automotion

05.21

The B&R technology magazine

ACOPOS 6D

A new era of productivity

Luca Galluzzi's Exciting journey as CSO

OPC UA Safety The sense in a new standard

Machine vision A look to the future

PERFECTION IN AUTOMATION
A MEMBER OF THE ABB GROUP

automotion

The B&R technology magazine is going digital

Get the latest news from the world of automation delivered straight to your inbox. Dive deeper into extended content with videos, animations, photo galleries and more – all just a tap or click away.

Subscribe to the digital edition today:
www.br-automation.com/automotion-digital

editorial

Company details

automotion:
The B&R technology magazine, 2021
Online version:
www.br-automation.com/automotion

Owner and publisher:
B&R Industrial Automation GmbH
B&R Strasse 1, 5142 Eggelsberg, Austria
Tel.: +43 (0) 7748/6586-0
automotion@br-automation.com

CEO: Jörg Theis

Chief Editor: Carola Schwankner
Editors: Craig Potter, Maria Gruber
Authors in this issue:
Stefan Hensel, Carola Schwankner, Alexandra Fabitsch, Craig Potter, Michael Corban, Franz Rossmann, Karel Sedláček, Patricia Wimmer
Graphic design, layout & typesetting:
Verena Werndl, Dave Long

Place of publication: B&R Strasse 1,
5142 Eggelsberg, Austria
Cover image: B&R

Follow us

Our privacy notice can be found at
www.br-automation.com
To unsubscribe from this magazine
please send an email to
automotion@br-automation.com

A new era

"If you always do what you've always done, you'll always get what you've always got." What Henry Ford knew then is truer than ever today: A competitive edge is built on the courage to reimagine the status quo.

As a technology leader in industrial automation, this mindset is deeply engrained in B&R's identity and in what we aim to achieve for our customers. In our cover story, you'll read how B&R is fully integrating magnetic levitation technology into our automation ecosystem and heralding **a new era of manufacturing**. Breaking free from rigidly linear production flows, ACOPOS 6D reveals new dimensions of open processing space – revolutionizing the way products are manufactured, assembled and packaged.

But it takes more than just innovative products to keep a company competitive. Luca Galluzzi stepping into his new role as chief sales officer also marks the beginning of **a new era for B&R**. In his interview, our new CSO describes how the challenges of flexible manufacturing are reshaping the automation industry and how B&R feels about its leading role in that transformation.

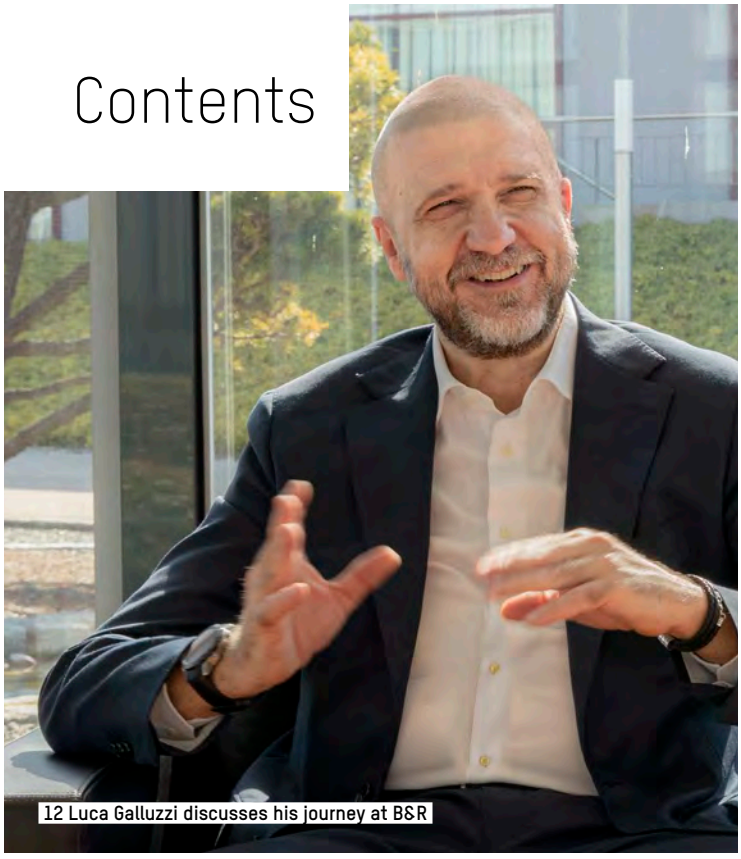
Your favorite technology magazine isn't treading water either, of course. Our previous issue was the first to appear in digital form, paving the way for **a new era of *automotion***. From now on, the magazine will be available in both print and digital versions with lots of extended content only a tap or click away. Decide for yourself whether you prefer flipping through a hard copy or gliding through the content on a tablet or PC.

However you choose to do it, I wish you, as always:

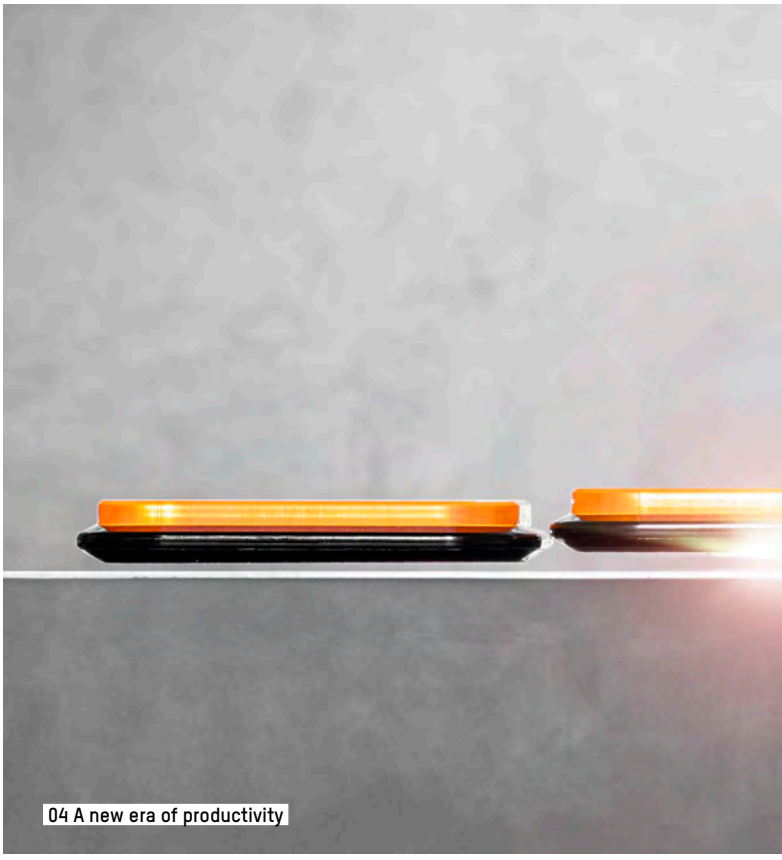
Happy reading!

Carola Schwankner
Corporate Editor, B&R

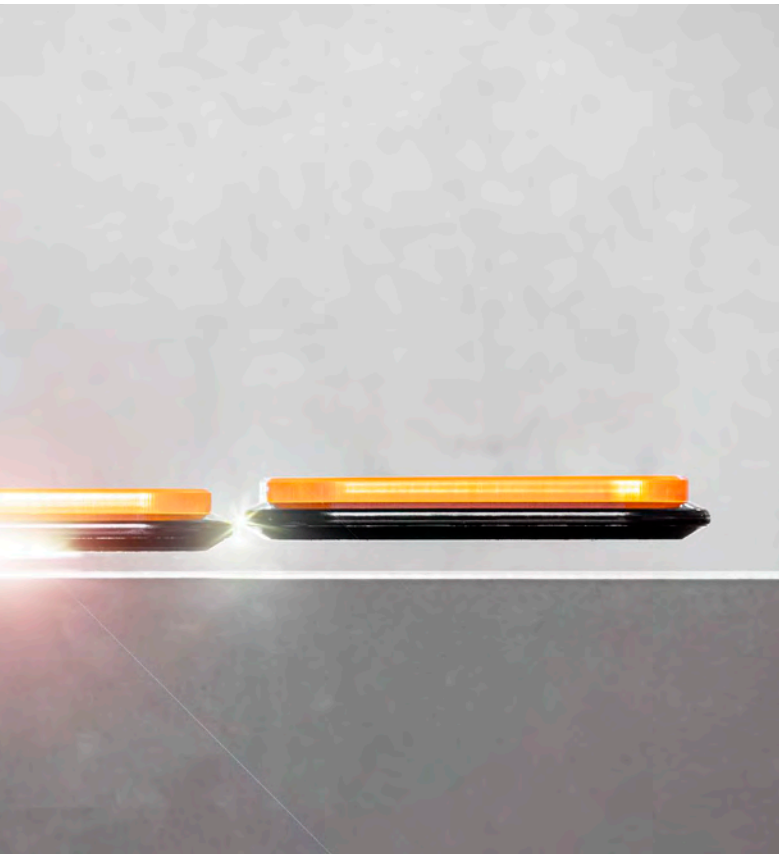
Contents



12 Luca Galluzzi discusses his journey at B&R



04 A new era of productivity



16 Quality revolves around efficient testing

Ideas & Insights

ACOPOS 6D

A new era of productivity

Today's plants and machinery take up a lot of space. But only a fraction of their footprint contributes to the production process itself. Far more real estate on the plant floor is dedicated to carrying products from place to place. It's time to break free from old limitations and set the stage for a new era of productivity.


ABB

Conveyor belts, rotary tables, carousels – there are many ways to move products from processing station to processing station. But they all have one thing in common: they don't contribute to the production process itself. Quite the opposite, in fact – they consume valuable floorspace and reduce the overall output per square meter.

"For machinery and equipment manufacturers, product transport is simply a necessary evil," says B&R mechatronics expert Dario Rovelli, not mincing words. In addition to all the space they take up, conventional product transport systems have a second costly disadvantage: they make the machine inflexible.

Henry Ford's breakthrough in industrial mass production was achieved through conveyor belts and strict production cycles. But, what once lifted productivity to new heights now weighs it down. Says Rovelli: "To meet the demands of smaller batches, shorter lifecycles and increasing personalization, we need to remove the shackles of rigidly sequential production."

More flexible with track systems

In recent years, new technologies have made production much more flexible, especially track systems like SuperTrak and ACOPOStrak. They can move each product independently and can also serve as a motion control axis at processing stations. Not only that, but they allow product flows to divide and merge at full speed.

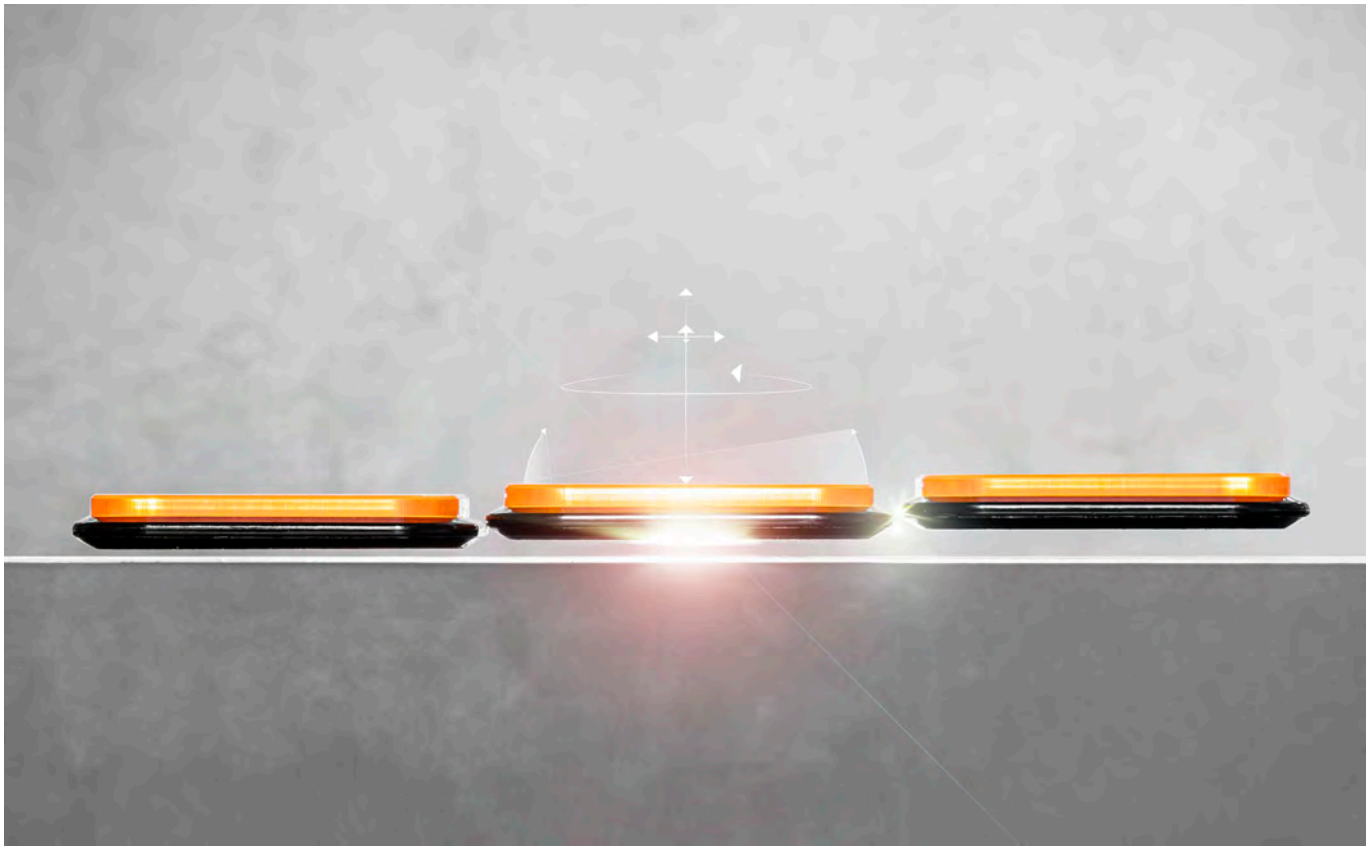
"Track systems have set a major milestone," explains Rovelli, "by synchronizing asynchronous processes." In other words: productivity is no longer throttled to the speed of the slowest processing station. By adding multiple instances of slower stations, an incremental investment brings exponential gains in productivity.

