



PC and panel systems

## Erasing the boundaries

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## Industry 4.0? NOW!

This October, you'll find us at the 23rd EuroBLECH exhibition for sheet metal working technology in Hanover, Germany. In sheet metal working – as in most industries – the role played by automation is a decisive one. Like you, we're looking forward to seeing examples of how this industry is fusing automation systems and manufacturing technology to form intelligent networks of distributed machine modules.

We're sure to find these telltale signs of Industry 4.0 demonstrated at every processing stage, from integrated robotic handling to all types of cutting, forming and joining. Virtually all of these areas have requirements for automation and control technology, including the necessary interfaces to CAD and CAM systems.

If you don't already think of Industry 4.0 as more than a fairytale vision of the distant future, maybe this issue of automation will convince you otherwise. In it, you will read about how the POWERLINK data highway provides a secure network between machine modules over large distances while also integrating intelligent sensors such as machine vision cameras. You'll find out how B&R's latest generation of modular PC and panel systems deliver the flexibility to master the challenges arising from increasingly modular and scalable machinery. Distributed motion control systems like the ACOPOSmotor and ACOPOSremote add some well-placed momentum to the mix. Finally, tomorrow's advanced automation solutions wouldn't be complete without a full range of simulation and diagnostic options such as those already seamlessly integrated in B&R's universal development environment, Automation Studio.

In short, this issue of automation will give you a glimpse into the colorful world that can be built with B&R's broad spectrum of products, as well as the virtually limitless possibilities of fully integrated and completely scalable automation.

Happy reading!

A handwritten signature in black ink that reads "Dr. Gernot Bachler". The signature is written in a cursive, flowing style.

Dr. Gernot Bachler  
*Technical Manager, Motion*

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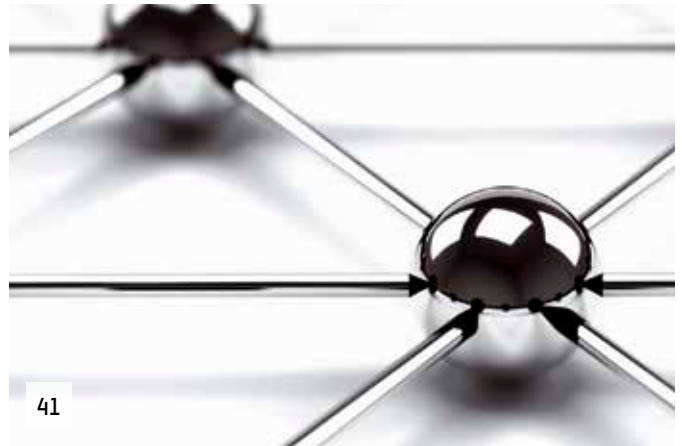
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Leading the way toward Industry 4.0 is the automotive industry. Yet, according to Stefan Schönegger, many other sectors are playing an increasingly active role in the revolution.

# Erasing the boundaries

The days of classic series-produced machines that manufactured the same exact product for 20 years have been over for quite some time now. As we move into the future, production will require ever-increasing levels of machine and system flexibility – flexibility that can be achieved thanks to modular panel components developed by B&R.



Panel PC 2100

Panel PC 900

Smart Display Link 3



Smart Display Link / DVI

Smart Display Link 3  
up to 100 m

Automation PC 910



The modular panel components can be used to build the perfect device for any application. And the individual components can also be easily exchanged if necessary.



The machine manufacturing industry is under a great deal of pressure. On the one hand, a single machine must be able to manufacture individualized products without having to undergo time-consuming retooling work; on the other hand, the machine cannot become outdated after just a few short years. "Modern industrial production is characterized by short product cycles and increasing product customization," explains Raimund Ruf, business manager of BSR's HMI business unit. "Batch-size-one production is no longer a unique feature of the automotive industry." With this in mind, his team has developed a modular platform strategy that offers machine builders one-of-a-kind flexibility.

#### Unlimited scalability

Put simply, B&R has completely severed industrial panels from the processing components. "The main idea is that any panel can be combined with any processor," explains Ruf. As a result, machine manufacturers only have to integrate a panel once. In this way, it is the individual panel components that are selected – the processor, memory, etc. – that determine the performance class of the system.

This new approach is centered around the Automation Panel, a series of display panels available in a wide variety of sizes and

#### The advantages

- Maximum flexibility
- Reduced engineering work
- Easy exchange of components
- Limitless scalability
- Ready for Industry 4.0

aspect ratios. When combined with a modular PC unit, the panels become powerful Panel PCs whose performance can be fine-tuned to actual demands. From single-core Celeron to quad-core Core i7 processors, the entire performance range is covered. Any necessary interfaces (e.g. POWERLINK or serial) can be configured as needed using plug-in cards.

#### Easy to upgrade

Performing maintenance or upgrading individual components has also become much easier. If a new application or HMI system requires more computing power, the Panel PC unit can simply be replaced by one with increased performance. The only technical expertise required is the ability to remove 6 screws. And with the robust connector, there are no cables to install or remove. Furthermore, all relevant application data stored on a CFast card, the new Panel PC can be brought back online immediately.

"This new building block principle also takes into account the fact that PCs and display technology have different life cycles," explains Ruf. It used to be the case that the entire unit – the PC and the panel – had to be replaced if the computing power was no longer sufficient or upgrades were necessary. "Our new approach opens up significant savings for machine builders and



**Raimund Ruf**  
Business Manager HMI, B&R

"BSR's modular panel platform is the ideal tool for a fast moving and flexible production line."





IP65-rated Automation Panels are available in 9 different swing arm designs. Upon request, displays can be equipped with additional switching elements, an RFID reader and a front-side USB interface.

end users, especially since it allows customized panels to be used over many processor generations."

#### Maintenance-free industrial PCs

Nearly all of the PC modules are fanless. Combined with CFast cards and SSD drive technology, it is possible to install an industrial PC whose lack of rotating parts makes it maintenance-free. This further eliminates the expensive and time-consuming work involved in replacing worn parts. "The entire cooling system for the Panel PC 900 received a complete overhaul," explains Ruf. "In order to achieve the best possible convective heat transfer, we performed extensive evaluations based on simulation models and implemented heat pipes." This allows even the powerful Core i7 3517UE processor to be used at ambient temperatures up to 50°C without a fan – under full load!

The cooling system for quad-core processors has also been optimized, with fans directing air through integrated cooling fins to guarantee smooth operation even on high-end systems. In addition, B&R sought out only those components that offered the highest levels of reliability, including the hard drives, circuit boards and housing. These components have been designed specifically for use in industrial environments, can withstand high ambient temperatures and will continue to be available for many years to come.

There is even potential for savings when it comes to managing stock. Since Automation Panel systems utilize the same base technology for panels connected via SDL/DVI as they do for Panel PCs, machine manufacturers can respond immediately to changing customer demands if the necessary components are already in stock. All-in-one devices not only face higher cost levels here, but also an increased amount of work.

#### Access from afar

All Panel PC 900 devices with Core i-series processors support Intel's Active Management Technology (AMT) – a feature of Intel's vPro technology – to provide out-of-band management. This allows PC systems to be serviced remotely at a level much closer to the hardware, regardless of which operating system is being used.

AMT makes it possible to read status information, change BIOS configurations and switch the PC on and off – all remotely. A remote boot option is also available. Because access takes place independently of the operating system, it is possible to reboot the system remotely even if the operating system is no longer responding. This is especially useful for PC systems being operated without on-site personnel, as is often the case with traffic management systems, for example.

AMT also provides additional remote service and troubleshooting options. This allows every bit of information about the PC components being used to be read – including the type of processor. The only requirement is that the PC is turned on and connected to a network. In addition, an event log provides detailed information about system processes running on the PC (e.g. "Starting operating system boot process").

#### Displays and touch screens for every requirement

Available in a wide range of designs, Automation Panels are perfectly suited to meet all the requirements of today's advanced industrial HMI applications. For example, widescreen variants are available in sizes up to 24" with Full HD resolution. At the same time, applications requiring compatibility to existing systems can take advantage of 4:3 panels with analog resistive touch screens. This makes it possible to continue using HMI applications at their current resolution while upgrading to the latest PC technology without



having to make any adjustments to the software. And since all touch screens can be operated with gloves, they are the perfect choice for withstanding even the toughest industrial environments.

Swing arm systems are becoming more and more prevalent as a way to optimize operator guidance on machines. B&R meets this demand by offering Automation Panels and Panel PCs for many different types of swing arm systems. This doesn't just tie into the different display sizes and formats; all variants are designed with IP65 protection, available in portrait format and ideal for use in hygienic applications. An additional panel component – the Smart Display Link 3 receiver – makes using panels in swing arm systems even easier. This device allows panels to be situated up to 100 meters from the Panel PC or Industrial PC when using conventional Category 6 or 7 Ethernet cables. And thanks to the slim RJ45 connector, there is no problem running the cable through the narrow swing arm conduit.

#### RFID for maximum operational security

Swing arm devices are available with a wide array of optional operating elements, with buttons, selector/key switches and E-stop layouts adaptable to customer needs. Thanks to an integrated RFID reader, individual access rights can be assigned to anyone

from service engineers to system operators. Passwords jotted on post-it notes are a thing of the past. A wide range of display sizes and formats is available, including a swing arm device in portrait format.

"An important advancement regarding safety has certainly been made possible with the introduction of multi-touch displays to industrial environments," says Ruf. Potentially critical situations – starting a process or motor, for example – can be made much safer using two-hand control. In this way, the operator must confirm a command with the other hand in order for the action to be executed. This eliminates the possibility of accidental activation.

#### Extensive operator guidance

Of course, multi-touch displays also allow the gestures that are familiar to us from consumer devices. For example, swipe gestures can be used to scroll or change pages, while 2-finger gestures can be used to zoom in and out. Together with large widescreen displays, this results in entirely new possibilities for operator guidance. Not only is it possible to display more information on-screen, operating personnel can also view data sheets or video guides without covering up information relating to the current status of the machine. ←

# Maximum performance comes in small packages

B&R presents the Panel PC 2100 – with the latest Intel® Atom technology



The PC module for the Panel PC 2100 from B&R is much more powerful than its small size suggests.



The new Panel PC 2100 from B&R is a full-fledged PC system whose exceptional performance is concealed by its ultra-compact housing. The innovative design of this new system takes advantage of the latest Intel® Atom technology and represents a decisive advancement in the performance of embedded systems. And the price/performance ratio couldn't be more optimal.

Equipped with a PC module, which has the same dimensions as a Smart Display Link or DVI receiver, any 2nd generation Automation Panel can be turned into a full-fledged Panel PC – including completely closed panels mounted on a support arm.

