reduces cabling and maintenance effort in the factory and improves diagnostics. The Automation PC 910 also provides long-term storage of historical data and reports.

Plastech has the option of further increasing storage space by using cloud services. APROL can easily connect to various cloud platforms using open protocols such as OPC UA, MQTT and AMQP. The modular X20 I/O system makes it easy for the company to choose the specific I/O functionality needed for each utility and machine. This reduces costs and adds flexibility to the process and data acquisition system.

"B&R's powerful hardware and software has impressed us," confirms Zod. Support for open source solutions like Linux, POWERLINK and OPC UA helps Plastech remain vendor independent at the machine, factory and cloud level. "The out-of-the-box energy monitoring and PDA solution, together with customizable reports, is a unique offering by B&R APROL," he notes.

The APROL EnMon solution is currently used to monitor energy consumption throughout the plant. The X20AP3131 energy metering module provides a compact connection for incoming supply. This reduces additional cost of system components and allows Plastech to easily integrate solutions right out of the box.

Looking to the future

"We have successfully deployed APROL in our manufacturing facility and have already seen the benefits," says Zod. "We are planning to leverage these benefits for our other manufacturing units by connecting all our sites together." In the future, Plastech plans to add energy monitoring for individual machines and utilities so that we get individualized data. "We are also looking at integrating condition-based predictive maintenance in all our machines using the APROL ConMon solution," concludes Zod. ←

Foil stamping

Stamp of approval

> One of the most popular ways to give products a high-visibility edge on the store shelf is foil stamping. Technoshell Automations has made a name for itself by building the machines that apply this technology. To achieve the desired accuracy and precision in their highly complex multi-axis machines, Technoshell relies on innovative, advanced automation technology from B&R.

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From personal relationships to purchasing decisions – first impressions are always critical. The appearance of a product plays a major role in influencing consumer behavior, and every industry has its tricks and techniques to grab consumers' attention and convey the desired brand image.

Technoshell Automation is a 28-year-old company offering complete printing and packaging solutions to a wide range of customers. With in-house design, machining and software development capabilities coupled with state-of-the art production capacity backed by high-tech machines and the latest automation technology, they are experts and leaders in their field. "Our machines are designed with our customers' needs in mind," says Technoshell's director, Nikhil Baste, "so we place particular emphasis on quality, productivity and affordability."

New dimensions of stamping

Products and packaging featuring hot foil stamping are known to attract attention faster and retain it for longer compared to those without it. Hot foil stamping and heat transfer are forms of product decoration that use a combination of heat, pressure and dwell-time to permanently apply metalized or pre-printed graphics on a product. "Our hot foil stamping machines and heat transfer machines operate on up-down and roll-on principles to cover a wide

range of applications. We offer a wide range of machines to beautify products and packaging," notes Baste.

Hot foil stamping on a flat surface or a simple geometry in two dimensions is a relatively straightforward process. With the addition of a third dimension, things become more complex – and even more so when the task involves hot stamping on a curved surface. In such applications, the challenge is to maintain the required temperature, pressure as well as adequate contact between the roller, foil and object.

CNC-based stamping

With its Pro Hot Foil Stamping machine, Technoshell revamped its machine design and mechanics as well as implementing CNC software. B&R's Automation Studio engineering environment played a major role in simplifying the development process.

The stamping process begins with the operator loading the product onto the machine, protected by safety light curtains. The safety interlocks prevent any accidents during loading. The foil containing the pattern to be printed on the product is pulled by the puller axis over the product. Another set of arms place the foil tightly against the product. The desired product profile is loaded in the software and the stamp is applied by a two-axis roller driven by a stepper motor. An X-Y axis gives it the necessary vertical and horizontal freedom, while the third axis allows for 360° rotation. For the hot stamping process, the roller is heated to over 100°C.