Mass customization

"Track systems let you do mass customization – for the first time – in a way that is economically sustainable," says Rovelli. Wherever there is a clear sequence of processing steps that need to be adapted dynamically to each product, a track system provides the necessary flexibility. Yet, there are other applications where the sequence of steps itself is constantly changing. These applications demand complete freedom in the flow of production.

"Manufacturing visionaries have had a dream for many years," says Rovelli. "They dream of dissolving the linear model of product transport entirely, and creating a multidimensional manufacturing space – where each product moves independently from station to station without being bound to a rigid, sequential production flow."

Dissolving the traditional model of linear product transport creates a multidimensional production space.



Magnetic levitation technology makes it possible to move and manipulate products with six degrees of freedom.

Contactless, noiseless, precise

What has long sounded like wishful thinking is now becoming reality, thanks to modern magnetic levitation technology. As if guided by an invisible hand, shuttles glide freely above a surface, accelerating and maneuvering skillfully in every direction. "Ever since the first time I saw this technology in action, I've been completely fascinated," says Rovelli. "It's contactless, noiseless and extremely precise. I realized immediately the profound impact it would have in shaping the world of manufacturing for years to come. And now, magnetic levitation has advanced to the point where it can deliver serious benefits in industrial applications."

The future of manufacturing

This same vision led B&R to fully integrate magnetic levitation technology into its automation system. ACOPOS 6D now heralds a transition from strictly linear production to an open, adaptive manufacturing space. "We're talking about nothing less than a revolution in the way products are manufactured, assembled and packaged," Rovelli says.

Cropping up again and again in discussions of Industry 4.0 and the Industrial Internet of Things has been the concept of products navigating their own way through the production process. "It's often been dismissed as a pipe dream," says Rovelli, "but now we actually have the technology to turn the vision into reality." With ACOPOS 6D, one machine can simultaneously manufacture different product variants or even entirely different products. Each product navigates its own path to the stations it actually needs. "We're witnessing the birth of swarm production." ←

Dario Rovelli,
Head of Product Management – Motion & Mechatronic Systems, B&R

"It's time to break free from old limitations. With ACOPOS 6D, we've set the stage for swarm production – and a new era of productivity."

Photos: B&R

An ACOPOS 6D shuttle carrying a workpiece could follow a CNC path, allowing the processing tool to be mounted rigidly.

ACOPOS 6D

A new era of manufacturing

ACOPOS 6D heralds a new age of multidimensional manufacturing. Magnetic levitation carries individual products freely through the machine, unbound by rigid timing and linear production flow. ACOPOS 6D is ideal for small-batch production with frequent changeover between products of different designs and dimensions.

ACOPOS 6D shuttles tilt along three axes.

ACOPOS 6D is based on the principle of magnetic levitation: Shuttles with integrated permanent magnets float over the surface of electromagnetic motor segments. The modular motor segments are 240 x 240 millimeters in size and can be arranged freely in any shape. A variety of shuttle sizes carry payloads of 0.6 to 14 kilograms and reach speeds of up to 2 meters per second. They can move freely in two-dimensional space, rotate and tilt along three axes and offer precise control over the height of levitation. All together, that gives them six degrees of motion control freedom.

Space savings
ACOPOS 6D offers up to four times the shuttle density of other systems on the market through the unique ability to control four shuttles on the same motor segment simultaneously. The shuttles can also be used as axes in processing stations. An ACOPOS 6D shuttle carrying a workpiece could follow a CNC path, allowing the processing tool to be mounted rigidly. Weighing stations can be eliminated entirely, since each shuttle can also serve as a high-precision scale. This makes it possible to design a more compact machine.

Zero wear
ACOPOS 6D shuttles levitate freely without any contact or friction. With no abrasive wear, there are no parts to be maintained. If a stainless steel cover is placed over the motor segments, ACOPOS 6D offers IP69K protection – making it ideally suited for cleanrooms or food and beverage production.

Fully integrated
ACOPOS 6D is fully integrated in the B&R ecosystem. That allows the shuttles to be synchronized with servo axes, robots, track systems and machine vision cameras with microsecond precision. Path planning for the shuttles occurs in a dedicated controller, connected to the machine network via POWERLINK – which means it has no impact on the performance of the network or machine control system. For systems with more than 200 segments or 50 shuttles, multiple controllers can be synchronized with each other.

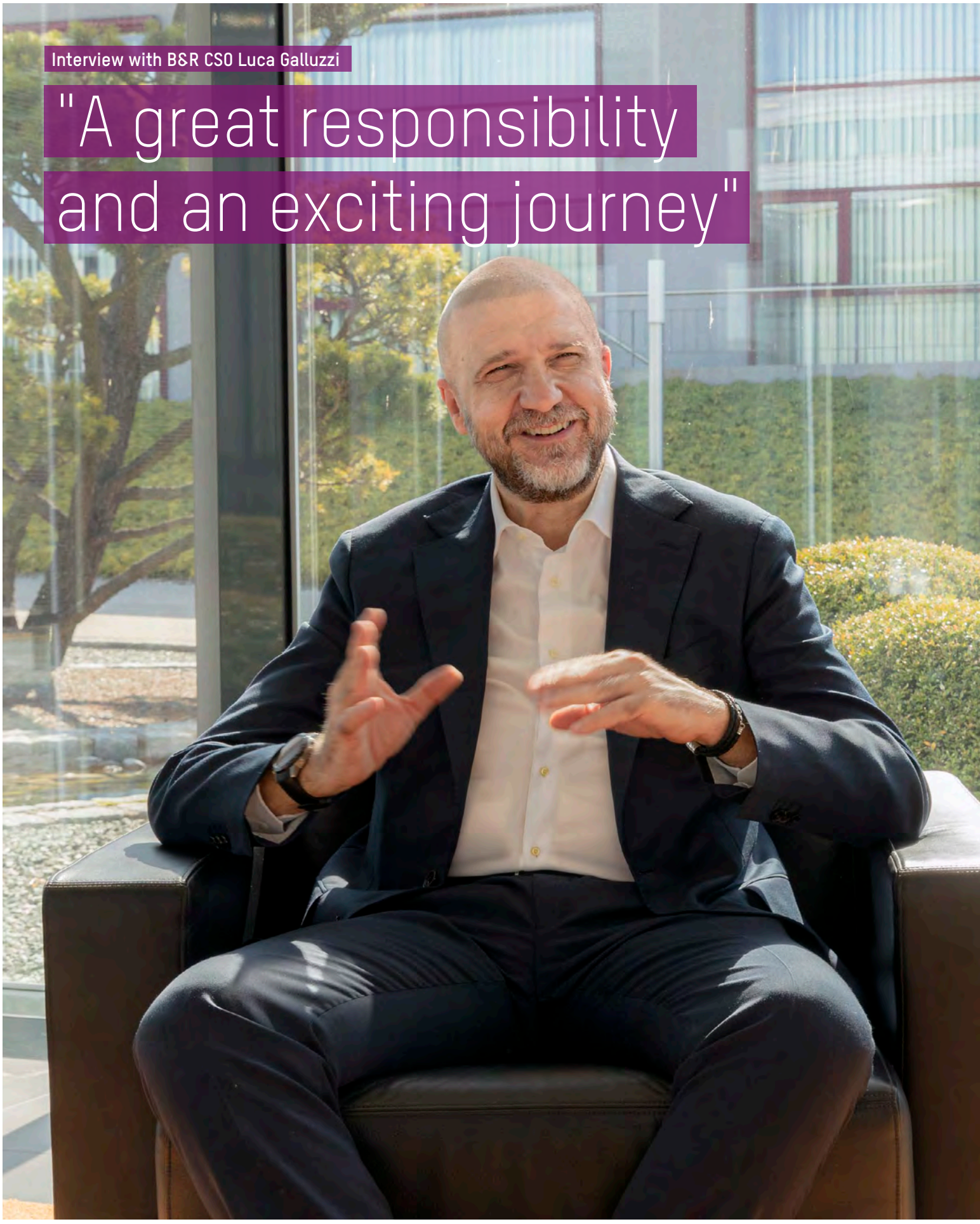
Intelligent shuttles
Unlike comparable systems, each ACOPOS 6D shuttle is assigned a globally unique ID. At startup, the controller immediately knows the location of each shuttle on the motor segments, and production can begin without time-consuming homing sequences or manual input by an operator. The shuttles offer a positioning repeatability of ±5 µm, making ACOPOS 6D perfectly suited for applications with strict positioning requirements, like those in the electronics industry and in the assembly of mechanical and electronic components.

Easy setup
ACOPOS 6D offers nearly limitless possibilities in machine design, yet is remarkably easy to set up. Sophisticated algorithms ensure the shuttles follow an optimal path while avoiding collisions and minimizing energy consumption. Developers are free to concentrate on their primary task: developing optimal machine processes that deliver maximum productivity.

ACOPOS 6D was developed in cooperation with Planar Motors Inc., a company with more than 15 years of research and development in the field of magnetic levitation technology for industrial manufacturing. B&R is a shareholder in Planar Motors.

Interview with B&R CSO Luca Galluzzi

"A great responsibility and an exciting journey"



Luca Galluzzi has been with B&R for more than half his life. We sat down with the chief sales officer to learn about his long and loyal career and hear his thoughts on the special relationship between B&R and its customers. He explained how the challenges of flexible manufacturing are reshaping the automation industry – and how B&R feels about its leading role in that transformation.

From Italy to all of Southern Europe, and now B&R's entire global sales force – as your responsibilities have grown over the years, what has changed for you?
Luca Galluzzi: Like so many others at B&R, I share an entrepreneurial spirit that drives us to do whatever we can for the company and our customers using the tools and resources at our disposal. Well, now I'm in a position to help more than ever, and I'm grateful for that opportunity. I may be viewing things from a new perspective with a broader horizon, but my focus remains unchanged. My primary responsibility is to take care of the people I work for: the dedicated B&R employees around the world who are responsible for our customers' success.

Stepping from Italy onto the bigger playground of Southern Europe prepared me professionally and mentally for this latest jump. For instance, it helped me see the importance of relying on our local talents to manage things on a more global scale. I realized that trusting and empowering people is not only necessary, but also mutually beneficial. The same energy that helps them succeed in their chosen career paths can propel the company toward common goals.

You've been with B&R for over three decades. How has it changed in that time?
Galluzzi: I'm often asked how I've managed to spend an entire career at the same company. The answer is: I haven't. B&R is a completely different company today than it was when I started. Like a living organism, it has grown and changed over the years – from an innovative start-up to a major player on the international stage. And as the company grows, new possibilities open up in terms of corporate culture and professional opportunities.

Being a part of that transformation has always been exciting for me. After all: if we don't change, we don't grow. And if we don't grow, we're not really creating anything. That's the main reason why B&R has evolved and will continue to do so in the future. At the same time, however, we have retained the core DNA that makes us who we are as a company.

And what is that DNA?
Galluzzi: What has remained consistent throughout all B&R's growth are our strong customer-orientation and spirit of cooperation. We work closely with our customers and commit all our passion and expertise to co-create the best solutions to their challenges.