#### **Scalable and maintenance-free**

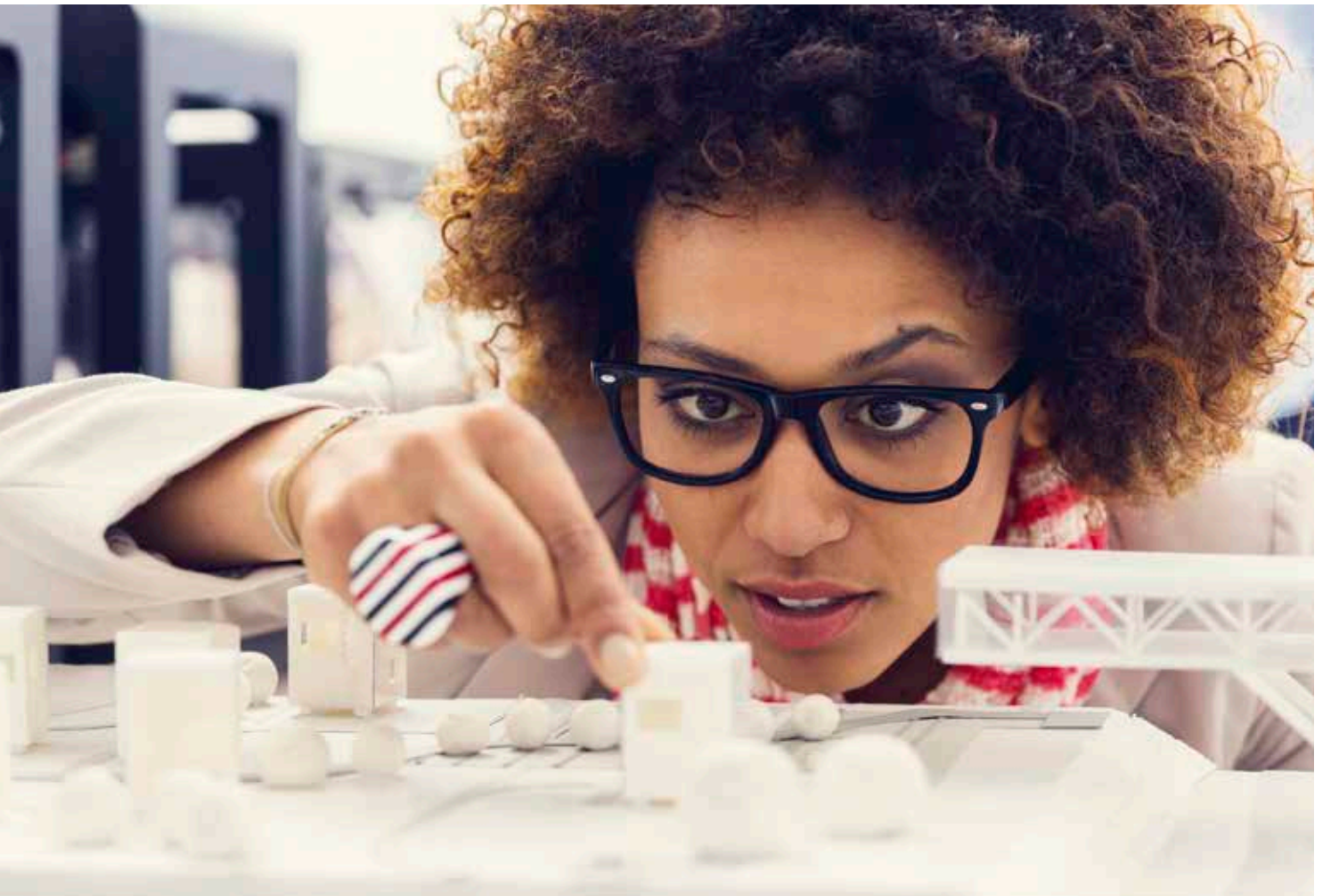
Available with single-, dual- or quadcore processors, the computing power of the Panel PC 2100 is fully scalable. At the upper end of the performance range, it's even possible to exceed the performance

of Core™ i3 chips. Regardless of the variant, no fans or other rotating components means that no maintenance whatsoever is required. Other standard features include two Gigabit Ethernet interfaces as well as one USB 2.0 and one USB 3.0 interface. Fieldbus technology such as POWERLINK or CAN can be individually configured through the use of interface modules, and compact MLC-based CFast cards up to 60 GB and more are available to meet every memory need.

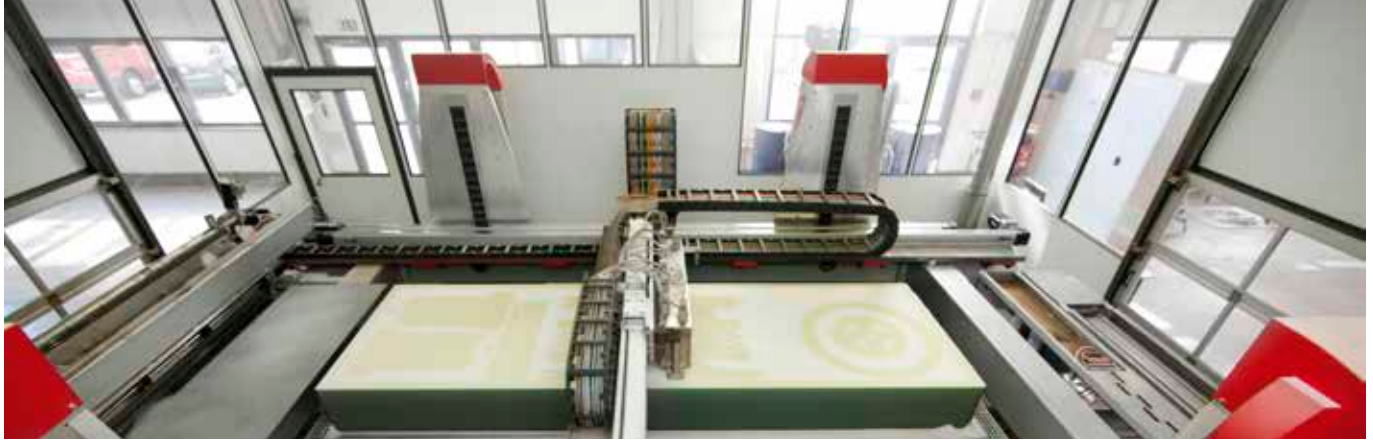
#### **Optimal graphics performance**

The graphics engine used in Intel® Atom processors is derived from Core i technology and provides powerful processing all the way up to Full HD. This is also the first time that support for DirectX 11 is provided in this segment, opening up even more possibilities for enhanced graphic capabilities in SCADA and other HMI systems. ←

# 3D printing – Made to measure



Using 3D printers from voxeljet, it is possible to create complex sand cores for cast metal components, custom movie sets, functional plastic components as well as highly accurate architectural models in just a couple of hours. Beyond the high levels of precision and unprecedented levels of design complexity that can be achieved with 3D printers, what users really appreciate is the tremendous time savings to be gained when producing small production runs, prototypes and models. All of this is supported by a versatile, integrated automation and control solution based on high-performance B&R technology, which ensures that even large print jobs can be handled reliably, precisely and accurately.



The largest 3D printer in the world has a print chamber 4 meters long, 2 meters wide and 1 high. With high-quality components, it is designed for continuous operation.



"In addition to our primary customers in the automotive industry, we are increasingly seeing new customers in a wide range of industries discover the potential of 3D printing. This is particularly true when it comes to producing prototypes, small production runs and models quickly and without special tools," explains Björn Matthes, responsible for electrical planning at voxeljet. "In recent years we have drastically expanded our range of printing services, and at the same time we have also developed a full spectrum of devices to handle workpieces of virtually any size."

#### Largest 3D printing system in the world

The printing technique used by voxeljet is quite similar to that used by traditional ink-jet printers. The difference is that the company's specially developed print head uses a liquid binder instead of ink. Layer by layer, the binder is applied on top of a coating of particles on the printer's platform in the shape of the workpiece to be created. This is how the VX4000 – the largest 3D printer in the world – creates components measuring up to 4 meters long, 2 meters wide and 1 meter high out of plastic, sand or other particle-based materials.

First produced by voxeljet in 2009, the VX4000 prints each layer in just 75 seconds with a resolution of 600 dpi and a thickness of 150-300 µm. The spacious platform allows the VX4000 to produce large individual components or several smaller parts simultaneously. By using the CAD data directly, it ensures high levels of precision and accuracy.

The printer's software places the 3D CAD model in a virtual workspace and then breaks it down into print layers. In order to process the large volumes of data involved, the voxeljet system uses an industry-grade PC featuring an SSD system disk and an additional hard disk with at least 1 TB of storage.

#### A seamless product portfolio without rival

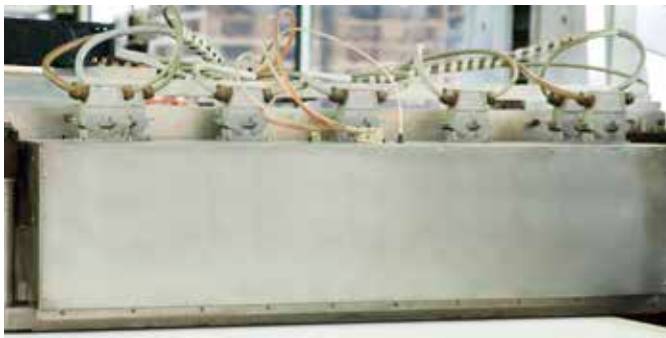
"On all the 3D printers we built prior to the VX4000, the PC was also responsible for controlling the entire system via a CAN bus connection," says Matthes. In developing the VX4000, voxeljet introduced an additional level of abstraction in order to further simplify the control architecture and relieve some of the burden from the PC. They also needed to develop a gantry system to drive the two portal systems on which the print head and particle recoater are mounted.

"We've learned from experience that if different suppliers are involved in producing the drive system, problems can arise due to tension and unclear responsibilities," explains Matthes.

"That's why we were looking for a partner who could handle the entire automation system, from the gears right through to the control system and HMI."

Matthes notes that voxeljet quickly concluded its selection process with a clear favorite. "B&R's seamless product range, which includes integrated safety and a universal development and configuration tool, really convinced us that we had found the right partner. The B&R system gives us everything we need as well as plenty of scope for future innovations."





The 1 meter wide print head with an impressive 26,560 jets is mounted on a portal with a gantry drive.



The operator terminal of the new VX2000 from voxeljet, based on a touch-screen Power Panel from B&R. The HMI application runs on the same PC that prepares the print data for the 3D printer.



**Björn Matthes, Electrical Planner, voxeljet AG**

"From the very first training session it was clear that B&R really thinks ideas through from start to finish to ensure that they are implemented right. The support provided by B&R is outstanding and has helped us many times in the past to quickly answer questions and build up our expertise."

The decision was sealed in a meeting with application engineers from B&R, where voxeljet was able to see firsthand just how easy it is to build a gantry system using B&R technology.

#### **Flexible architecture**

In the automation solution for the VX4000, which uses B&R technology for everything except the PC, a CPU module from B&R's X20 series functions as the motion controller. Movement commands generated by the PC are transmitted via standard Ethernet to the CPU module, which converts them into the corresponding motor movements. In addition to the four servo motors controlling the Z axis of the two portals of the gantry system, the VX4000 uses up to another eight LSA and JSA servo motors which are partially synchronized (2 x X1 and 2 x X2). voxeljet uses exclusively servo motors in order to keep the architecture flexible, respond quickly to future requirements and optimize inventory. All motors are powered by ACOPOSmulti drives which communicate with the controller via POWERLINK. The drives are used for more than

just motion control. They are also used to coordinate the sequence of lower level functions that regulate tasks directly related to printing, such as moving the print head (Y) and filling the recoater.

"The prototype VX4000 which was built using this architecture is still working efficiently and reliably at our service center," says Matthes. "Of course, we have continued to develop and improve the architecture since then."

#### **Simple commissioning with openSAFETY**

The automation solution now incorporates the Safe Torque Off (STO) and Safely Limited Speed (SLS) safety functions. Both functions were implemented by voxeljet developers using ACOPOSmulti inverter modules with integrated SafeMC safety technology and Safe I/O modules from the X20 system.