Once the stamping is over, the arms lift upwards and the foil is pulled away by the stepper axis in order to be ready for the next cycle. "Our hot foil stamping machines provide photographic resolution with the possibility of metallic colors. They offer a permanent and safe decoration solution for complex curved surfaces and are a more sustainable solution compared to metalizing for any product," says Baste. "With the Pro Hot Foil Stamping machine, we are proud to say that we are the only company providing such high-end technology so cost effectively."

Easier to mapp it

In virtually every industry, the rate of new product launches is at an all-time high. "Catering to such rapidly changing demands is becoming a challenge for machine builders," reports Baste. "Thanks to B&R, our machine can handle such requests easily and be ready for any change without requiring us to spend time on-site." Programming new products on the machine is very easy and fast. The G-code created while designing the product can be loaded directly onto the controller, or the operator can use the graphical user interface to modify an existing product or create a new one.

The Pro Hot Foil Stamping machine features a Panel PC 2100, which serves as an integrated HMI/PLC unit and controls the entire

The Panel PC 2100 runs B&R's Windows-based real-time operating system, ARwin, and provides the robustness and determinism needed for industrial applications.

The use of ACOPOS P3 servo drives reduced the control cabinet footprint drastically – by around 69%.

Technoshell offers a wide range of printing and packaging solutions to beautify products and packaging.

machine. This is coupled with remote X20 I/O modules, ACOPOS P3 and ACOPOSmicro servo drives over a real-time Ethernet POWER-LINK network.

Technoshell utilized the mapp Technology software framework provided in Automation Studio throughout all aspects of machine development. Having previously used mapp Technology in other machines, Technoshell was well aware of its features and benefits. The mapp philosophy of configuring more and programming less helped the company substantially reduce development time. Creating a CNC application in addition to the standard hardware and application functions would previously have been unthinkable, but with the mapp CNC component was exceptionally easy. "Even as a CNC application, we still have full freedom to program our machine," says Baste. "That gives us a lot of flexibility in addition to high performance."

Integrated architecture

"We have been using B&R for around 10 years, and have seen clear benefits of their integrated approach on many occasions," observes Baste. "In all our machines, we have used POWERLINK as the vendor-independent networking protocol. It helps us to choose from a list of vendors for various components and yet be able to program, commission and diagnose them in Automation Studio." The use of ACOPOS P3 servo drives reduced the control cabinet footprint drastically – by around 69%. The POWERLINK network needs just a single Ethernet cable across the cabinet to the Panel PC 2100. This reduces cabling effort and improves maintenance. All the systems are tightly linked together with Automation Studio as the universal programming tool for all B&R hardware. The Panel PC 2100 runs B&R's Windows-based real-time operating system, ARwin, and provides the robustness and determinism needed for industrial applications.

Entering a new era

Today's manufacturers demand machines that are ready for Industrial IoT. For years, Technoshell has already been providing its customers with features like remote diagnostics and maintenance, integrated and connected machines, usage of open source technologies, scalable and flexible machine design and much more. "We build machines that satisfy the complex and varied demands of the printing and packaging industries," says Baste. "Our focus has always been on equipping our machines with next-generation technology. By coupling B&R solutions with our industry expertise, we have consistently been able to offer our customers precisely that kind of advanced solution." ←

Nikhil Baste
Director, Technoshell
Automations Pvt. Ltd.

"In all our machines, we have used POWERLINK as the vendor-independent networking protocol. It helps us to choose from a list of vendors for various components and yet be able to program, commission and diagnose them in Automation Studio."

More than embedded: fully integrated

Among B&R's exhibition highlights will be its first cloud application for OEMs.

B&R presents complete machine vision portfolio at SPS IPC Drives

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B&R will be presenting intelligent cameras, innovative lighting and advanced image processing algorithms at the SPS IPC Drives fair. The comprehensive machine vision solution is seamlessly integrated in the B&R control system. Other highlights on display at the B&R booth (Hall 7 / Booth 206/114) include B&R's first cloud applica-

tion for OEMs, safe human-track collaboration and robotics fully integrated in the B&R system. B&R's first cloud application allows OEMs to collect data from their global fleet around the clock and view it in a convenient dashboard. They can use it to make well-targeted machine upgrades, offer next-level service and unlock new revenue streams. The cloud application indicates where maintenance is necessary and provides the basis for tailor-made maintenance service.