What challenges are B&R's customers currently facing?
Galluzzi: Consumer behavior is shifting rapidly toward personalized products available on demand. At the same time, there is an important focus on implementing more sustainable solutions. Geopolitical developments are causing uncertainty about where to invest and localize production processes and factories. Increasingly sophisticated manufacturing systems make it challenging to find and train specialized workers.

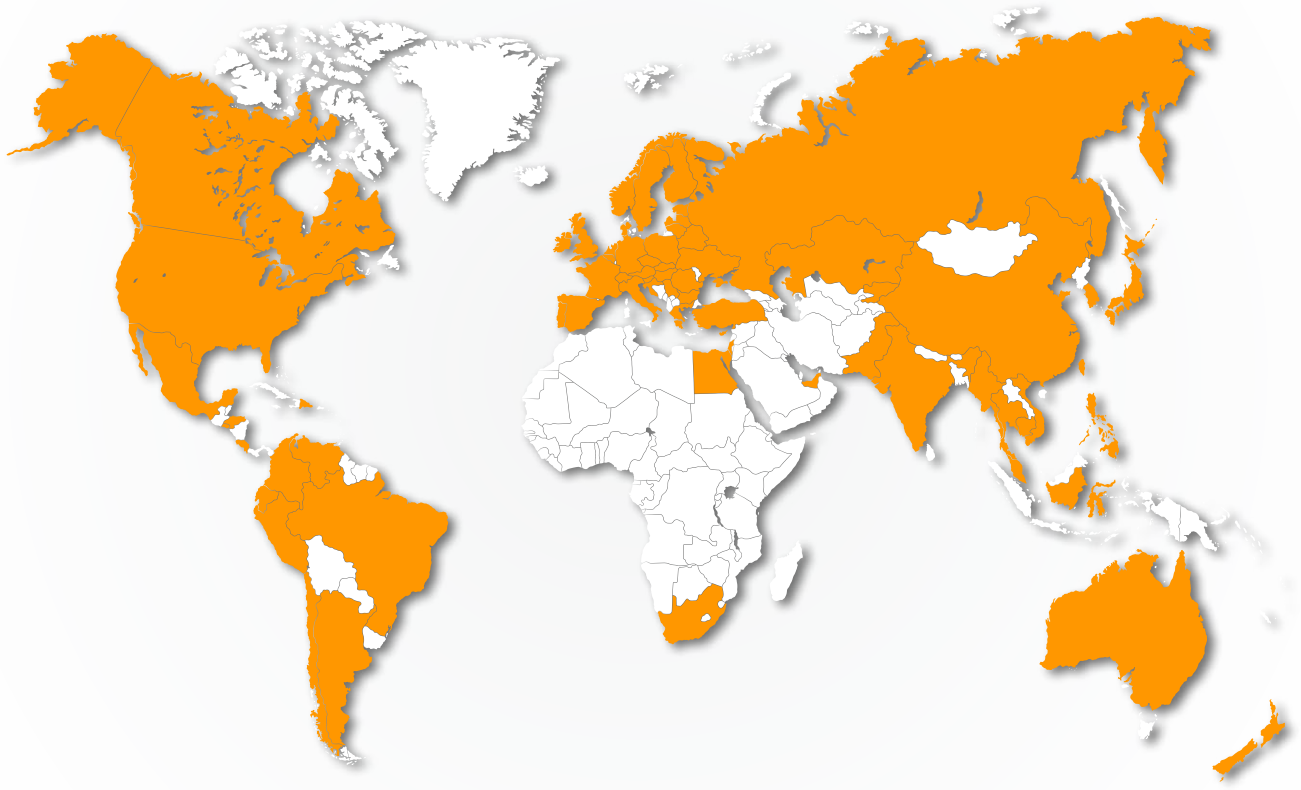
What all these mega trends have in common is that mastering them requires manufacturing solutions that are more digital, automated and – above all – flexible. Machines and entire production lines must adapt quickly and automatically to new requirements, materials and products. They must allow mass production efficiency down to batches of one, while also reducing material and energy consumption.

And what solutions does B&R offer to help with that?
Galluzzi: Our mechatronic product transport systems – SuperTrak, ACOPOStrak and ACOPOS 6D – are perfectly integrated with our robotics and machine vision, as well as our modular software and vendor-agnostic connectivity solutions. We've created an unrivaled ecosystem that is transforming the landscape of the automation industry. At B&R, we see our protagonist role in that transformation as both a great responsibility and an exciting journey.

As CSO, what are your plans for B&R's evolution?
Galluzzi: I want to continue focusing on our strategic pillars. Our outstanding innovative solutions and our total devotion to the needs of the customer are the DNA that has always shaped our success. We will tightly align our business development and product strategy forces, with a focus on specific industries. In increasingly dynamic markets, we have to be good at intercepting those changes from the beginning, so we can offer solutions that meet our customers' rapidly changing needs.

As we continue to expand our sales network, we will also localize important services and activities in ways that make us closer and more responsive to our customers. To achieve that, we must give our subsidiaries more decision-making freedom and responsibility so that they can respond even better to the individual needs of our customers in each country.

Photos: B&R



As CSO, Luca Galluzzi now leads a team of highly trained sales employees working in over 70 countries around the world.

What unique strengths set B&R apart from the competition?
Galluzzi: I believe we are alone in providing such a complete and innovative portfolio that is so well-tuned to the needs of fast-changing markets. But what really sets us apart is our unwavering focus on our customers. That focus comes from our company's most important asset: our people. They are the ones who work with our customers hand-in-hand and at eye level to find their best possible solution.

That's why we keep our teams around the world trained to consistently high standards with the rigorous engineering curriculum at our Automation Academy. Yet it's not just our minds, but the heart and soul that we put into good partnership that defines us. It's the closeness of our employees to our customers and their commitment to Perfection in Automation. That's why we look back on so many long and successful relationships – and why we look forward to so many more exciting journeys to come. ←

Passing the baton

Luca Galluzzi joined B&R's executive management team on August 1, 2020. As chief sales officer, he succeeds Peter Gucher, who entered retirement after 34 years at the company. In his role, Luca is responsible for all of B&R's global sales activities.

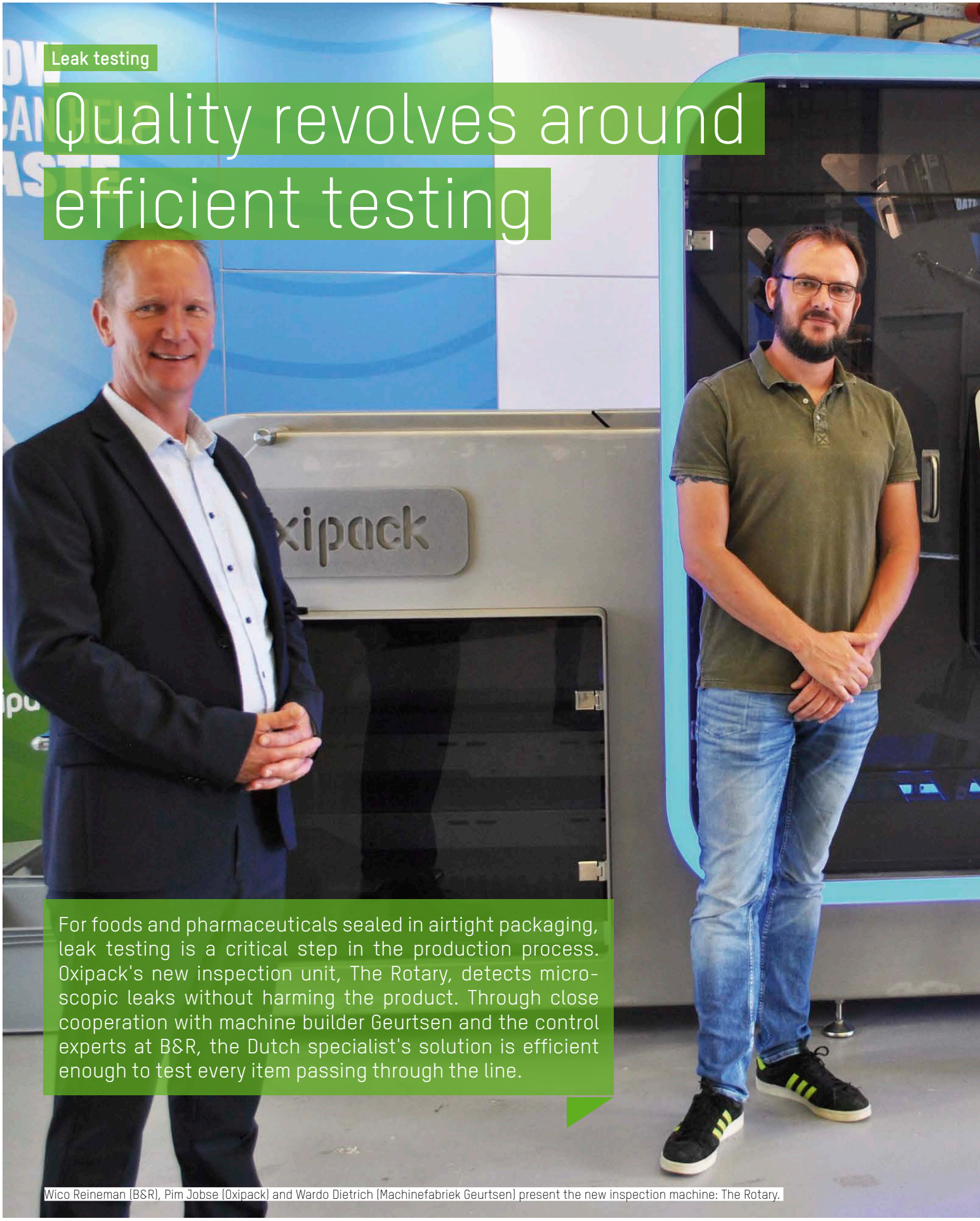
Luca has been working at B&R since 1988 and was among the first employees at B&R Italy. He later served as managing director of B&R Italy and regional sales manager for Southern Europe. As CSO, he now leads a team of several hundred sales employees working in over 70 countries around the world.

Luca lives with his wife and three children in Milan, Italy.

Leak testing

Quality revolves around efficient testing

For foods and pharmaceuticals sealed in airtight packaging, leak testing is a critical step in the production process. Oxipack's new inspection unit, The Rotary, detects microscopic leaks without harming the product. Through close cooperation with machine builder Geurtsen and the control experts at B&R, the Dutch specialist's solution is efficient enough to test every item passing through the line.



Wico Reineman (B&R), Pim Jobse (Oxipack) and Wardo Dietrich (Machinefabriek Geurtsen) present the new inspection machine: The Rotary.

In the perpetual pursuit of waste reduction and quality improvement, companies in the food and pharmaceutical industries attach great importance to packaging. Among the most important objectives is the removal of leaky packaging from the process as early as possible. Often, this is done by immersing random samples in water to see if any air bubbles escape. Such manual checks lack reliability and are not precise enough to detect microscopic holes. Though small enough to evade manual detection, these microleaks are still large enough to spoil a product before its official use-by date, resulting in unnecessary costs and posing a potentially image-damaging health risk to consumers.

Oxipack Leak Detection has developed an alternative method based on innovative vacuum technology. "The idea is fairly simple," says Pim Jobse, technical manager of the company based in the Dutch city of Houten. "You place the product between two rubber membranes, seal everything and create a vacuum. If the packaging is closed properly, nothing will happen. But if there is a small hole in it, the pressure in the vacuum chamber will continue to rise." This approach makes it possible to detect leaks as small as ten microns. And, importantly, it does so without damaging or contaminating the packaging – so it's possible to check every single product rather than just random samples.

Like the water immersion method, vacuum detection also takes time. "The whole process takes about half a minute start to finish," Jobse knows. That posed a challenge for the Oxipack engineers: To meet the market's demand for inline leak detection, they would need to check 120 units per minute. The company therefore sought out a machine building partner to develop a solution with the necessary efficiency and the smallest possible footprint.

Universal development environment

Oxipack found the innovative development partner it was looking for in Machinefabriek Geurtsen. For controls, the machine builder has been standardizing on B&R technology for years. "That's largely because of how easy B&R's Automation Studio platform makes it to program and control everything," says Geurtsen's chief designer, Wardo Dietrich. "Whatever you hook up to your system, it communicates. For a programmer, being able to do everything in one familiar environment is ideal."

"I was convinced in ten minutes," says Jobse. In addition to the ease with which all his questions were answered, Jobse was particularly impressed by the convenient controller diagnostics. "You see the status of the controller immediately, without having to do anything; it's all preprogrammed. That makes me very happy. Other vendors may tell you that there is a driver error, but it's up to you to find out what's going on and how to fix it. B&R's System Diagnostics Manager gives you quick access to detailed information along with a recommended solution."