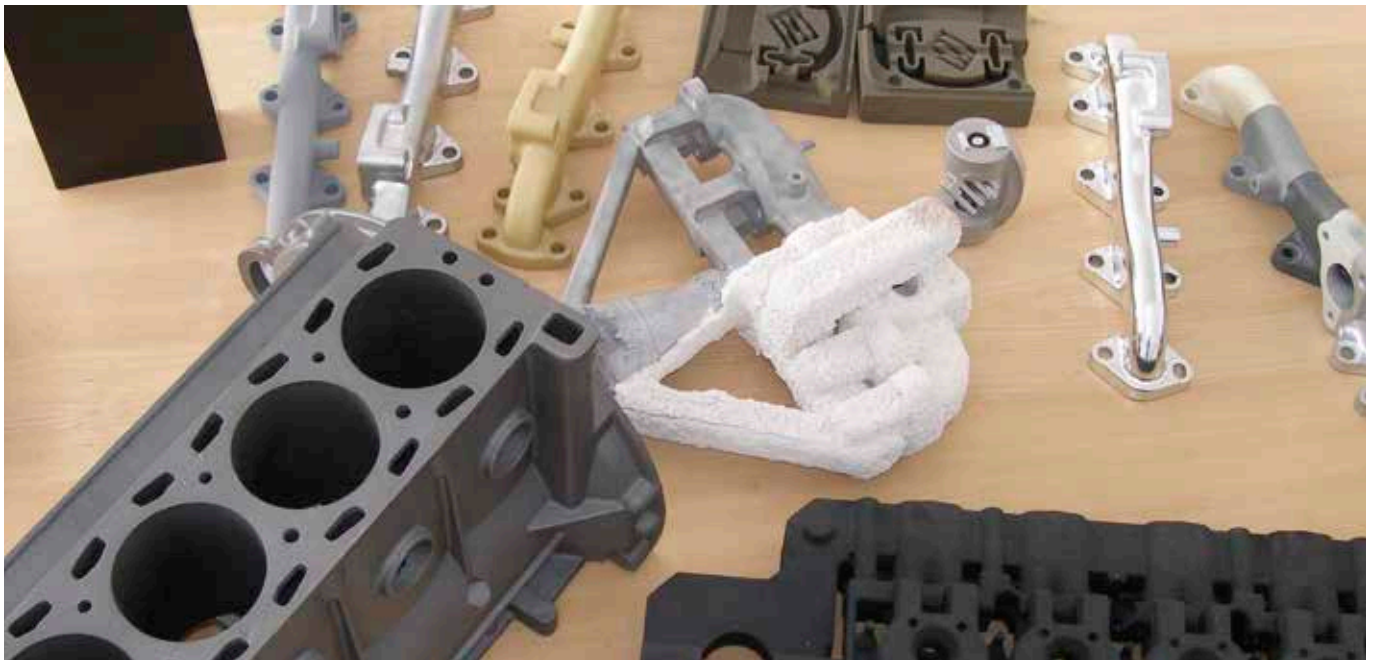
"Even with the large dimensions of the printer, which measures 20 meters long and 7 meters wide, servicing and commissioning are much easier because person-

nel can safely move around inside the printer and monitor the processes without having to hold down an enable switch," says Matthes. "The equipment and time needed to integrate the safety functions was minimal thanks to the openSAFETY communication protocol."

The system was designed with the I/O modules split into two strands. While the safety I/O channels are connected directly to the CPU, the I/O channels with no implications on safety are isolated via POWERLINK. Originally this separation didn't exist. "By separating the channels it is now easier to expand the system. Another bonus is being able to disconnect the power supply for the standard slices without affecting the safety-related areas," continues Matthes.

#### **Virtual master axes simplify reuse**

In addition to the integrated safety functions, voxeljet has since also incorporated the concept of virtual axes into the system's architecture. Now all master axes are implemented as virtual axes.



Pieces produced on 3D printers from voxeljet. These printers can create items of virtually unlimited complexity (including undercuts) from all types of raw material – such as molding sand or plastic.

For voxeljet this means that, when developing the control software, it doesn't matter which drive will later be connected to a particular axis or how the axes should work together. "This allows us to simulate the drive hardware and test the automation solution even before the system is completed," explains Matthes. "What's more, using virtual axes makes it much easier to reuse the automation architecture for other systems." Matthes is speaking from experience, because voxeljet has already reapplied the B&R-

based automation solution to its recently launched VX2000 with only minimal modification.

#### **Bearing wear at a glance with condition monitoring**

voxeljet already has its sights set on its next big innovation. "We use an eccentric shaft in the recoater. This puts extreme pressure on the bearings," explains Matthes. "Since a print job can only be interrupted briefly, stoppages caused by worn out bearings can result in an entire work-

piece being lost." This is particularly frustrating if it happens just as you are finishing a large item, where the printing process can take several hours. With this in mind, voxeljet investigated the possibilities of condition monitoring and the corresponding X20 module for detecting bearing damage before it becomes critical.

The developers at voxeljet received great support from B&R when introducing this and other technologies. ←



Automation Studio offers a number of clear benefits for Voxeljet. It provides a single tool that unifies the entire range of B&R automation components, including control software, HMI and safety functions. The comprehensive diagnostic functions make analyzing software and troubleshooting errors much easier. Of particular value is the clear structuring of the engineering environment and the ability to synchronize hardware configurations thanks to the integrated EPLAN interface. All new automation projects from Voxeljet are created using Automation Studio 4.

Power generation

# Full steam ahead for decentralized power

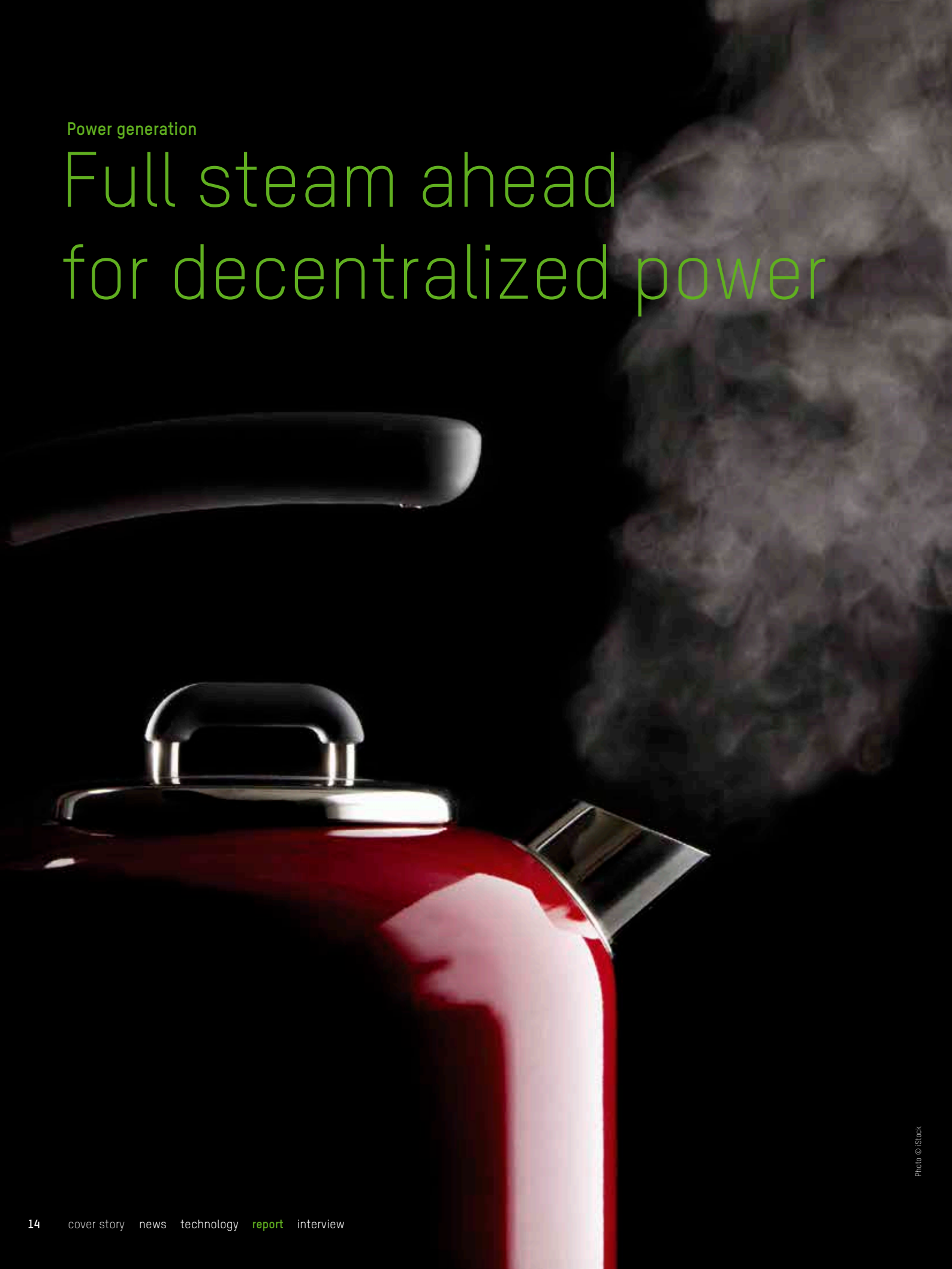


Photo © iStock



Waste heat from industrial processes, cooling and combustion systems has been an under-utilized energy source – until now. Help is at hand with the ePack system from Orcan Energy, which is ideal for capturing energy from smaller volumes of heat, such as those produced by combined heat and power plants. Control technology from B&R makes a significant contribution to the highly efficient performance of the ePack micro power plant and allows it to be operated unmanned and at partial load.



Every second around the globe, enormous quantities of unused energy are pumped into the atmosphere in the form of waste heat. Power stations, private furnaces and motor vehicles that burn fossil fuels only utilize around a third of the total energy released. The same is true of biogas, where the efficiency is still only around 40 percent, despite the advanced technology used. The remaining 60 percent of the energy contained in the fuel is released as heat. Until now, this thermal energy has only been used to a limited extent, for example in district heating networks. Due to a lack of consumers, it is often the case that only 10 percent of waste heat is used to heat the fermenters in the biogas systems and the on-site agricultural buildings.

#### Micro power plant with ORC technology

Turning this untapped thermal energy into a commercially viable resource was the motivation for Munich-based Orcan Energy to develop its ePack micro power plant. "The ePack uses ORC technology, which makes it possible to generate electricity from heat. In comparison to traditional steam turbines, this process works at considerably lower temperatures and lower levels of thermal energy," explains Detlef Eissing, sales and marketing manager at Orcan Energy.

ORC technology itself is not new, however. A number of different plants across Germany are already generating electricity from waste heat using the Organic Rankine Cycle (ORC). Unlike conventional steam turbines, the ORC process doesn't use water as its heat transfer medium. Instead, it uses organic materials such as ammonia, butane or pentane, which have a significantly lower boiling point than water and allow the system to operate at temperatures between 80 and 500°C.

Despite this, ORC plants have only ever been used in a small number of highly specialized applications. "The fact of the matter is that each one of these plants had to be customized to suit the specific requirements of the application. This means that entire components or sections of the plant needed to be redesigned or redeveloped each time," says Eissing. "While this might help us boost efficiency by a couple of percent, it drastically increases

the cost of the systems, reducing their cost-efficiency in applications with small heat sources or low temperatures. This is generally the case with stationary or mobile combustion engines, heating systems or cooling plants."



The ePack was designed to convert heat from stationary combustion engines into electricity. By using industry standard components and batch production manufacturing processes, the power generation costs per kilowatt-hour could be reduced to a competitive level.



The ePack micro power plant generates power at a rated output of 20 kW from waste gases and the energy contained in engine coolant.

**Jens-Patrick Springer**  
Developer, Orcan Energy GmbH

"B&R prevailed in our search for a control systems partner. What convinced us was the outstanding quality of the Power Panel, the user-friendly engineering environment and the company's philosophy of innovation. Our positive experiences with the technology combined with the excellent service convinced us that B&R was the right choice."