Human-track collaboration

B&R is the first manufacturer of intelligent track systems to introduce human-track

collaboration. Five integrated safety functions allow humans to work directly alongside the track with no safety barriers – without impairing productivity.

Fully integrated robots live at the exhibition booth

B&R is expanding the range of robotics completely and seamlessly integrated in its automation landscape. At the B&R booth, visitors can see how openROBOTICS seamlessly integrates robots from different manufacturers into a B&R machine control system. The exhibited kinematics range from robots for pick-and-place applications to various 6-axis robots. ←
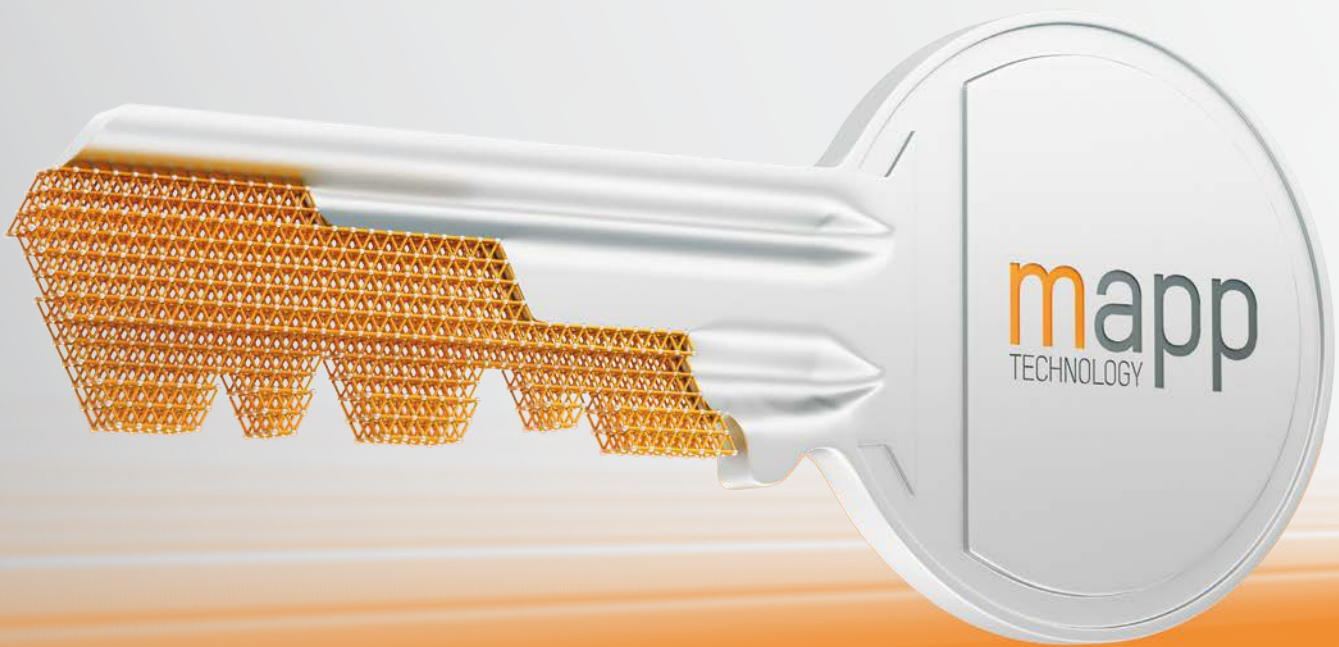
Photo: B&R

Integrated automation
Global presence
Solid partnership

ETHERNET **POWERLINK**

open **SAFETY**