Reduced floorspace

Oxipack had some clear ideas about what it wanted from Geurtsen's developers. "Because of negative experiences in the past, I was originally instructed not to develop a carousel," says Dietrich. He therefore came up with a number of alternative concepts, such as a solution in which the vacuum chambers are arranged in a kind of bookcase during measurement. In the end, however, almost all ideas turned out to be too cost intensive, and only one serious option remained. "Like it or not, a carousel was the way to go," laughs Dietrich. But, unlike the horizontal carousel Oxipack had used previously, Dietrich greatly reduced the required floorspace by flipping it on its side like a Ferris wheel.

The solution, called The Rotary, contains up to twelve measuring chambers. As each product completes its turn on The Rotary, the air is evacuated from the chamber and the measurement is taken. By the time it returns to the starting point, it is clear whether the packaging is good or should be rejected, and the product slides onto the corresponding belt.

For the infeed, Geurtsen opted for a shuttle conveyor, which retracts at the last moment while the belt continues to advance. "That drops the product quietly and neatly into place," says Dietrich. "It's a method we use quite often, but with the infeed going into a rotating wheel, the timing was very tight." Through extensive testing and collaboration, Geurtsen and B&R arrived at a successful solution.

The perfect synchronization of the infeed belt and rotary wheel was made possible by a fully integrated motion control system

Photos: Oxipack

Oxipack collaborated with Machinefabriek Geurtsen to develop a modular machine able to perform leak testing on up to 120 packages per minute.

The infeed belt and rotary wheel are synchronized perfectly thanks to B&R's fully integrated motion control system.

from B&R that includes servo drives, inverters and safety technology. Control of The Rotary is handled by a B&R Panel PC 2100, which combines HMI and powerful PC-based control in a single device. "Thanks to the use of software components from B&R's mapp Technology toolkit," says Jobse, "the infeed shuttle conveyor can be set up for different packaging without any complicated calculations – it's a simple matter of setting a few main parameters."

The mapp component for recipe handling makes it quick and easy for machine operators to switch between products of different sizes and weights. By using sensors to automatically determine the product parameters, it's even possible to handle combinations of products running at the same time.

Scalable and compact

The first unit built by Oxipack and Geurtsen went to an Italian customer for testing. "With the current setup, they're able to check 20 products per minute," says Jobse. For real inline measurement during production, a speed of about 120 packages per minute will be required. "That's where the modular design pays off," notes Jobse. "They can easily add five more wheels without a significant impact on the footprint of the packaging line." ←

Wardo Dietrich
Chief Designer, Machinefabriek Geurtsen

"For controls, we have been standardizing on B&R technology for years. That's largely because of how easy B&R's Automation Studio platform makes it to program and control everything. Whatever you hook up to your system, it communicates. For a programmer, being able to do everything in one familiar environment is ideal."

Once the chamber is closed and the air has been evacuated, a continued increase in chamber pressure would indicate a leak in the package.

Adaptive machines

"Master the unknown"

Batch size one and product individualization have framed the discussion about Industry 4.0 right from the start. The aim has always been to create machines able to adapt automatically to new tasks that were unknown at the time of commissioning. Markus Sandhöfner, managing director of B&R Germany, explains why these adaptive machines are more than just modular and what role automation technology plays in the process.

"An adaptive machine you install today will master tasks you haven't even thought of yet – all on its own, without any additional tools or equipment. That's the essence of what makes adaptivity so revolutionary," says Markus Sandhöfner, managing director of B&R Germany.

The trend towards modular machines and flexible connection of manufacturing cells continues. B&R now looks to take it even one step further by creating adaptive machines. Can you explain just what it is that sets an adaptive machine apart from a modular machine?

Markus Sandhöfner: The next step comes from combining a variety of state-of-the-art technologies available today. A modular machine is one that the user can easily adapt to the task at hand. But when that machine now adapts itself to new tasks, it becomes an adaptive machine. In other words: Adaptive machines are also capable of mastering tasks that were not yet known at the time of commissioning. And they do so independently, without any additional tools or equipment. That's the innovative idea behind adaptive machines.

What are the driving forces behind this development?

Sandhöfner: One of the big driving forces is e-commerce, where individually configured products require production of ever smaller batches. The advantage of adaptive machines is that they can immediately start producing a large number of product variations – even down to batch size one – as soon as the order is received. And I mean that quite literally: The online product configurator can be coupled directly with the adaptive machine. When the order is placed, the data is sent directly to the machine and it can start production right away. In a way, the whole machine is online: It's now possible to digitize the entire process – from ordering to packaging. Incidentally, this also lays the foundations for taking part and remaining competitive in an increasingly volatile business environment.

Another advantage of adaptive machines is therefore their scalability. When demand increases, you want to have your production output match that as quickly as possible. A current example are the protective masks we now wear every day. Demand skyrocketed suddenly early on, and came with a desire for individualization. In addition to the dimensions, this also included demand for a masks with custom designs, images and logos. Those who were able to quickly produce, package and ship masks had a clear advantage in this situation.

The transition from modular to adaptive won't come all at once. In the meantime, can scaling still be implemented smoothly in hybrid solutions?

Sandhöfner: Certainly. Take B&R's track system, ACOPOStrak, for example. What's key here is that the track system can easily be expanded when new products exceed a line's capacity. And, since all of our automation components are designed to be modular and interoperable – even the communication and software – the entire manufacturing system can grow flexibly along with it. Even during ongoing operation, it's also possible to quickly boost output by adding processing stations along the existing track. To handle sudden increases in demand, the user can set up processing stations in parallel and split production flow between them at any time using diverters. This prevents bottlenecks before they start. In other words: Modular and, above all, adaptive machines are not closed systems. Parallel production and machine expansion are always options.

Photos: B&R


Custom
Labels
Digital Twin

"We've seen plants with as many as 300 shuttles that are operated as a single, integrated system," reports Markus Sandhöfner.

One example of just how flexible the system is, is what we call the virtual shuttle. To transport certain products, two real shuttles can be joined virtually and controlled as a single shuttle. We have even taken this concept further and worked with customers to implement an entire train of products. The railroad analogy fits quite well here, because in the corresponding logic, the cars and couplings are defined in a way that allows you to assign a single destination for the train as a whole. This makes it very easy to use.

So the key is defining interfaces, not only in terms of software or communication technology, but also for the hardware...

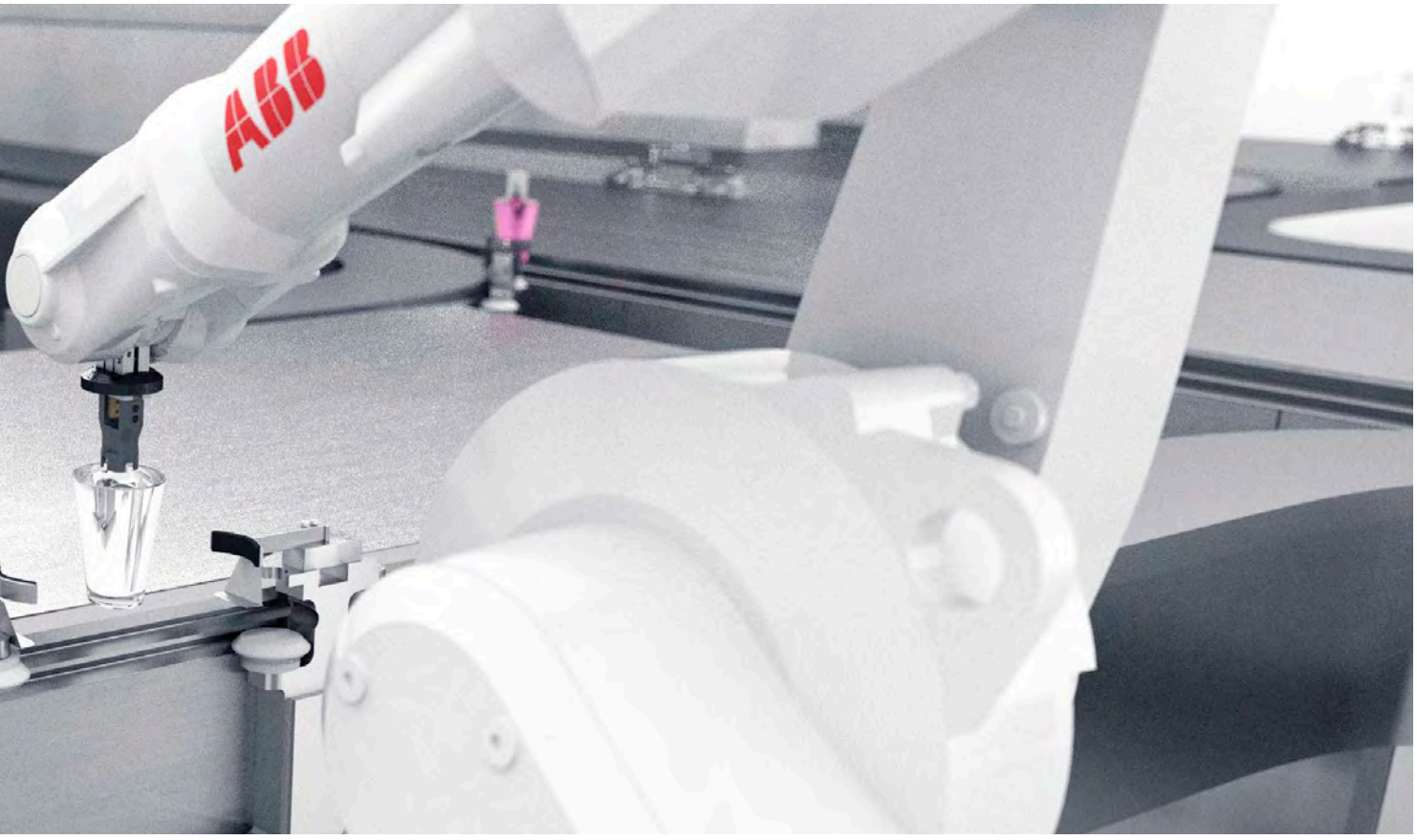
Sandhöfner: That's right. And also the ability to scale without compromising system performance, the way ACOPOStrak does. With one controller, I can easily run 100 shuttles over a track length of 100 meters. However, I can just as easily add another 100 meters of track by connecting a second controller, and hand off control of the shuttles seamlessly between the two. A manufacturing system designed this way can contain large subsystems operating either autonomously or synchronized with each other. We've seen plants with as many as 300 shuttles that are operated as a single, integrated system. B&R has long relied on decentralized automation for this purpose. That means distributing control of time-critical processes throughout the system, while maintaining full transparency over the entire system at all times on a central controller.

Can systems that large be simulated and tested in advance?
Sandhöfner: Definitely. And the simulation gives me the certainty, especially with regard to an adaptive machine, that the requirements can be met without any bottlenecks and without requiring manual intervention by machine operators. The same digital twin can also be used for diagnostics in real applications. Today, our application engineers can solve many problems faster right on their computer screen using a digital twin. This is particularly helpful in cases where production facilities are spread out over a large area, where the distance traveled trying to localize an error can really add up. If the digital twin gives me an idea of what is causing the problem, I can perform a much more targeted and efficient inspection of the system.

What role does robotics play in an adaptive machine?
Sandhöfner: A very important one! Just as the track system offers flexibility between processing stations, the robot offers flexibility within a station. Essentially, it's having a robot in the machine that enables you to have flexible, adaptive manufacturing processes. It gives the processing station a much wider range of possibilities without having to be physically reconfigured. Pivotal in all this is, of course, the ability to synchronize processes. We have already demonstrated how we synchronize robots and track systems on multiple occasions at trade fairs. Merging robotics and machine control into one unified architecture enables manufacturers to embrace the trend of mass customization.

That's a topic that almost calls for artificial intelligence (AI). How far along is B&R in that area?
Sandhöfner: This works very well together with machine vision, which we offer as a modular component within our automation system. That makes it easy to record processes and then use that to train AI algorithms via machine learning (ML). This way, you can recognize patterns and use that knowledge to optimize processes. There are many different ways this can help achieve goals like higher output and better quality. The openness of our system plays an important role here, because we want to leave it up to the machine builders and system integrators to decide which AI solution to use. They will always benefit from the level of integration throughout the automation system, however. Especially when it comes to using cameras, but this ultimately applies to all automation components. The goal always remains to implement an adaptive machine – a machine that, over the course of its lifecycle, will be asked to manufacture products that no one had thought of when it was designed. ←

Author: Michael Corban, Chief editor at elektro AUTOMATION



Experts explain

"Our journey has only just begun"

The first series-built machines featuring B&R's integrated machine vision system have hit the market, and many more are set to follow in the coming months. It's the perfect time to check in with our machine vision expert, Andreas Waldl, to hear about the experiences of those first customers and get a glimpse of what lies ahead.