**Batch production with standard components**

In developing the ePack, Orcan made the decision to use existing technologies and components which are easy to modify. This means the company didn't have to develop its own steam turbines, instead relying on mass-produced compressors normally used for refrigeration. "This allowed us to significantly reduce the investment costs for ORC systems. Moreover, it provides both us and our customers with the assurance that the components are reliable and won't be beset by initial teething problems," stresses Eissing.

This is why Orcan also uses tried and tested products when it comes to control technology. The ePack uses a B&R Power Panel 65 touch screen HMI for control and visualization. "When we were researching potential technologies, B&R stood head and shoulders above other suppliers of control systems," explains Jens-Patrick Springer, a mechanical engineer who was closely involved in the development of the ePack. One of the key factors in choosing the B&R solution was the high-quality construction of the Power Panel, which offered the optimal amount of processing power for the application.

**Cost savings thanks to B&R technologies**

The control system communicates with the various ePack components using a range of I/O modules from the X20 system. This allows it to measure temperature, pressure and heat volume, read error messages and regulate the speed of the generator, condenser and feed pumps. "All of the potential solutions we looked at were able to measure the temperature," says Springer. "The difference was in the cost per measurement. B&R really stood out in this respect."

However, because Orcan Energy was still using control technology produced by other suppliers in the initial prototypes used for demonstration and development, there were fears that making



Using Automation Studio, the experts at Orcan Energy were able to develop the whole basic structure for the ePack power plant in a matter of weeks. The transparency of the system allows it to be quickly adapted to higher level system controls and there are no limits to the ongoing development of the control system.

a switch would delay the ePack's roll-out. "Any concerns we had were quickly put to rest," recalls Springer. "With basic programming skills we were immediately up and running. The Automation Studio development environment provided us with everything we needed. Assisted by training and support from B&R engineers, we were able to develop the basic structure of the control software in a matter of weeks.

#### High efficiency, even at partial load

Since then, the sophisticated and constantly evolving control system, which is used in conjunction with specially-designed Orcan plant technology, ensures that the ePack can adapt to fluctuations in the level of available thermal energy without any human intervention. "Many other ORC plants can't be operated automatically; they need human operators and are slow to react to fluctuations in the energy supply. As a result, the efficiency of these plants deteriorates noticeably when they are operated at partial load," notes Springer.

Eissing explains that with the ePack, the efficiency remains fairly constant over a broad range, even if the supply of energy is reduced. "If only 50 percent of the anticipated heat is being supplied, our equipment automatically switches into partial load mode. Even in this mode, the ePack still manages to return almost half of the rated output."

This is also significant for combined heat and power plants with a rated output of 450-500 kW and for stationary engines, for which the compact ePack – measuring 2 x 2 x 1.2 m (L x H x W) and delivering a thermal power of 300 kW and electrical output of 20 kW – is ideally suited. Eissing goes on to say that, "Even in biogas plants, the combustion engine fluctuates more than you might first expect. For example, the fermentation process runs differently in summer due to the higher outside temperatures."

#### Safeguarding power costs for 15 years

Thanks to the relatively low investment and the high efficiency even at partial load, Orcan systems generally pay for themselves

within a few years. "With a combined heat and power plant running for around 7,000 to 8,000 hours, we can already achieve generation costs of less than 5 cents per kilowatt-hour and secure this for 15 years," says Eissing proudly.

These figures have won over customers in a host of different sectors. In 2013 alone, Orcan sold 15 ePacks. "This success is unquestionably owed to our basic principle: supply the right device at a competitive price," explains Eissing.

But for the head of marketing, the finish line is still some way off. Orcan believes it will be possible to achieve annual sales of 1,000 of the 20 kW ePacks in the medium-term, and that in the future users will benefit even more from the savings due to larger scale production.

#### B&R – the right choice

Springer notes how B&R has fully supported Orcan's efforts to make ORC systems even more economical and broaden their range of applications. "As an innovative company, B&R constantly monitors the latest trends and is quick to establish new ones. This is a clear benefit for our users."

The ORC expert was very pleased with the introduction of the M-Bus communication module (X20CS1012) that provides developers access to a wide range of measurement devices, as well as the energy measurement module (X20AP3131), both from the X20 system.

Prior to the introduction of the energy measurement module, Orcan had the added time and cost of integrating separate measurement instrumentation. Now the energy measurement module is right on the DIN rail as an integral part of the control system. "For us this means easier installation, smaller space requirements and lower overall costs," says Springer. "This also confirms to us that we made the right choice in working with B&R and that we are on the right track towards our goal of improving the energy balance of combined heat and power systems and stationary combustion engines." ←

# Reel innovation

The Chinese tobacco industry is changing rapidly. Small brands are being consolidated into larger brands and individual production volumes are increasing. This creates a need for new manufacturing processes that provide significantly higher levels of productivity. Pantec GS Systems is successfully exporting equipment to China to provide value-added finishing for tobacco product packaging. When it comes to automation, the Swiss company relies on system solutions from B&R.



Machine module for the efficient application of holograms and hot foil embossing on packaging.



The state-owned China National Tobacco Co. is the largest manufacturer of cigarettes and cigars in China. At the same time, it is responsible for marketing, production and sales of all tobacco products in the country. Recent decades have seen the start of a process of modernization and consolidation in the industry with the aim of halving the number of factories producing tobacco products within a few years. "This means that much more efficient production processes are needed," explains Peter Frei, CEO of Pantec GS Systems. "In addition, the range of brands is being reduced to a select few, which substantially increases the production volume for those that remain."

#### **New packaging machines**

There is a demand for machines that can cope with high production rates while at the same time applying trademark protections to the packaging. This includes finishing with hot foil embossing and the application of holograms, a requirement that has previously limited efficiency since it relied on sheet-fed printing. "Not only does this mean manually feeding sheets into the packaging machines – already highly inefficient – it also means large portions of the sheets go unused, resulting in more waste and, ultimately, increased costs," says Frei.



**Peter Frei, CEO, Pantec GS Systems**

"The remote maintenance features and worldwide support provided by Pantec Automation are a decisive factor for our Chinese customers."

#### **Tight schedule**

And so the Chinese tobacco goods producers approached Pantec GS Systems, which has long been recognized as a specialist in efficient and high-quality finishing processes for packaging. In just seven months, four new machines from the e-pack™ 850 CHEETAH™ F series were to be sent to China. "This schedule was particularly tight and represented a significant challenge for the entire automation team," explains Frei. The existing technology was adapted for the tobacco market using the newly-designed CHEETAH foil embossing system. In addition, an offline "e-pack" system was developed to move and control the web. This permits reel-fed foil embossing and pack finishing with web speeds of up to 120 m/min.

#### **Structured development**

Automation for the system was supplied by the Liechtenstein-based affiliate,

Pantec Automation. This allowed the team to prove the strengths of the Pantec PHOENIX™ Project Accelerator toolset. Using targeted requirement engineering, professional project management and standardized, modularized software development, the project was kept streamlined, transparent and quantifiable at all times. "Our customers were amazed when the machine went into operation in China after just a few months, complete with the extensive range of functions they had requested. The development methodology really paid off quickly," says Frei.

#### **Complete solution from a single source**

What Pantec GS systems was looking for was a complete, one-stop solution for the automation system. "The CHEETAH™ F is very complex. This is why we wanted to be certain that the individual components worked together perfectly and that our requirements for robustness, reliability and long-term availability were met," says Manfred Kindle, project manager at Pantec Automation, describing the design requirements. In choosing a hardware platform, we opted for components we could trust. B&R supplied the real-time PLC, bus system, drives and servo motors, an integrated safety solution and even a comprehensive development and diagnostics system.



**Manfred Kindle, Project Manager, Pantec Automation**

"As a complete solution provider, B&R supplied us with a fully integrated automation system. Given the complexity of the machine to be automated, this was a decisive advantage."



# Open communication for Industry 4.0

## Additional OPC UA functions in Automation Studio



B&R continues to advance the integration of OPC UA in the B&R Automation Studio development software. With POWERLINK, openSAFETY and OPC UA, B&R offers its customers the perfect tools to meet the high demands of Industry 4.0.

Automation Studio supports OPC UA clients and servers directly on the controller, thus allowing vertical communication to SCADA, MES

and ERP systems as well vendor-independent communication from PLC to PLC. With new PLCopen-compliant OPC client function blocks, this communication can be easily implemented in the application software regardless of the hardware being used. Through the support of OPC UA subscriptions, larger amounts of data can be transferred faster.

### More efficient development

OPC UA is standardized in accordance with IEC 62541 and offers easy-to-use functions for vendor-independent data exchange. This makes it easy for software developers to engineer complex systems with high data communication demands. Implementing flexible and modular automation solutions more easily is the result. ←



B&R controllers can be implemented as OPC UA servers and as OPC UA clients.

# FiFi, at your service

Tap, swipe, drag – these are instinctive actions for many of us when we see a screen and want to use it. With experiences shaped by our everyday use of smartphones, tablets and gaming consoles, it's natural that we apply the same logic at the workplace as well. Gesture controls are more than just a gimmick, something which Bär Automation – working together with the Institute of Mechanical Handling and Logistics (IFL) at Karlsruhe Institute of Technology (KIT) – has proved through the development of FiFi, a goods transport vehicle whose visual center is an industrial PC from B&R.





## WAIT MODE

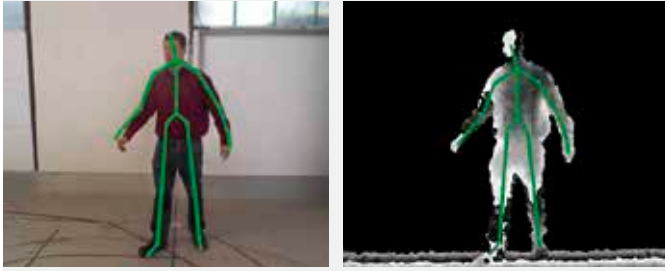


Image processing software running on an industrial PC uses the data from the 3D camera to generate a skeleton structure of humans in order to interpret their gestures.



FiFi is a battery-powered goods transporter built on Bär's proven driverless transport system. Fitted with a 3D camera, the vehicle can recognize people and their hand gestures and interpret them as commands to control its own movements.

"We decided to use a kinetic camera on the first prototype vehicle," explains Michael Herkert, project and sales manager at Bär Automation. "This is the same depth perception camera used on the PS2 gaming console, and as a result of its widespread use it is available at an attractive price."

### Camera provides 3D representation of its surroundings

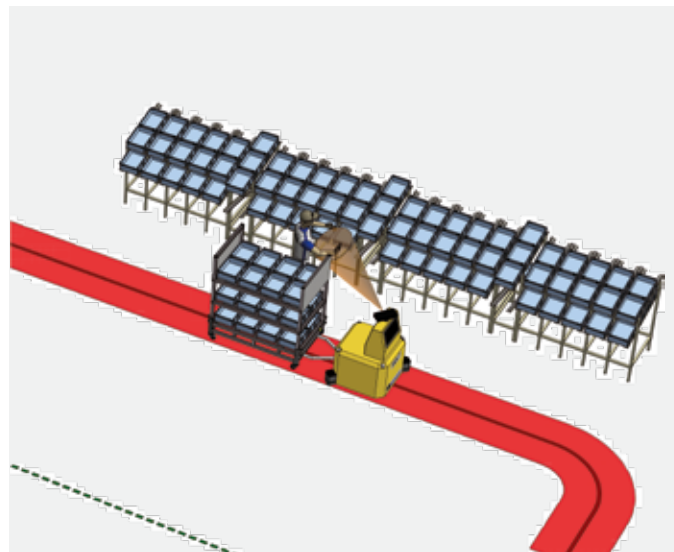
The camera features an integrated infrared depth sensor that helps create a 3D image of the surrounding area. The software then extracts a skeleton structure of any person in the camera's field of view, analyzes their arm movements and compares them against predefined gestures to determine the appropriate control command.

"Processing these algorithms requires a high performance computer," says Bär's control systems expert, Dominik Merkel. "What's more, because the unit is battery-powered, the PC needs to have low energy consumption, must be suited to mobile use and needs to fit into the limited space available on FiFi."

### Using the Automation PC 910 for image processing

FiFi's developers found the perfect solution in the form of the Automation PC 910 from BSR. "Not only does this industrial PC provide the level of computing performance we need, it uses power very efficiently and is highly resilient against vibrations and other environmental factors," says Herkert. "Its compact design and competitive pricing also played a role in our decision."

From the range of CPU options available for the Automation PC 910, they chose a motherboard based on a quad core Intel® Core™ i7 processor. An Automation Panel 900 multi-touch unit with a 15" screen provides the HMI platform. If required, FiFi can also be fitted with a second identical panel. In both cases the HMI units are linked to the image processing computer via Smart Display Link (SDL). This communications connection works in both directions and requires just one cable to transfer image data and touch signals as well as signals from any optionally included buttons or USB ports.



As an order picker takes items from a shelf, FiFi follows in hybrid mode, maintaining a constant distance as it follows a defined path.

### Michael Herkert

Project and Sales Manager, Bär Automation GmbH

"The Automation PC 910 uses power very efficiently and is highly resilient against vibrations and other environmental factors. Its compact design and competitive pricing also played a role in our decision. With its powerful computing performance it is the ideal solution for data intensive mobile applications like FiFi."



### Ready to go with zero programming

The image processing system interprets the gestures made by the operator and generates commands for the control system to the corresponding axes on FiFi.

A built-in laser scanner monitors FiFi's path to prevent collisions with people or obstacles. This allows the vehicle to be maneuvered without any programming, configuration or training to perform a versatile range of tasks.

Additional flexibility is provided by the vehicle's five different operating modes: Maneuvering Mode allows FiFi to be controlled by gestures with fine positioning for loading and unloading materials from carriers. Follow Mode allows FiFi to follow on the heel of individual users so that they can keep their hands free for other activities. If large quantities of goods need to be transported, several FiFi vehicles can be operated in Cluster Mode behind a lead FiFi vehicle. For conventional operation as an AGV, FiFi can be used in Line Mode. With this mode, the user can send FiFi to a pre-programmed destination and is then free to start the next task. The fifth mode is Hybrid Mode, which provides a combination of follow and line modes. In this mode, FiFi maintains a constant distance from the user as it follows the defined route.

### Universally applicable

"Thanks to the operating modes we have developed, FiFi is not restricted to any particular application. The vehicle is undoubtedly destined for use in intralogistics, however, and will quickly

pay for itself in many different areas – from goods inwards through to order picking, packaging and goods outwards," says Bär's managing director, Ralf Bär.

During a pilot project at a German car manufacturer, FiFi easily passed the practical test involving order picking. As the picker takes items from the shelf, FiFi follows in hybrid mode, maintaining a constant distance as it follows its defined path. This frees up the picker's hands and reduces the distance that he has to travel. When order picking is complete, the user guides FiFi to a handover point. Here, a transponder in the floor ensures that the FiFi automatically switches to line mode and brings the goods to their destination just like an AGV.

### Industrial readiness proven in pilot application

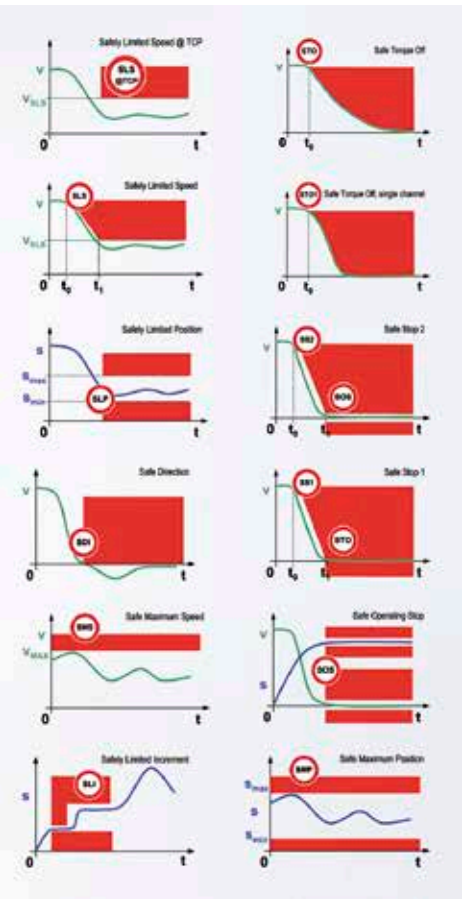
"This test application proved that the concept is completely suitable for industrial applications and that it is quickly accepted and valued by staff," reports Bär. "With demand for more versatile production, as well as demographic developments, we will be seeing this type of assistance system find its way into more and areas of use, both business and private. I can say that with confidence, judging by the responses to our presentation of FiFi at the LogiMAT exhibition and the orders we have received so far."

Bär Automation is already thinking ahead to the next variants of the vehicle. "We won't have any problems expanding the gesture controls or incorporating additional features such as a hub function – thanks to the high-performance B&R industrial PC," says Bär. ←

# Modular mechatronic systems gaining momentum



An ACOPOSmotor combines the motor, drive and safety technology in a single unit.



## ACOPOSmotor sets new standards for distributed motion control



With the ACOPOSmotor, B&R combines a servo motor and drive in one compact unit. Safety technology can also be integrated as an option. This gives developers more freedom when designing a machine and can save valuable space in the control cabinet.

The ACOPOSmotor is connected to the drive network using a hybrid cable. This cable includes all necessary power and signal lines and establishes the connection to the POWERLINK network.

ACOPOSmotor modules come in three sizes with torque ranging from 1.8 to 12 Nm. If needed, an optional fan assembly can provide a performance boost of up to 100%.

### Safety included

In addition to the proven wired safety functions STO (Safe Torque Off) and SS1 (Safe Operational Stop 1), a network-based ACOPOSmotor module variant will also be available in the future. This will allow users to access the following functions (as with the ACOPOSmulti): STO, SOS, SS1, SS2, SLS, SMS, SLI and SDI.

The ACOPOSmotor is fully compatible with the ACOPOSmulti drive system. This makes it possible for users to select the best-suited servo drive for each machine without having to do any additional engineering work. ←

# A new perspective on integrated vision

Manufacturing companies are increasingly turning to machine vision systems to support their quality control and documentation processes. Traditionally, however, integrating these systems has been a time-consuming and costly endeavor. Weber Systemtechnik has come up with the ideal solution using a vision system based on POWERLINK.



Photo © BSR



The quality and documentation requirements facing industry have increased. Using machine vision systems, however, manufacturers can meet this challenge head-on. Nowadays, entry-level intelligent cameras with impressive functionality are already available for less than 2,000 euros. What's more, the software behind these systems no longer requires laborious programming in high-level languages, but instead is a convenient matter of setting parameters. "We have used the momentum built up in recent years to strengthen our position as a provider of complete vision systems for the pharmaceutical and food and beverage industries," says Thorsten Rauber, product manager for measurement and testing systems at Weber Systemtechnik. Located in the German town of Wetzlar, Weber Systemtechnik is one of the first partner system integrators (PSI) to work with Cognex and has used the American company's systems exclusively for 18 years.

#### Simple integration of cameras

The intelligent cameras from the Cognex In-Sight 7000 series are the first machine vision system in the world to support the POWERLINK protocol. In 2010, Cognex and B&R entered into a partnership which, according to Rauber, has contributed significantly to the increasingly widespread implementation of machine vision. "For the first time, both process and image data

can be transmitted via the same medium." Traditionally, two separate networks have been needed. "This simplifies the process of integrating cameras into automation systems and increases the acceptance of machine vision systems among OEMs," continues Rauber.

The real-time Ethernet POWERLINK connection means that instead of transmitting simple trigger signals, the system can send more detailed positioning data to the motion axes. As a result, movement sequences can be coordinated with much greater precision.

#### Easy implementation and maintenance

Production control and quality assurance processes in industrial applications also



The tremendous flexibility and performance of the image processing system means that complex shapes such as logos can be detected, evaluated and used as alignment marks.



## ETHERNET POWERLINK

The intelligent cameras from the Cognex In-Sight 7000 series are the first machine vision system in the world to support the POWERLINK protocol. For the first time, both process and image data can be transmitted via the same medium instead of using two separate networks. The fast, real-time Ethernet POWERLINK connection means that instead of transmitting simple trigger signals, the system can also send more detailed positioning data to the motion axes. As a result, movement sequences can be coordinated with much greater precision.

One of Weber Systemtechnik's system solutions is an alignment control system for monitoring cylindrical objects such as champagne bottles and is particularly useful in filling and labeling machines. At the heart of this system is an industrial PC from B&R's Automation PC 910 series, which is used to run the VisionPro image processing software from Cognex.

stand to benefit from merging machine vision, control logic, I/O and motion into a flexible, coordinated solution. The result is simplified implementation and maintenance, which was a convincing argument for the Weber specialists. It is now the way they prefer to automate the system solutions they develop.

One of these system solutions is an alignment control system for cylindrical objects such as champagne bottles and is particularly useful in filling and labeling machines. At its heart is an industrial PC from B&R's Automation PC 910 series, which is used to run the VisionPro image processing soft-

ware from Cognex. The system evaluates the data received from the connected cameras to detect registration marks, warning symbols or any other graphical elements and generate a corresponding trigger signal which can be used to coordinate a particular movement.

### Accurate positioning down to 0.1 mm

In alignment control applications, the trigger signal is used to line up objects such as champagne bottles so that collar labels can be placed over the neck of the bottle in line with the center of the bottle's main label. The required dynamic rotational movement is provided by a step-

per motor that rotates the bottle into position at 3 rpm with a precision of 0.1 mm. The motor (NC axis) is controlled with a stepper motor module and a CPU module – both from B&R's X20 system.

The control functions and Windows-based image processing communicate by means of a PVI interface. Depending on the specific situation, the developers at Weber Systemtechnik use I/O or communication modules from the X20 system to handle communication with higher-level controls. "Thanks to the completely integrated B&R technology, our system is able to adapt very flexibly to the specific requirements of



The Automation PC 910 offers maximum computing power for the most complex tasks, such as sophisticated machine vision systems.

### Thorsten Rauber, Weber Systemtechnik

"With the Automation PC from B&R, you might say it was love at first sight. We were convinced by the hardware configuration alone, but the global availability was the icing on the cake."

individual applications," explains Rauber. "And it has the performance to easily handle systems with up to 16 cameras."

#### Industrial PC with no performance limits

Even in a system where not all cameras are sending data at the same time, the control computer must be capable of high processing performance should the need arise. In addition to alignment control, additional functions frequently need to be integrated such as reading and verifying 2D product codes. "Particularly with our 360° inspection system for cylindrical containers, we have run into performance limits using the PCs previously supplied by other

vendors," notes Rauber. However, this wasn't the only reason Weber Systemtechnik began looking for alternatives and ultimately selected the Automation PC 910.

"With the Automation PC from B&R, you might say it was love at first sight. We were even convinced by the hardware configuration alone. Yet, what is equally important now is the fact that our customers can get them anywhere in the world thanks to B&R's international network of offices," says Rauber. He is also very pleased with the stability that B&R provides. "The configuration of the PCs we used in the past was constantly changing, and we were contin-

ually having to modify and adjust our systems to keep up. Thanks to the Automation PC 910 and its guaranteed long-term availability, this simply isn't an issue anymore."