Photos: B&R

Andreas, tell us about the reactions you're getting from machine builders when they first use the B&R vision system?
Andreas Waldl: They're very positive. The unique integration of machine vision into the automation system opens up a lot of possibilities they didn't have before. I know a lot of machine builders who were initially just looking into basic quality inspection. But then they realized they could also use our camera to control production processes in real time and significantly increase productivity.

What industries has the system been used in so far?
Waldl: Our system has a wide range of potential applications, and it's being used in nearly every industry you can think of. And not just in machines, by the way: we also have customers using it as a high-speed camera for R&D. Since our high-performance LED lighting is so tightly synchronized with the motion control system, they can capture crisp, clear images of extremely fast movements with exceptional positioning accuracy and repeatability.

What trends have shaped the progress of machine vision technology over the past few years?
Waldl: The most fundamental trend is that vision applications are growing increasingly pervasive. Cameras are no longer being used just for inspection, but also as an integrated sensor that can directly influence the production process. And that's exactly the type of application our system is perfect for.

Where do you see the next big developments happening?
Waldl: There are definitely a number of exciting things on the horizon. We've been evaluating which developments are relevant for our customers and how we can shape our portfolio accordingly over the next few years. I can't reveal any details at the moment, but I can tell you this much: our journey has only just begun.

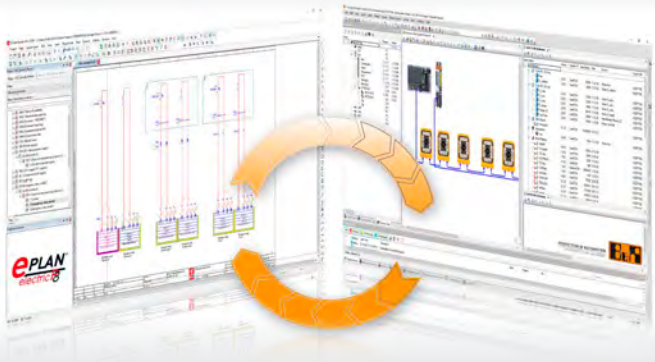
The advantages of the B&R vision system

The strength of the B&R's machine vision is its complete integration into the automation ecosystem. The cameras, intelligent image processing algorithms and innovative lighting portfolio are an integral part of the B&R control system. That has many benefits:

- Cameras, lighting, motion axes and all other machine components are synchronized with microsecond precision. Because of that, image processing results can be applied to control commands in real time.
- There's only one engineering system for development, deployment and diagnostics. Controls programmers are able to solve many tasks themselves that would have previously required a specialist.
- Rather than traditional programming, they simply assemble a machine vision application from ready-made mapp Technology software components.

Product news

B&R among first members



Tighter cooperation for more efficient engineering

As electrical engineering solution provider EPLAN launches its new partner network, automation specialist B&R is among the first on board. Today more than ever, such coordinated integration brings users added value in the form of more efficient engineering and faster time to market. Each a leader in its respective domain, B&R and EPLAN are already joined by nearly a decade of cooperation that allows seamless interaction between their engineering environments. The new EPLAN Partner Network (EPN) further solidifies that relationship and ensures users more powerful round-trip engineering solutions going forward.

Efficient integration between B&R's Automation Studio engineering environment and EPLAN's Electric P8 ECAD platform is made possible by a round-trip connector. These two platforms provide unparalleled support for the automated exchange and synchronization of hardware configurations, I/O mappings and process variables. Developers can start projects with either software or electrical planning, work in both disciplines simultaneously, and easily compare and merge projects.

High-end PC for mobile machinery

Heavy-duty PC for data-heavy applications

B&R is adding a high-end PC to its mobile automation portfolio. The new PC offers significantly more processing power and memory, giving it plenty of resources to implement autonomous functions for agricultural and construction vehicles or self-driving transport systems. The PC is specially designed to perform in harsh environments. The housing temperature can be between -40°C and +85°C. The PC is also highly resistant to shock and vibration.

Inside the mobile PC's IP69K housing is a powerful Intel Core i7 processor. It also has 16 GB RAM and 480 GB flash memory, making it ideal for applications that are computationally intensive or involve larger volumes of data. The increased computing power is needed for tasks such as accurate path planning in autonomous agricultural vehicles. More efficient, more precise vehicles deliver increased yield.

Photos: B&R

More space in the cabinet

Increased machine availability with modular ACOPOS P3 cooling

B&R's ACOPOS P3 servo drive is now also available with feed-through heat sink or cold plate cooling. The new cooling solutions dissipate up to 60% of generated heat outside of the control cabinet. This makes it possible to use much more compact cabinets, since fans and air conditioners can be reduced or eliminated entirely. Operation and maintenance costs are reduced.

The new ACOPOS P3 cooling solutions are suitable for a large number of axes in all power ranges. With the elimination of fans and air conditioners that bring outside air into the control cabinet, there is also substantially less dust that gets sucked in along with it. This significantly reduces the need to stop the entire machine for maintenance tasks like replacing air filters. Machine availability goes up.

Fanless from -20°C to +60°C

Rugged Panel PC with shallow installation

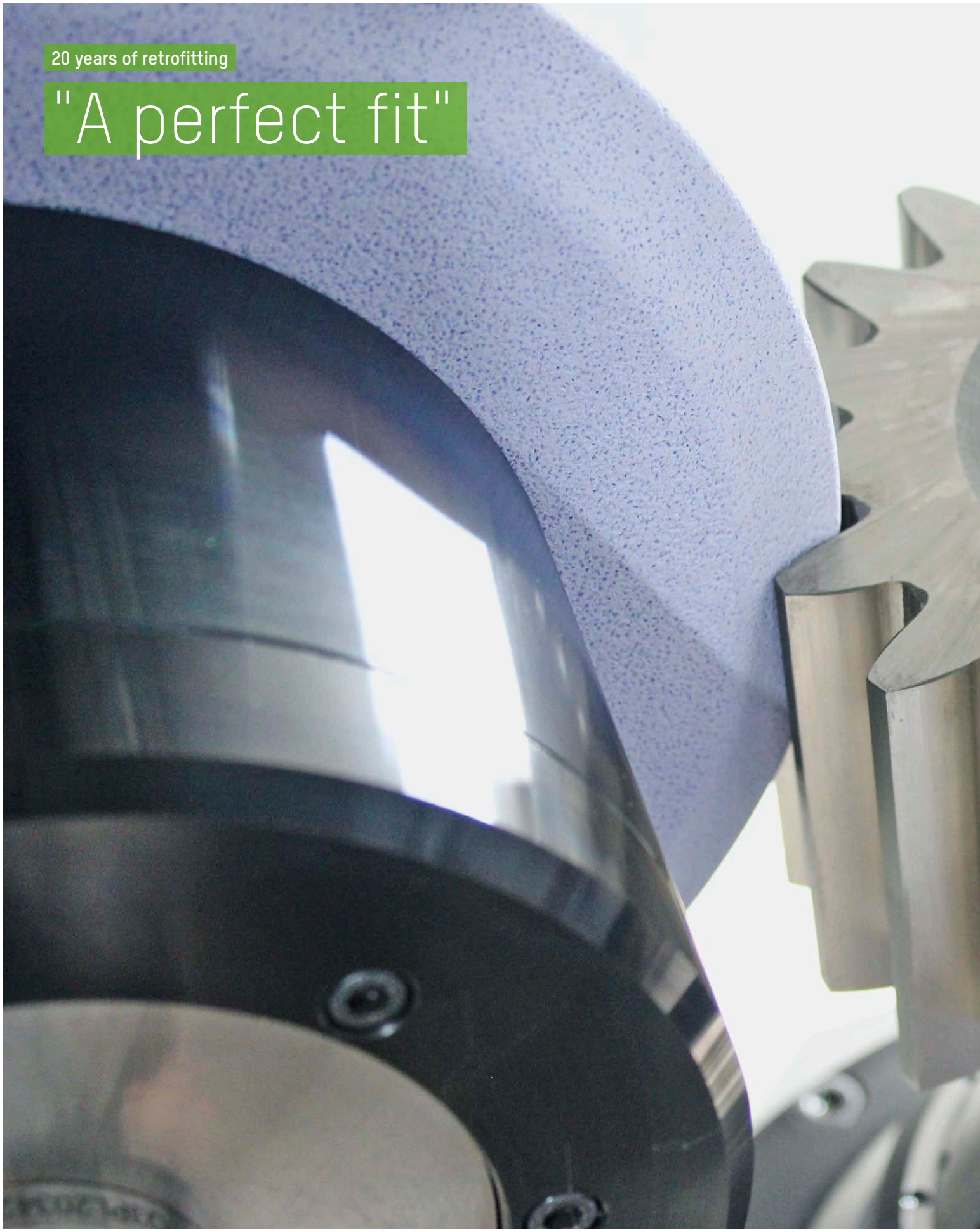
With the Panel PC 1200, B&R introduces a compact and cost-effective all-in-one PC. The shallow installation depth helps it fit easily into any control cabinet. With passive cooling and fanless operation, the Panel PC 1200 can be operated in the extended temperature range of -20°C to +60°C. That makes it ideal for a wide range of applications – even under harsh industrial conditions.

Equipped with the latest Intel Atom processors and up to 256 GB of mass storage, the Panel PC 1200 is ideal for running HMI applications under Windows or Linux operating systems. With 2x Gigabit Ethernet and 2x USB 3.0, it is ready for integration into any machine network. Compact CFast cards are used for data storage. The device is available in four sizes from 7.0" to 15.6".

Photos: B&R

20 years of retrofitting

"A perfect fit"



To meet specific customer requests, you need flexible machines that can adapt to individual requirements. For new machines with built-in intelligence and connectivity, that's no problem at all. But most shop floors are full of legacy equipment that is not equipped to participate in a smart factory solution. In these cases, one approach would be to replace it all with new equipment – a complex and costly solution. A more economical approach to modernization is retrofitting. Twenty years ago, Dieter Burri went into business retrofitting machine tools. To automate his machines, he relies on B&R's portfolio of scalable hardware and software.

Innovative gear grinder
Dieter Burri's company developed the world's first hydraulics-free horizontal grinder for micro gears using B&R technology. Instead of a conventional hydraulic solution, workpieces are held in place using an integrated motor-drive unit from B&R. The workpiece and counter spindle are controlled synchronously and work together with high precision.

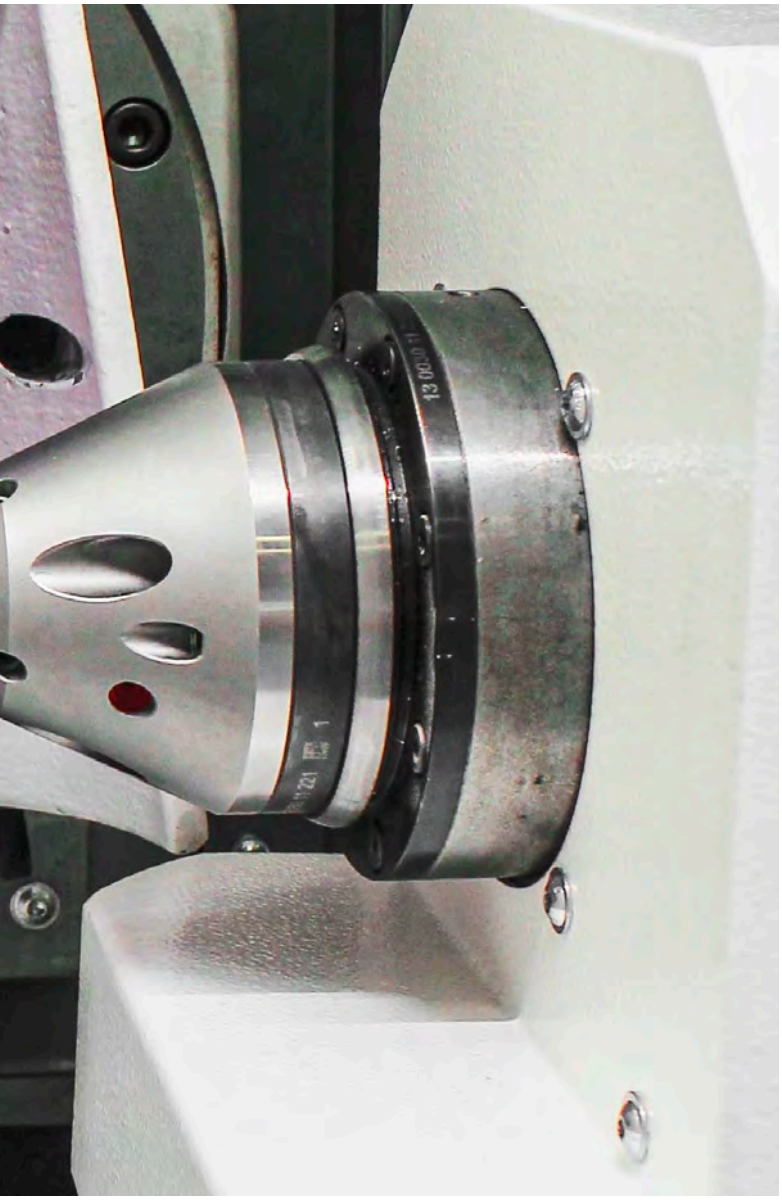
Twenty years ago, you made a decision to automate your first machine with B&R technology. Why?
Dieter Burri: When I was first getting started twenty years ago, I found that many of the controllers on the market were too bulky to fit in the control cabinet of the grinder that I was retrofitting. The compact design of B&R's control system was exactly what I needed. And to this day, working with B&R has proven a perfect fit in every way.