Instead, the experts at Weber Systemtechnik can focus their full attention on developing new functions and applications. Their positive experiences with the technology and support provided by B&R prompted Weber Systemtechnik to switch the inspection systems in their own production facility over to B&R solutions. "This way our customers benefit from the combined expertise of B&R and Weber Systemtechnik," says Rauber. ←

# Exhibition highlights

Over the past year, technical managers and developers have experienced the latest innovations at each of B&R's exhibition appearances. Industry 4.0, real-time applications with microsecond responsiveness and modular panel PCs were just a few of the topics they learned about. Here are some of the highlights:



## Amper 2014

One of the highlights of B&R's booth in Brno was the new reACTION Technology and its response time of only 1  $\mu$ s.

B&R also introduced its Power Panel T-Series and C-Series, X20 compact controllers and Panel PC 900 multi-touch. All products are networked using real-time Ethernet POWERLINK technology.



## Hannover Messe 2014

A demo model shows how seamlessly a CNC system, a 6-axis robot and a motion controller can work together - offering a glimpse at the digital factory of the future.

B&R offers vertically integrated automation - from the ERP system down to the sensor - with Automation Studio and APROL PDA.





Link:  
BSR on Youtube



### Interpack 2014

reACTION Technology raised many eyebrows at this year's interpack. BSR continues to push packaging performance to its physical limits.



### POWERLINK Convention 2014

Italy's first POWERLINK Convention will bring together prestigious companies like ABB, BSR, Cognex, Comau, Eaton, Festo, Hilscher and Laumas to show Italian machine builders, end users and system integrators how POWERLINK technology can make them more competitive on a global scale.



### SPS Italia 2014

SPS IPC Drives Italia is one of the largest international exhibitions for electrical automation technology – and one of the few to feature integrated automation solutions. The big event drew more than 21,000 visitors and provided the perfect venue for BSR to present its latest innovations.

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Production: <http://www.kreativfilm.tv> (1)  
Production: <http://www.lismagazine.it/categoria/diretta-sps/> (1)

Industry 4.0

# POWERLINK is hack proof



Photo © BSR

Industry 4.0, the widely heralded next industrial revolution based on the "Internet of Things", will further boost the need for fast and open industrial networks. At the same time, many producers are reluctant to connect their factory-floor equipment to outside lines, let alone cloud-based services, for fear of hacker or malware attacks that could paralyze production. Nevertheless, an industrial network that provides high speed and uncompromised openness and whose architecture prevents intrusion without the need for external security measures does exist. That network is POWERLINK.



Thirty years ago, a virus was a microscopic organism that made you sick, the Trojan horse was a gift in ancient Greek mythology and the word "malware" had not even been invented yet. Since then, cybersecurity has become a major concern of companies all over the world. What's more, the fear of hackers is now no longer limited to the office environment, where they have been wreaking havoc and causing a considerable amount of damage for years.

Although the advantages of increased efficiency are obvious, companies have been reluctant to connect their PC-based automation hardware for industrial plant and machinery to the Internet for remote operation, diagnostics, maintenance, updates or other services. "This is understandable since any downtime whatsoever of a production machine results in losses," says Stefan Schönegger, managing director of the Ethernet POWERLINK Standardization Group (EPSSG). "For producers in a highly competitive environment, confidential production data in the hands of outsiders is also not a notion they can easily come to terms with."

#### **A matter of protocol**

ICS and SCADA security has been a serious concern for over a decade, but it has come under increased scrutiny following the discovery of the Stuxnet virus in 2010, the DuQu virus in 2011 and the Shamoon virus in 2012, all of which specifically targeted industrial control systems. Last October, the Repository for Industrial Security Incidents (RISI) published their 2013 Annual Report on Cyber Security Incidents and Trends Affecting Industrial Control Systems. It includes an in-depth analysis of 240 incidents recorded in the RISI database from 2001 through 2012, as well as detailed results and analysis from the second annual RISI Control System Security Benchmark Survey. It finds that 33% of all ICS security incidents were perpetrated through remote access and notes a significant

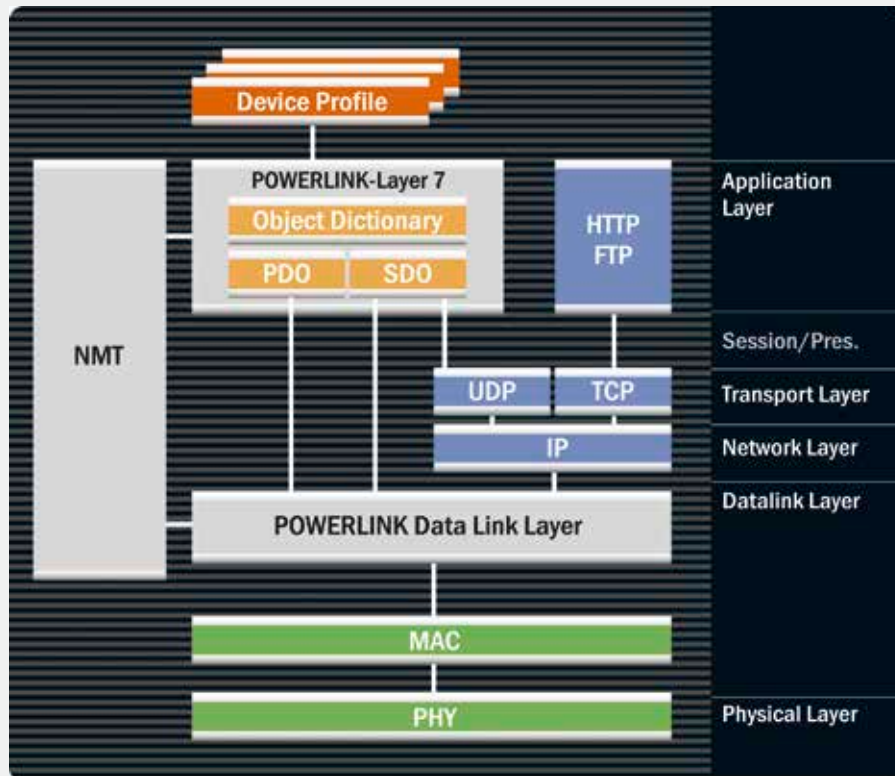
increase in the number of reported cybersecurity incidents in recent years, over 150 percent in some industries.

Hackers and malware programmers are gaining access to specific computers through the Internet using their unique IP addresses. Since this addressing scheme is used by the TCP and UDP protocols – the most popular communication protocols for LANs as well – attackers are guided directly to individual hardware in internal networks, even when they are not directly connected to the outside world themselves.

The internal hardware in production machines is connected via fieldbus or, increasingly, one of several industrial Ethernet implementations currently available. The various standards differ considerably in the way nodes are addressed and data is routed. Some continue to use the TCP/IP protocol as it is. Consequently, automation manufacturers and suppliers of industrial IT hardware that support these standards are addressing this issue by offering security concepts involving industrial-grade firewall hardware to protect Ethernet-based networks on the factory floor.

#### **Built-in firewall**

Other industrial Ethernet protocols, notably those covering hard real-time requirements, rely on master-slave communication models for the majority of data transfer and only use TCP/IP communication layers to route regular Ethernet communication through the system. Some of these models make use of non-standard layers, which open up potential future compatibility issues. There are, however, industrial Ethernet network protocols that not only build on certified standard IEEE 802.3 Ethernet layers without modification, but also take advantage of deterministic communication layers for real-time communication.



To achieve maximum performance, the POWERLINK protocol is directly based on the IEEE 802.3 Ethernet MAC standard. The TCP/IP stack is located on top of the POWERLINK data link layer, providing inherent protection for the real-time POWERLINK communication layers.

One notable technology that features this type of architecture is POWERLINK, which combines timeslot and polling procedures to achieve isochronous data transfer. How the master node addresses the controlled nodes can be configured by software developers using suitable engineering tools, though this is not transparent to other entities in the network. "The fact that there is no way whatsoever for users to access these network configuration details during system runtime eliminates the need for specific protection against fraudulent manipulations in the system itself," says Schöneegger.

#### General data completely isolated

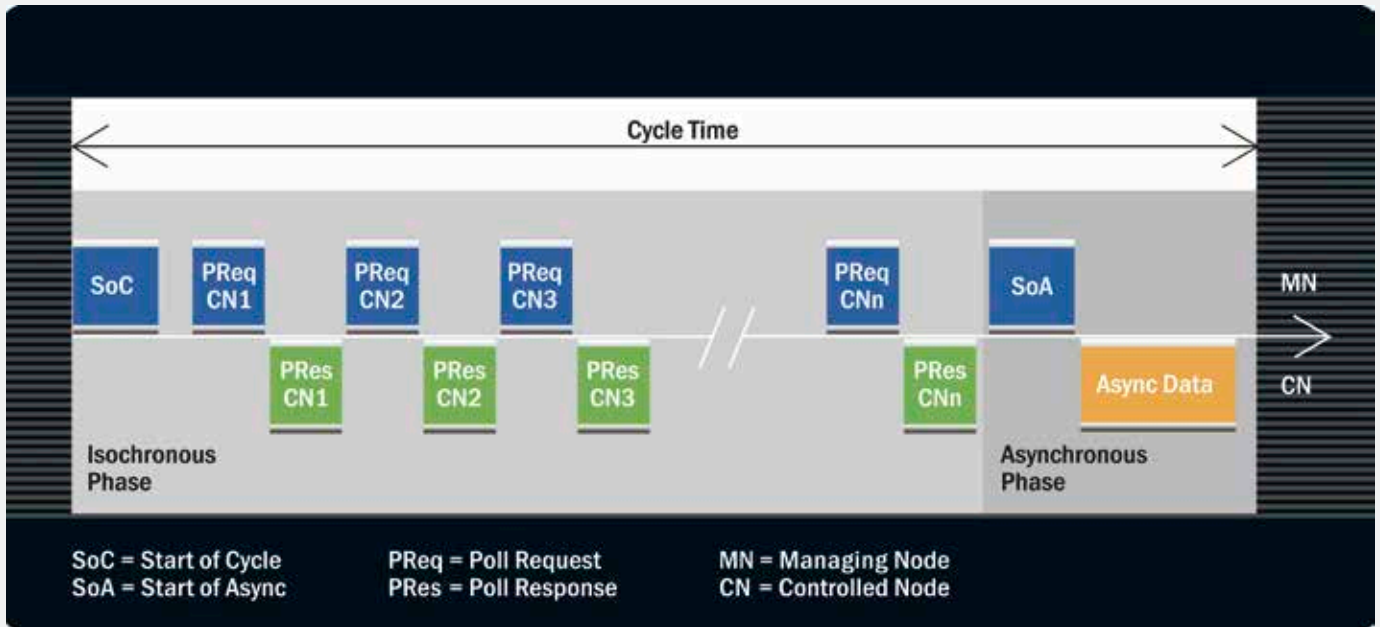
Every POWERLINK communication cycle consists of three phases. In the initial phase, the master node sends a synchronizing message to all controlled nodes as preparation for the isochronous data exchange that takes place in the second, cyclic period. The third phase is the asynchronous phase, where user data and TCP/IP packets are sent through the network. Built-in routers safely and transparently separate real-time and asynchronous data; not doing so would pose a risk to the real-time behavior of the entire system. As a result, even if malware were planted directly in the network, it would remain completely isolated.

Hackers or malicious software intruding from outside lines also have no realistic chance of compromising a POWERLINK network since they would only get as far as the opposite side of the controller acting as the network's managing node. Since attacks should be prevented from traveling through an industrial network across the TCP/IP communication layers, it is simply a wise course of action to protect external lines with a proper firewall on the non-POWERLINK side of routers. Nevertheless, the real-time communication layers of POWERLINK are inherently protected and do not need to rely on such precautions.

#### High speed, high availability and high security

POWERLINK owes much of its unparalleled level of security to the fact that it is open-source software. The stack's source code and any modifications to it are subject to frequent review by the community. This not only prevents security issues – they are discovered and eliminated long before they can do any harm – but also provides effective protection against hidden backdoor attacks.

"With the early stages of Industry 4.0 relying on the 'Internet of Things' for advanced and sustainable efficiency, plants require industrial communication mechanisms that are not only fast and



The third phase is the asynchronous phase, where user data and TCP/IP packets are sent through the network. Built-in routers safely and transparently separate real-time and asynchronous data; not doing so would pose a risk to the real-time behavior of the entire system. As a result, even if malware were planted directly in the network, it would remain completely isolated.

open, but highly available as well," says Schönegger. "High speed regardless of network size, total and complete openness, high tolerance to electrical interference, line and master node redundancy and inherent security that stops attackers in their tracks - POWERLINK fulfills all of these criteria." ←


The POWERLINK specification is available at <http://www.ethernet-powerlink.org>

The openPOWERLINK stack is available at <http://sourceforge.net/projects/openpowerlink>



**Stefan Schönegger**  
**Managing Director, EPSG**

"With the early stages of Industry 4.0 relying on the 'Internet of Things' for advanced and sustainable efficiency, plants require industrial communication mechanisms that are not only fast and open, but highly available as well."

A photograph of an automotive inspection facility. The scene is dimly lit, with a car partially visible on the right side, elevated on a lift. The background shows industrial structures and lighting fixtures. The overall tone is dark and technical.

Automotive

# Bringing surface defects to light

OLIGO Lichttechnik Surface Controls is specialized in innovative lighting and image processing technology used for the visual and digital evaluation of colors and surface finishes. With its latest generation of control systems based on B&R technology, the company has been able to increase the flexibility of its lighting systems, raise the level of automation of its inspection systems and create a control solution that can easily be scaled down for more basic applications.



Photo © DUBO Lichttechnik GmbH surface controls



OLIGO uses Automation Studio 4 to create all of the control and HMI applications for its surface control solutions. A central role is played by Automation Studio's System Designer, which is used to quickly and easily select devices, components and connection types and arrange them in either a hardware tree structure or in a 2D control cabinet view.



The experts at OLIGO recently created a 100 meter long light tunnel for a US automobile manufacturer which was put into operation in early 2014. Finished vehicles pass through this tunnel for a rigorous visual inspection. Highly concentrated workers slowly circle around the body of the car under the glow of 64 light arches, searching for signs of damaged paintwork, processing residue or any other surface imperfections.

The lighting configuration is automatically optimized for each individual vehicle that passes. "Different surface textures and colors as well as different types of inspection have very specific lighting needs to ensure that any defects are easily seen with the naked eye," explains Heiko Rieck, manager of the OLIGO plant in Lenzen, Germany and deputy managing director of OLIGO Lichttechnik Surface Controls.

#### **A full spectrum of control optics**

To provide the necessary resources for its light tunnels as well as the various other OLIGO product segments – such as workstations for surface auditing and color matching – the company developed a comprehensive range of lighting solutions for surface control applications. This selection is unique in the industry, and it is

from this range that the 64 arches that make up the light tunnel for the US automobile manufacturer were drawn.

An OLIGO control system ensures that the appropriate lighting configuration follows along with each vehicle as it moves through the tunnel's 16 stations of 4 light arches each. The main challenge here is to allow workers to reduce the speed of vehicles in any given station or briefly stop a vehicle in order to carry out essential repairs.

"With vehicles moving at different speeds, we need to coordinate the timing of the light arches to ensure that at any given time, the best lighting conditions are used for each vehicle," says Joachim Becker, development manager at OLIGO Lichttechnik Surface Controls. "This requires a high level of flexibility from the control system, which is only possible using our latest generation controls based on B&R technology."

#### **Power Panel and X20 system for more flexibility**

The control and HMI platform for the system is provided by a Power Panel with a 10.4" touch screen and Intel Atom processor. The software is developed entirely us-

ing Automation Studio 4. "This highly integrated engineering environment means we can quickly and easily modify the control system, including the user interface, at any time," says Becker. This is particularly important because each OLIGO system is built to meet the customer's specific requirements as well as the local and technical requirements of the customer's site. "It's not always possible to completely eliminate surprises during commissioning, but thanks to the flexibility of our control systems we can deal with them quickly," says Rieck.

Flexibility is also essential when it comes to the hardware, because the lighting controls and their associated higher level systems – such as the conveyor system which moves the vehicles through the tunnel – need to be networked with a wide range of different sensors. This is supported by the modular design of the X20 I/O system, which provided a broad selection of versatile modules. B&R's I/O system includes bus controllers for all common fieldbus and industrial Ethernet systems such as CAN, Ethernet/IP, Profinet and of course the real-time Ethernet POWERLINK, which is used to connect the Power Panel HMI to the control system.





Automatic color control - Generation 4.0

### The X20 system offers a virtually unlimited number of outputs

For OLIGO, it was just as important that the control platform be able to communicate with the digital ballasts which have been used for several generations of controllers and feature a DSI interface. "B&R accommodated our request to include a digital standard output module to process the DSI protocol," says Rieck. "This way we can use the X20 system to implement virtually any number of outputs."

With this new generation control system, OLIGO no longer needs to install additional controllers for larger solutions, as used to be the case with earlier generations that only supported up to 14 DSI outputs. An important factor for the 100 meter light

tunnel was the fact that distances of up to 100 meters between I/O modules could be spanned cost effectively with POWER-LINK and a bus controller. Even longer distances – up to 2 km – can be handled using fiber optic cable.

In addition, the X20 system includes a DALI module which allows OLIGO to equip controllers with this internationally standardized interface at minimal cost.

### A direct route to success

Before switching to B&R technology, OLIGO had developed its control systems in-house. In order to limit system certification expenses, an external power supply with ETL approval was used.

"Workarounds like this are longer necessary, because B&R handles certification of all the control components and ensures compliance with EMC/ESD regulations," Becker is pleased to report. "In addition, we benefit from B&R's high level of innovation and global presence, not to mention the long-term product availability and excellent support."

With the assistance of B&R's expert engineers, OLIGO was able to incorporate machine vision into the color matching controller in a very short time, using the same B&R technology as the light tunnel control system. The image processing software runs on Windows using the same Power Panel that provides HMI and control. "We use the camera to automatically adapt



**Heiko Rieck, OLIGO surface controls**

"With B&R automation solutions we are in a position to quickly and easily build and modify customized control solutions in different performance categories for different areas of application."



The surface control optics from OLIGO are installed in the light tunnel to create reflections that make defects on reflective surfaces more visible.

the color temperature and light density to the surface being viewed during production and inspection," explains the head of development.

#### **B&R technology for state-of-the-art operator controls**

OLIGO is driving the industry trend towards increasingly automated surface inspection. "As well as automatic defect detection and support for human inspectors, we are committed to improving ergonomics to prevent fatigue from factors such as glare," says Rieck with respect to recent market developments.

For OLIGO, the switch to B&R has already paid off. The company has used the generously dimensioned Power Panel touch screen to create a state-of-the-art user interface, whose realistic visualization of lighting configurations in a virtual workstation provides exceptionally intuitive operation.

Particularly when inspecting larger objects, when working in the light tunnel and when inspecting surfaces inside vehicles, workers appreciate the convenience of using a tablet PC to operate the controller without having to stop what they're doing and walk to a terminal.

#### **Scalable controls for custom solutions**

"New paint systems, innovative substrates such as carbon-fiber reinforced plastic (CFRP) as well as a trend toward increasing automation are placing more challenging demands on surface inspection control," says Rieck. "This requires high-performance controllers. With our new control generation featuring modular B&R hardware and the highly integrated Automation Studio engineering environment, we are in a position to quickly and easily build and modify customized control solutions in different performance categories for different areas of application." ←

# "A more colorful place"

Revolution or evolution, call it what you will – we're well on our way to the world of Industry 4.0. Leading the way is the automotive industry, but the rest are quickly picking up momentum, explains B&R's marketing manager, Stefan Schönegger, during an interview with the website GIT SICHERHEIT.



**Mr. Schönegger, the entire concept of Industry 4.0 is closely tied to a trend where customers and their individual needs exercise a greater amount of influence over the production process. How exactly is that going to work?**

We can take a look at the automotive industry for an answer to that. Mass production began with Ford's Model T. A key factor there was the decision to restrict production to just one model. Even the range of colors was restricted, leading to the famous quote attributed to Henry Ford: "You can have any color as long as it's black." These days, however, the world is a more colorful place. All you need to do is take a look at the websites of car manufacturers to get an idea of the wide-reaching changes taking place. Complex configurations with virtually endless variants and options allow customers to create, quite literally, a one-of-a-kind product.

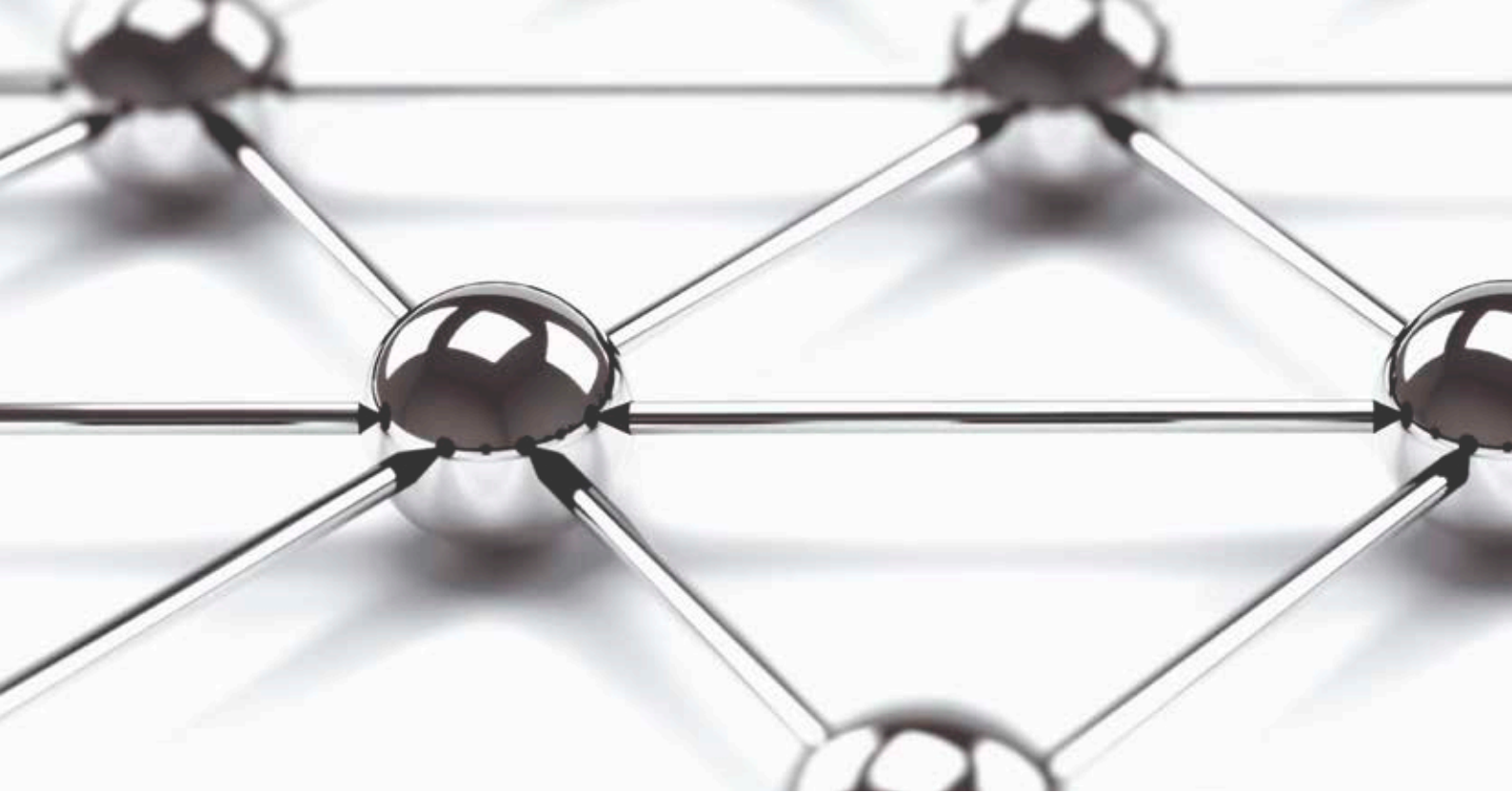
Customers can define virtually every aspect of their car, and the production process is modified accordingly. Through this process the customer gains direct access to the ERP system and, in turn, the production process. Of course, there are still limits. Customers must make due with a selection of "only" four or five chassis types. Similarly, the potential for variation in paint type and color is also limited. Nevertheless, the signs all point to batch size one, and suppliers of machinery and automation need to align themselves with this trend.