Your company does retrofitting. What does that entail exactly?
Burri: We're specialized in the retrofitting of gear grinding machines. That involves replacing mechanical change gears with CNC axes. What that does is give the user a huge productivity boost, while also extending the life of a good machine. Even back then, B&R already offered electronic gears, which allowed me to synchronize the electronic CNC axis with the axis of the grinding wheel.

Once the machines have been modernized, they get integrated into an existing company network. How do you ensure that communication works without problems?
Burri: B&R's automation systems are so thoroughly integrated and open, it's easy to provide our customers with helpful information about the machines and their processes. And since OPC UA is deeply anchored in the B&R automation system, the task of integrating the data into IT systems is really straightforward.

Any B&R controller can be operated as an OPC UA server or client. That means they can communicate both vertically with SCADA, MES and ERP systems and horizontally from PLC to PLC, even in multi-vendor systems. With all the different communication interfaces B&R products support, we can make the machine can talk to any other system we need it to.

Photos: Burri Werkzeugmaschinen GmbH & Co. KG, Franz Rossmann



So you also use B&R software in all your machines?
Burri: That's right. Since the B&R software is decoupled from the hardware, we can use the same basic software on very different machines. Despite all the differences in the machines we work on, we only need two software projects: one for gear grinding machines and one for profiling machines. And that's regardless of whether it's a retrofit or a new machine. When it comes to maintaining and updating our software, that makes things a whole lot easier. We've now also begun using B&R's integrated safety technology, which also greatly simplifies our work.

So you're building your own machines now too?
Burri: Exactly. Since 2015, we've been applying our knowledge – and B&R technology – to construct new machines as well. For example, we've created the world's first hydraulics-free horizontal grinder for micro gears.

Over the past twenty years, has there ever been a time when you considered a different supplier?
Burri: B&R has always seen itself as a partner to machine builders, rather than simply a component supplier. Early on, they handled development of both the machine control and HMI applications. That saved me a considerable amount of development overhead and business risk. B&R technology has always done well by our customers, and by us. Our periodic supplier evaluations have only strengthened that conviction. We use B&R technology wherever possible – and by now that includes nearly the every product in their portfolio. That's not to say there haven't been B&R skeptics amongst our customers.

How did you manage to convince them?
Burri: One that comes to mind is a large German automotive manufacturer who had decided to retrofit a machine, in spite of some dissenting opinions internally. One day, I received a call with what they thought was a crisis: they needed an additional emergency switch-off integrated into the machine controller. When I told them our employees could take care of it via remote access in five minutes – faster than a technician could even walk through the hall – they finally changed their tune about the B&R control solution. ←

Dieter Burri
CEO, Burri Werkzeugmaschinen

"At B&R, I have found not only a supplier, but rather a reliable partner for many years."

3D printing in building construction

Concrete dreams

3D printers are showing great promise in building construction, printing prefabricated components that are then transported to the construction site. A research project at the Technical University of Liberec in the Czech Republic aims to create a mobile robot that can print buildings directly on site. The team is using B&R controls, drives, HMI and software solutions to control the ground-breaking robot's sophisticated print head.

A research project at the Technical University of Liberec (TUL) is designing a 3D-printing robot that will print entire multi-story buildings on site.

The first 3D printers used in architecture played a supporting role in the design process: producing plastic models for displays and presentations. Now, larger printers are beginning to fabricate concrete components used in the construction of actual buildings. At the Technical University of Liberec (TUL) in the Czech Republic, however, a team of researchers is already preparing for the next step in this evolution: mobile robots that will do the printing right at the construction site.

Exciting possibilities with a few limitations

3D printing promises exciting benefits in the field of building construction. Building components are now being printed from a mix of concrete and reinforcing materials. The new design possibilities are inspiring architects' creativity, and the components are considerably more economical to produce. Since they don't require the extensive formwork needed for conventional monolithic structures, they also result in less waste.

Exciting as these experimental methods are, however, the current state of the art still has a number of drawbacks. The components are fabricated in a production hall and must then be transported to the construction site. The vehicles used for transport place constraints on component dimensions and generate considerable logistical costs and environmental impact. Current systems also print only the vertical elements of the building, while the horizontal slabs for the floors and ceilings are created using conventional methods.

Entire buildings printed directly on site

The TUL research team aims to overcome these drawbacks and print entire multi-story buildings – floors and ceilings included – directly on the construction site. The mobile 3D printing robot will be called Printing Mantis, due to the robot arm's resemblance to the elongated forelegs of the praying mantis insect. The project is being conducted in cooperation with the Institute of Information Theory and Automation of the Academy of Sciences of the Czech Republic and the Klokner Institute of the Czech Technical University in Prague and will feature controls, drives, HMI and software from B&R.

At the Klokner Institute testbed, the print head is controlled using a swing-arm HMI panel from B&R. The web-based HMI application can also be viewed on a PC, smartphone or tablet.

Jiří Suchomel, from the TUL Faculty of Arts and Architecture, predicts that on-site printing with the Printing Mantis will allow architects even greater creativity to implement intricate shapes with unprecedented accuracy of 2-3 millimeters. The robot will assemble multistory buildings on site like large Lego pieces. "Horizontal slabs will be printed on the ground and hoisted into place, while the vertical walls will be printed directly in their final location," describes Suchomel. "All directly on site."

Cement production has a significant environmental impact, and the aggregates and gravel added to make concrete are in limited supply. "That's why we want to build light, thin-walled concrete structures with unconventional reinforcements," explains Suchomel. "That will significantly reduce material consumption."

More than just swapping plastic for concrete

The 3D printers most of us are familiar with use powders and plastics. Adapting the design to print a house, on the other hand, involves quite a bit more than simply replacing these materials with conventional concrete. The cement mix alone is a major challenge. It must be flexible enough to work with, yet also solidify fast enough to support subsequent layers. Ordinary concrete matures for 28 days, but the printed structure must be able to hold itself up immediately.

Another key challenge is giving the robot the ability to print walls of virtually any curvature, including inflection points, and to implement sharp angles and interruptions. "That's important, so that we can give architects maximum freedom," says one of the Con4Bot's lead designers, Associate Professor Václav Záda from the TUL Institute of Mechatronics and Computer Engineering. Thanks to the Con4Bot's design, when the end effector stops printing briefly, for example to leave space for a door or window, the rest of the robot can continue moving. "The large robot is able to retain its considerable kinetic energy," says Záda, "and that's something other machines can't do."

When it is complete, the Printing Mantis will be a rotating and sliding robotic arm with a horizontal reach of up to 5.6 meters and a vertical reach of 3.3 meters. The project is being conducted using two test setups. The first is a SCARA robot. Currently being tested at 1:4 scale, the full-scale version will later be transported by a standard construction truck. The second is a Cartesian robot at the Klokner Institute in Prague, where researchers are testing and developing the print head along with different building material mixtures.

In cutting-edge R&D, scalability is key

After a decade of cooperation with B&R, the research team knew the automation components would deliver not only the necessary performance, but also the scalability to grow along with the robot through future phases of development and implementation. "We put together an automation solution that can handle whatever new requirements appear down the road," says B&R engineer Tomáš Kohout.

The drive system includes axes with absolute multiturn encoders, servo motors, a modular control system and advanced safety functions. "The integrated B&R motion control system made the solution very pleasant to work with, both for designers and for future operators," says Leoš Beran from the TUL Institute of Mechatronics and Computer Engineering. "The solution is exceptionally scalable for the future, which is especially important for a cutting-edge research project like this."

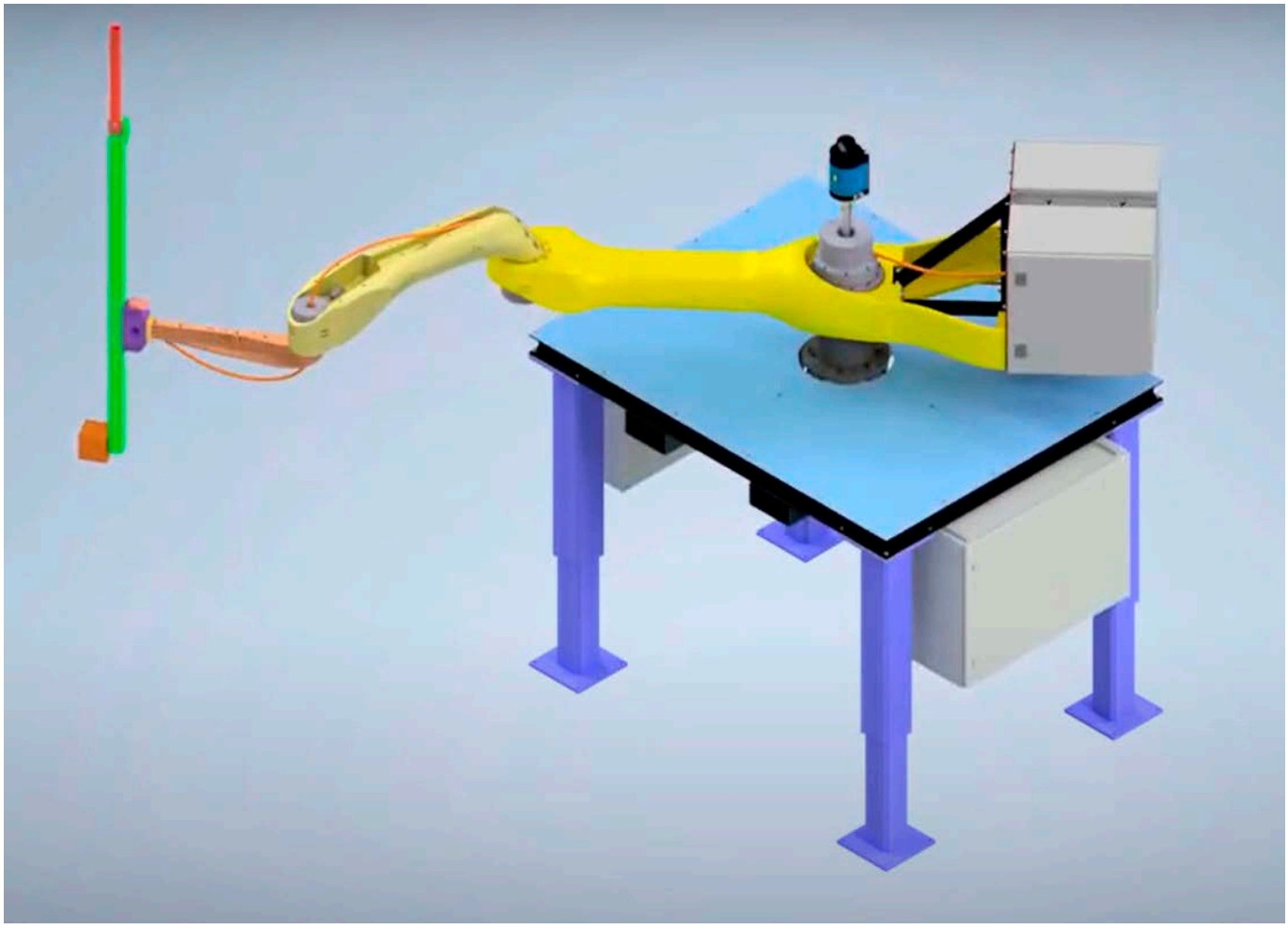
Efficient programming, flexible operation

The robot's print head end effector is operated by a B&R control system. The core of the 3D printing software is based on standard B&R CNC components. Additionally, B&R's mapp Technology toolkit provided ready-made software components that saved the team from having to program basic functions such as recipe handling and user management.

The control software runs on a powerful industrial PC from B&R's Automation PC series. "In addition to the control software, the Automation PC will also run the web-based HMI application," says Kohout. The HMI application is displayed on a swing-arm-mounted

David Čítek of the Klokner Institute demonstrates the Printing Mantis print head, where a sophisticated B&R motion control solution dispenses a highly specialized concrete mix.

Photos: Technical University of Liberec (TUL), iStock.com/sl-f



The final design of the Printing Mantis at 1:2 scale will be ready for research and development at the Technical university of Liberec in September 2021.

Automation Panel 5000 with custom operating elements. "The high-end HMI offers a high degree of flexibility and control ergonomics," notes Kohout, "and the web-based HMI application can just as easily be viewed on a PC, smartphone or tablet."

Well equipped to print the buildings of the future

When and where the Printing Mantis will create its first multistory building on site remains to be seen. Among other things, that depends on the progress of building regulations for printed structures. One thing is certain, however: with B&R as an automation partner, the research team has access to a broad portfolio of flexible, scalable solutions – and can quickly and easily adapt the Printing Mantis to whatever challenges it encounters printing the buildings of the future. ←

Leoš Beran
Technical University of Liberec, Institute of Mechatronics and Computer Engineering

"The integrated B&R motion control system made the solution very pleasant to work with, both for designers and for future operators. The solution is exceptionally scalable for the future, which is especially important for a cutting-edge research project like this."

The Technical University of Liberec's 3D Star project (CZ.02.1.01 / 0.0 / 0.0 / 16_025 / 0007424) receives funding from the Operational Program "Research, Development and Education" which applies European Union funding to address key challenges in research and education, including measures to help Czech research achieve international excellence.

Product news

Complex tasks solved in minutes

Smart Camera supports changeover at full production speed

B&R's integrated machine vision portfolio now includes a Smart Camera that combines multiple machine vision functions in real time. On a machine producing multiple variants of a product simultaneously, for example, the Smart Camera only needs to capture one image to determine which variant it is looking at and check the printed label. One function provides the feedback needed for the subsequent function.

The developer simply connects the individual image processing functions in a visual editor. There is no need for time-consuming programming. Thanks to complete integration in the B&R system, it takes only minutes to set up and synchronize even complex tasks like picking products off a moving conveyor and sorting them into boxes.

Sophisticated design

New servo motors with up to 75% higher nominal torque

B&R is adding the new 8LW and 8LS servo motor series with high torque density to its portfolio. Their sophisticated design helps them achieve up to 75% higher nominal torque than comparable motors when used together with an ACOPOS servo drive. Machine builders can make their machines substantially more compact and economical.

With an optimized design that improves heat dissipation, B&R has significantly increased the performance of these motors. A new winding design substantially reduces speed fluctuations. This results in exceptionally smooth rotation, which is especially beneficial in printing and grinding processes. The new design also offers more precise positioning and repeatability.

Photos: B&R

New in APROL: Automatic encryption of engineering data

A new function enables automatic encryption of engineering data during import and export. B&R is constantly adding new security functions to its APROL process control system that protect users' projects against cyber threats. That ensures maximum data security with minimum effort.

After commissioning, the entire project is handed over to the responsible archivist in a tamper-resistant manner. Subsequent manipulation without a password is impossible. Users benefit from a high level of data security and save a lot of time since manual encryption and decryption is no longer necessary.

Switch it on and get started

The Power Panel C80 offers top performance for every industry

The new Power Panel C80 offers the combined advantages of a powerful controller and a modern operator terminal in a single HMI device. The C80 is installation-compatible with B&R Automation Panels. Users thus have full flexibility when using the new panel and can scale their machine to meet changing performance and cost requirements.

With its low installation depth, the C80 multi-touch HMI is suitable for particularly compact machines where space in the control cabinet is limited. Operation without a hard disk and fan also make it particularly low-maintenance. The Power Panel C80 can be put into operation quickly and easily, because all the necessary software packages are pre-installed. I/O modules, motion control axes and safety components can be connected directly to the panel. There's no need for additional controllers. The user only has to switch on the Power Panel C80 and transfer the application.

Public transportation

The tram of the future

In 1885, passengers and onlookers celebrated as the first tram traversed the Belgian coast from Ostend and Nieuwpoort. In 1912, the steam powered tram was upgraded to run on electricity. There was renewed cause for celebration when the tramway recently received another major upgrade after more than a century. The project was completed in cooperation between Prague-based Elektroline and Austrian automation specialist B&R.


s Veurne
4 winkels, 4 stijlen, de N°1 aan zee
baan Veurne - De Panne

The complex control and safety system operates the track switches automatically via wireless communication.

As the longest tramline in the world, "The Coastal Tram" travels 68 kilometers along the Belgian coast between the municipalities of De Panne and Knokke-Heist at the country's borders with France and the Netherlands, respectively. "There are a lot of interesting things about The Coastal Tram," says Mikuláš Burgr, head of implementation and project engineering for tram control systems at Elektroline. "In the summer season, for example, the tram is used so heavily that they have to borrow tram cars from Ghent and Antwerp."

Sophisticated system

The junction in Ostend has three platforms and one tram storage track. The system is highly complex, since all twenty track switches need to be controlled simultaneously to ensure safe and smooth operation.

All traffic is managed from a control room located nearly 30 kilometers away in Bruges. Dispatchers can view the entire tramline, including footage from its countless surveillance cameras, on control room monitors or on tablets and other mobile devices.

Safety first

System integrator Elektroline was tasked with modernizing The Coastal Tram. "Managers of the transportation company had a clear goal for the modernization project: to automate tram traffic in a way that is both safe and state-of-the-art," says Burgr. "To implement the safety technology and the demanding HMI requirements, we selected B&R – a decision based on the positive experiences we've had working with them on other projects. The B&R system makes it easy to develop the software for the demanding safety requirements in accordance with SIL 3."

Following the modernization, the complex control and safety system operates the track switches automatically via wireless communication. To do this, the conductor enters the number of the line in the onboard system. Each tram has a transmitter installed on the underside of the car, which sends identification data such as the number of the line and the route to the receiver in the track system. The conductor can take over manual control if necessary, but otherwise there is virtually nothing else to do. That guarantees safe travel for trams, cars, cyclists and pedestrians alike.

Photos: Elektroline a.s.

The Elektroline control system is also used in Pilsen.

Successful cooperation with B&R

"For an integration project as demanding as the one in Ostend, you need to have good cooperation with a technology partner," explains Burgr. "We used B&R technology for the HMI in the track switches that come with our system. The web-based HMI solution, mapp View, plays a central role in commissioning and maintaining the system. The dispatcher system that controls the flow of data has its own HMI application that provides a complete overview of all tram traffic. It is used to control the tram car depots and complex intersections along the tramline. The most difficult task was to define the system's many highly complex process steps, which made it impossible to use a standard one-size-fits-all solution. That's why we worked with B&R to create a custom solution."

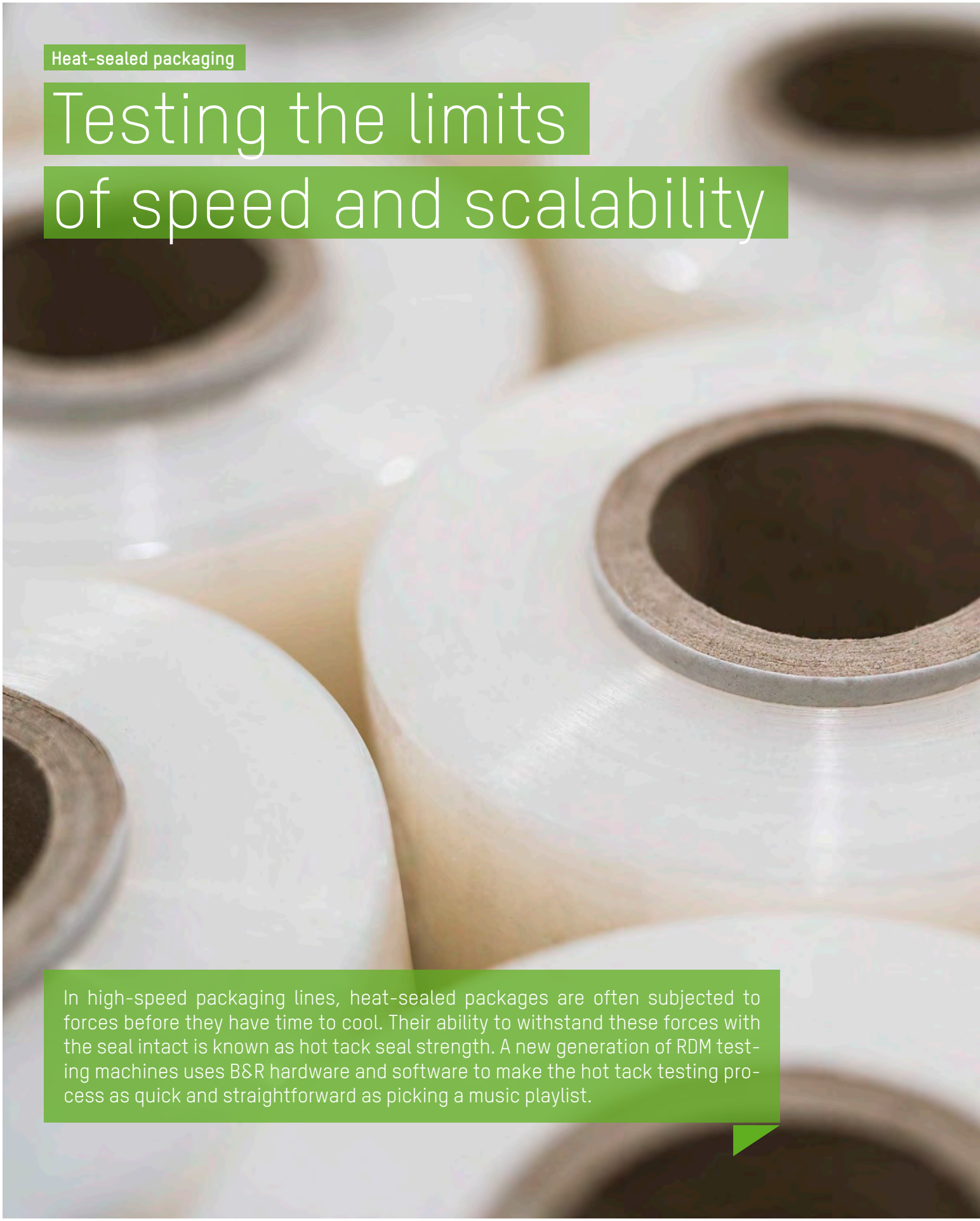
B&R's Václav Pravda adds: "Our customers can always count on our full support, whether that's with HMI software like in this project, or with the controller itself. Our software engineers worked together with the Elektroline team throughout the duration of the project. Our automation system was originally created for machine control, but has long proven itself in many other areas – from gas pipeline monitoring to the energy sector and traffic infrastructure – as you can see in the successful project in Ostend." ←

Mikuláš Burgr
Head of project engineering for tram control systems, Elektroline

"To implement the safety technology and the demanding HMI requirements, we selected B&R – a decision based on the positive experiences we've had working with them on other projects. The B&R system makes it easy to develop the software for the demanding safety requirements in accordance with SIL 3."

Heat-sealed packaging

Testing the limits of speed and scalability



In high-speed packaging lines, heat-sealed packages are often subjected to forces before they have time to cool. Their ability to withstand these forces with the seal intact is known as hot tack seal strength. A new generation of RDM testing machines uses B&R hardware and software to make the hot tack testing process as quick and straightforward as picking a music playlist.

Over the past 35 years, RDM Test Equipment has established itself as a leader in hot-tack testing technology used by film producers and converters who supply product manufacturers and packers.

Without a perfect seal, packaged food and pharmaceuticals are at best unfit for sale and at worst a health risk for the consumer. Seal integrity is therefore a vital factor in minimizing waste and preventing costly returns and recalls. For heat-sealed packaging, the first few seconds are crucial. High-speed lines subject the packages to forces before the material has a chance to fully cool down. The ability of the seal to withstand these forces is known as hot tack.

Along with other key properties like friction, thickness and tensile strength, hot tack is tested in laboratories, using machines like RDM Test Equipment's HT-2PC. For its latest generation of hot tack testing machines, RDM has used B&R automation technology to make the process faster, easier and more reliable.

Automated loading and feeding

Hot tack seal strength testing used to be a slow process that required each film sample to be loaded manually into the machine. Although each test itself lasted only a few seconds, it would take a skilled operator several minutes to cut a sample, load it into the machine and then remove it to load the next sample.

With the new machine, the loading and feeding process is now automatically controlled and indexed by a B&R PLC. In addition to reducing the likelihood of loading errors, this enables multiple tests to be carried out on the same length of film in rapid succession. Operating the touch screen user interface is similar to queuing up a music playlist on a smartphone or tablet. The user can stack up multiple tests, which the machine then carries out sequentially. The touch screen alerts the operator if the test sample breaks, or if there are any loading or feeding errors. Testing sequences can be programmed and saved into the system according to individual customer requirements.

Environmentally friendly alternatives
The machine can handle many different film types, from traditional hydrocarbon plastics to new environmentally friendly alternatives. And it can carry out up to 40 tests on the same piece of material – in a fraction of the time it would take to cut and load the same number of samples manually.

Automated loading and sequence indexing reduce the amount of human interaction in the testing process. This eliminates the risk of operator errors, such as inadvertently loading a sample the wrong way around. It also prevents tampering with the results, ensuring that clean data is measured and reported automatically.

Data visibility and connectivity
A 15" swing arm Panel PC with an Intel Atom CPU uses a Windows-style interface for transparent, user-friendly operation, while B&R's Automation Studio software solution easily manages the complex algorithms required by the testing process. Hypervisor software allows Windows or Linux to run alongside B&R's own real-time operating system, making it possible to combine a controller and HMI PC in one device. The system uses industry standard OPC UA communication to allow connectivity between the machine and any external devices or data recording and analysis systems.

The software also introduces more efficient interaction capabilities with the test results. For instance, after multiple hot tack tests have been performed, the software provides a trend analysis graph. This gives the operator a detailed picture of the heat-sealing characteristics of the film between two temperature extremes. Having precise control of process variables such as temperature, pressure and duration enables an optimal balance between material specifications, packaging machine speed and seal integrity.

B&R's automation solution makes hot tack testing very simple, yet also extremely flexible. Results can be viewed locally as CSV or PDF files or printed test reports, and raw data can be exported automatically to third-party software applications via OPC UA. Increased automation of processing and reporting means that more data can be processed in less time and with greater repeatability. It opens up the potential for sophisticated trend analysis, giving operators improved insight into performance data.

Streamlined programming
B&R's scalable hardware and software allows each customer to use the touch screen size that fits their requirements. B&R's mapp View solution makes the HMI screens exceptionally scalable. Changing display size or switching from portrait to landscape format is easy to do without having to rewrite any software. "Rather than write lines and lines of code to build a user management system, alarm system or motion control sequence from the ground up, we were able to simply configure the ready-made mapps," says RDM Sales Director Phil Neal. "And since they make complex algorithms so easy to manage, our programmers can focus entirely on the machine process."

A key requirement for the new machine design was that it be future proof, ensuring proactively that the equipment would be ready to meet evolving customer needs. "New alternatives to hydro-carbon plastic films are being developed all the time," notes Neal. "But before customers can use them, they need to know exactly how they will perform and whether they can withstand the rigors of high-speed production."

With B&R's improvements to stability, security and repeatability, the new RDM machine allows customers to carry out more testing in less time, delivering both improved quality and reduced time to market. ←

Phil Neal
Sales Director, RDM Test Equipment

"Rather than building a user management system, alarm system or motion control sequence from the ground up, we were able to simply configure the ready-made mapps. They make complex algorithms easy to manage so our programmers can focus entirely on the machine process."

Photos: RDM Test Equipment, iStock.com/Dony

With the new machine, the loading and feeding process is now automatically controlled and indexed by a B&R PLC. In addition to reducing the likelihood of loading errors, this enables multiple tests to be carried out on the same length of film in rapid succession.

Safety technology

"They will complement each other"

The youngest member of the OPC UA specification family – OPC UA Safety – enables safety communication in OPC UA networks. We sat down with B&R's head of product management for safety technology, Franz Kaufleitner, to learn what the new standard has to offer and what implications it has for B&R's openSAFETY technology.

With openSAFETY, B&R already offers an open, bus-agnostic safety standard. What's different about OPC UA Safety?

Franz Kaufleitner: Both safety communication standards are based on the black channel principle. The difference is that OPC UA Safety has been specified by the OPC Foundation. an organization in which all of the leading automation suppliers are represented. They are all on board with the vendor-agnostic OPC UA communication standard, and in the future OPC UA Safety as well.

What advantages does specification by the OPC Foundation offer?

Kaufleitner: After many years of anticipation, the calls for an internationally recognized safety protocol have finally been answered. The OPC Foundation has brought together a diverse group of manufacturers in pursuit of a common goal. The new standard covers the needs of both discrete and process manufacturing, including specialized sectors like oil and gas and maritime. That's a very important aspect when it comes to ensuring global acceptance of the technology.

Photos: B&R

If B&R is now moving in the direction of OPC UA Safety, what does the future look like for openSAFETY?
Kaufleitner: B&R will continue to develop and offer openSAFETY technology. It will coexist with OPC UA Safety, and the two will complement each other. B&R customers can keep using openSAFETY in their existing machines, for example, while also using OPC UA Safety for line-level safety communication. In a way, you could say they get an OPC UA upgrade for their proven openSAFETY applications.

What does that coexistence look like in practice?
Kaufleitner: Both technologies are based on the black channel principle. So, in the B&R system, both openSAFETY and OPC UA Safety use the same, proven POWERLINK and OPC UA over TSN network resources. What's decisive is that all the applications come together on B&R's SafeLOGIC controller. Since both safety protocols are implemented on our safety controller, it can communicate just as easily via openSAFETY or OPC UA Safety – on the same device at the same time. When it comes to operation of the machine or plant, it makes no difference which safety protocol is used. The same applies to software development.

When you say that openSAFETY and OPC UA Safety are both based on the black channel principle, what exactly does that mean?
Kaufleitner: Safety communication always occurs between two safety nodes. Whether OPC UA Safety or openSAFETY, the safety protocol enables the nodes to exchange data with each other safely. What's special about these safety protocols is that they detect any faults that might occur during transmission of the data. One way to identify data loss is through time monitoring, for example. If a fault occurs, the receiving node usually sets the data to 0, sending the application into a safety state.

The probability of a fault going undetected is far below the thresholds required by the applicable IEC 61784-3 standard. That's why transport layers like POWERLINK or OPC UA over TSN are not considered during safety appraisal, nor is the network infrastructure, like routers and switches. These components can't bring the machine into a dangerous state, because any conceivable faults would be detected by the safety protocol. The transport layers are therefore referred to as a black channel layer.

OPC UA Safety was created to allow machines from different manufacturers to communicate with each other safely. What was the most challenging part of that?
Kaufleitner: There are three main considerations when it comes to machine-to-machine safety communication. The first problem that needs to be solved are address conflicts. Imagine a production line with twenty identical robots, each with an emergency stop function. In the robot, the emergency stop function is identified by an address – let's say #01. Since all the robots are constructed identically, and since the application program should ideally not be modified during commissioning, our production line ends up with 100 instances of address #01. It's obviously very important that these addresses don't get mixed up. OPC UA Safety does that using globally unique SafetyBaseID identifiers that are generated for each robot.

"OPC UA Safety and openSAFETY will coexist, and the two will complement each other," says Franz Kaufleitner, B&R's head of product management for safety technology.

You said there are three main considerations. What are the other issues?
Kaufleitner: The second challenge is to establish seamless cybersecurity. OPC UA Safety uses OPC UA security mechanisms, making it the first – and so far only – standard to offer integrated security all the way from the cloud to the sensor.

And, finally, machines running different control systems must be able to communicate with one another. Since OPC UA Safety is supported by all of the world's leading manufacturers, data can be exchanged safely between all of their automation devices.

The more controllers from different manufacturers interact with each other, the more complex safety functions become. And as that happens, detecting errors becomes increasingly difficult. How does OPC UA Safety deal with that?
Kaufleitner: The key is to detect faults and localize their root cause quickly. OPC UA Safety defines which diagnostics data should be displayed for each type of fault, such as a timeout. The error code that is output for a given fault type is always the same, regardless of which control system is used. Diagnostics can be performed using the existing mechanisms provided by the controls manufacturer or via OPC UA, which significantly accelerates the process of identifying the source of the fault.

What specific advantages can machine builders look forward to with OPC UA Safety?
Kaufleitner: Both manufacturers and their automation suppliers are dealing with a dramatic shift in consumer behavior. In addition to more online shopping, they also have to handle increasing product variety and unpredictable fluctuations in demand. So, what they need are exceptionally flexible, adaptable machines. With OPC UA Safety, they have the perfect safety communication system to go with these machines. Safety technology requirements are now taken into account on machines with components from different manufacturers. It becomes possible to produce small batches of frequently changing products efficiently and safely. ←

Leadership news

Fredrik Holmberg heads business development in field of medical device assembly

B&R has added Fredrik Holmberg to its business development team as an expert in the field of medical device assembly. The focus is on automation solutions for small-batch production. Many of the products used for medical treatments consist of numerous individual parts that must be assembled. This is a complex process that is difficult to automate – especially when producing multiple variants of each item or set. Hardware and software solutions from B&R offer an excellent opportunity to automate even small batches efficiently.

After obtaining his degree in electrical engineering, Holmberg worked as a software developer and application engineer before taking on various positions in technical sales at B&R Sweden. During this time, he gained years of experience working with customers in the field of medical device assembly. His know-how will serve him well in this new position.

Ömer Yücel takes over as managing director

In September, Ömer Yücel took over as managing director of B&R Turkey. The B&R subsidiary has been on a steady course of growth since it was established in 2012. Among Yücel's primary goals is to strengthen B&R's presence in the Turkish market. Turkey's automation sector is gaining in global significance, driven by a strong increase in exports to Europe and Asia. This creates exciting opportunities for B&R. Yücel draws inspiration from the Vision 2030, laid out by the Turkish machine manufacturing association, which aims to boost industry's share of the Turkish GDP from the current 15% to at least 21%.

Yücel began his B&R career in 2013 as an application engineer, before later moving to Sales. He most recently served as sales manager of B&R Turkey. Yücel's career path at B&R has given him insight into the various areas of the company, and he is very familiar with the challenges B&R customers face every day.

Photos: B&R

Three closing questions

for adaptive manufacturing specialist Wlady Martino

Wlady, B&R makes a compelling case that adaptivity is the answer to today's biggest manufacturing challenges. Is an adaptive solution always the right choice?

No, that's not quite true. If you're mass producing identical items day after day, you've got little to gain from adaptivity. But, as you start producing more and more batches on the same line, the investment begins to pay off in changeover and cleaning time, and in personnel and training costs. In other cases, an adaptive solution is not just beneficial, but essential. If you've got customers personalizing items on e-commerce platforms. If you want to get new products to market while demand is hot. If you want to run mixed batches simultaneously on the same line. In these cases, there's no question: adaptive manufacturing is always the right choice.

One of the keys to adaptivity has been to equip the line with a track system like SuperTrak or ACOPOStrak. How does the new ACOPOS 6D fit into that equation?

There are two ways. First, it complements the track systems by enabling adaptive product transport in specific environments. The complete lack of friction, wear and contamination makes it perfect for food and pharma applications. The other big contribution is that the shuttles can take on a variety of roles at processing stations that would otherwise require more complex hardware. You end up with a more flexible station that takes up less space on the line. Dedicated stations for weighing or rotating products can be eliminated entirely, since the shuttles can do those things on-the-fly. ACOPOS 6D inspires a whole new way of thinking – the rigid production line becomes an open processing space, navigated by a perfectly orchestrated swarm of shuttles.

With stores closed and people stuck at home, we've witnessed a global boom in e-commerce. How is that impacting the CPG industry?

The pandemic has catalyzed trends that were already in motion. The explosive growth will level off, but there will be no going back. Consumer expectations in terms of convenience and delivery speed have shifted, and producers will have to adapt to meet them. Direct-to-consumer models will force companies who used to produce large batches and do repackaging externally to start running mixed batches with rainbow packs coming straight off the line. Already, nearly half of CPG companies surveyed[1] are considering a dedicated line just for e-commerce orders. To those companies I would say: partnership with B&R gives you the full range of technology to make those lines adaptive – and a global network of experts ready to help make your project a success.

[1]Source: https://www.pmmi.org/report/secondary-packaging-trends-retail-e-commerce-direct-consumer

Photo: B&R

THE ADAPTIVE MACHINE

Your competitive advantage

To win in a world of mass customization, e-commerce, direct-to-consumer and omnichannel, it takes machinery that's built to adapt. The first machinery concept that adapts to the products being produced and packaged!

Today's challenges	Adaptive machine solutions
Mass customization	Machines that make to order
Product proliferation	Instant changeovers on-the-fly
Short product lifecycles	Easy reconfiguration via digital twins

B&R enables the adaptive machine through intelligent track technology integrated with robotics, vision and digital twins.

Get your competitive advantage at www.br-automation.com/adaptive

PERFECTION IN AUTOMATION
A MEMBER OF THE ABB GROUP

B&R
Industrial Automation GmbH

B&R Strasse 1
5142 Eggelsberg, Austria

t +43 7748 6586-0
f +43 7748 6586-26

office@br-automation.com
www.br-automation.com

Your local contact
www.br-automation.com/contact