**Aside from the automotive industry, what other sectors and product types are affected by this trend? Is this type of advanced customization only an issue for certain industries?**

All industries are affected. Think about smartphones with custom covers, photo books from your family vacation or foods with individualized packaging. Even the pharmaceutical industry is already producing blister packs containing custom-sorted medication. Patients in hospitals now receive the precise selection of medication they have been prescribed, and it is prepared by a fully automated system. This completely eliminates the potential for human error during preparation. Krones and Dividella are just two examples of customers with whom we have worked in this area. It's also the approach we take at our own factory. For example, we offer our customers the option having our modular I/O system pre-assembled and delivered as an out-of-the-box solution, complete with custom channel labeling.

**What does it take to get there?**

To make these possibilities a fully automated reality, you need direct access to individual sensors right from the ERP system. The strictly defined layers of the traditional automation pyramid will continue to fade, leaving a single, fully integrated solution. A modern control system can, for example, take over the tasks of a SCADA or even MES system while simultaneously monitoring the current status of a sensor signal. To deal with the diversity of variants, modular design is absolutely crucial. You need to be able to add and remove components or group them into mechatronic units as needed – without ever impeding the production process. Of course, in order to do this, the system needs to be able to automatically adjust the configuration of all the components involved.



***In addition to vertical integration in terms of consistency and transparency as you have just mentioned, you also talk about horizontal integration of the disciplines. What do you mean by that?***

By horizontal integration I mean the merging of all disciplines involved in the development and production of a product. Simulation, electrical engineering, mechanical engineering, automation and quality assurance inspections must work together seamlessly. For example, any changes to the electrical layout in the ECAD system need to be accounted for in the automation system as well. Of course this also applies in the opposite direction to changes made in the automation system.

***Can you give us some specific examples of this?***

B&R and EPLAN have developed a perfect interface that is ideally suited to linking the worlds of ECAD and automation. This type of workflow is precisely what is meant by the term "round-trip engineering". The same applies to the integration of machine vision systems and the control system. Vision systems are frequently used for final product inspection to provide quality assurance. Manufacturers want to know which products, with which serial numbers and from which batches are delivered to which customers. This is known as "track and trace" and requires close links between the machine control and the production control systems further up in the architecture. Together with Cognex, the well-known manufacturer of vision components, we have integrated real-time synchronization into the camera system using POWERLINK. This allows us to use the camera to control time-critical processes such as sorting out faulty products.

***You've also mentioned terms such as differentiation and efficiency. Where do they come in?***

All of these requirements serve the same goal, namely to ensure the viability and profitability of the manufacturer. Differentiating

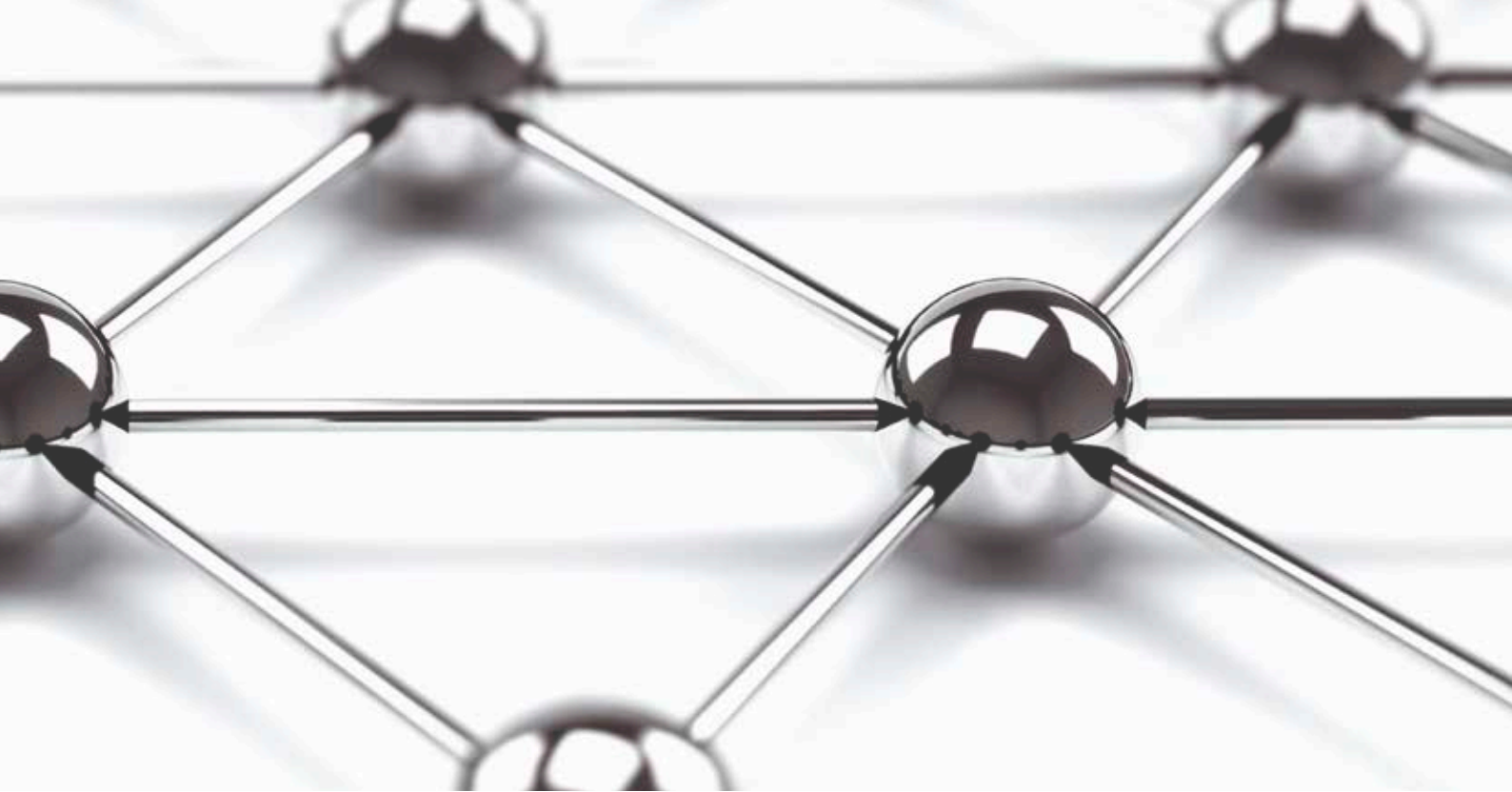
oneself on the global market is a serious challenge. Machine manufacturers are affected by this too. All the focus on batch-size-one and the need for more individualized solutions doesn't change the fact that you still need to produce goods efficiently. Retooling times must be dramatically reduced, and plant downtime simply cannot be tolerated. With Scalability+ we provide the ideal basis for machine manufacturers to tackle these challenges.

***What exactly does Scalability+ mean?***

Scalability+ is an approach to automation that makes it possible to design completely new machine concepts. The basis for this is the complete freedom to combine components from across the entire hardware portfolio with all the available technology functions. For example, you can implement sophisticated robotics control on a cost-effective standard controller rather than relying on – and being restricted to – specialized controllers. Customers also have the added benefit of being able to differentiate themselves with their own modular application components. The reusability afforded by this modular software can significantly reduce development expenditures. Through the complete flexibility to select and scale hardware components as needed, customers are able to delay definition of the final, optimized hardware configuration until very late in the development process.

***Another key aspect of Industry 4.0 is standardization. That's where POWERLINK comes in, right?***

POWERLINK and openSAFETY form the ideal basis and meet all of the technical requirements needed to support the long-term goals of Industry 4.0. Both communication standards are open source and are freely available, because, after all, genuine openness is the true essence of the fourth industrial revolution. Both systems are well-complemented by OPC UA and I/O-Link communication. These four technologies are ideal for use to-



gether and their individual strengths come together to create a nicely harmonized system.

***Speaking of openness, industrial communication networks are increasingly required to work much more closely with third-party systems. Why is this gaining significance?***

Industrial communication networks must provide interoperability with third-party systems. Virtually every production line is a conglomeration of machines and production units supplied by different manufacturers. For efficient and economical production down to batch size one, however, communication across all production units is a fundamental requirement. Each component involved in the production process must be capable of exchanging data with every other component. This cannot be limited to components from the same manufacturer. A solid foundation of compatibility with existing systems and a dedication to completely open technology are absolutely critical. An open standard is a safeguard for investments and provides freedom to both the user and the owner of the system.

***Ultimately, the development of Industry 4.0 and concepts such as the Internet of Things and cloud computing all call for the decentralization of automation processes. What exactly does this mean?***

Components these days are incorporating ever higher levels of intelligence, and this is adding to the overall volume of data to be managed. Direct communication between components is an absolute necessity for certain processes. A core technical characteristic of POWERLINK is that stations on the network can cross-communicate with each other. POWERLINK organizes communication among network stations, while at the same time allowing the system to be expanded freely without affecting real-time performance. Rigid topologies cause problems when you go to expand the system.

***A further dimension of Industry 4.0 in this context is how to maintain a safe working environment in high voltage areas while at the same time achieving the necessary levels of flexibility and openness in production processes that we've been discussing. Nobody wants to enclose their machines in safety cages or behind protective gates. What are the implications for safety on the production floor?***

You're right, enclosing machines in safety cages is not the way to go. It should be possible to dynamically configure machines and production areas according to the workpiece that is currently being produced by adding, removing or rearranging machine modules. Safety control systems integrated on the fieldbus network are a core prerequisite for modular machine construction. Since it is completely independent of the type of fieldbus used, the openSAFETY protocol allows individual modules and entire machines to be equipped with a uniform safety solution, even when they use different protocols to communicate among themselves. With openSAFETY, a production line – including all of its dynamically configurable modular units – can be managed as a single safety unit. Operators benefit from unbridled performance without the restrictions of protective barriers – thanks to fully integrated safety functions for complex kinematic chains and features such as safely limited speed at the tool center point. There is no longer any excuse for using cost-intensive safety cages. ←

***This interview was carried out by Regina Berg-Jauernig, Editor of GIT Sicherheit.***

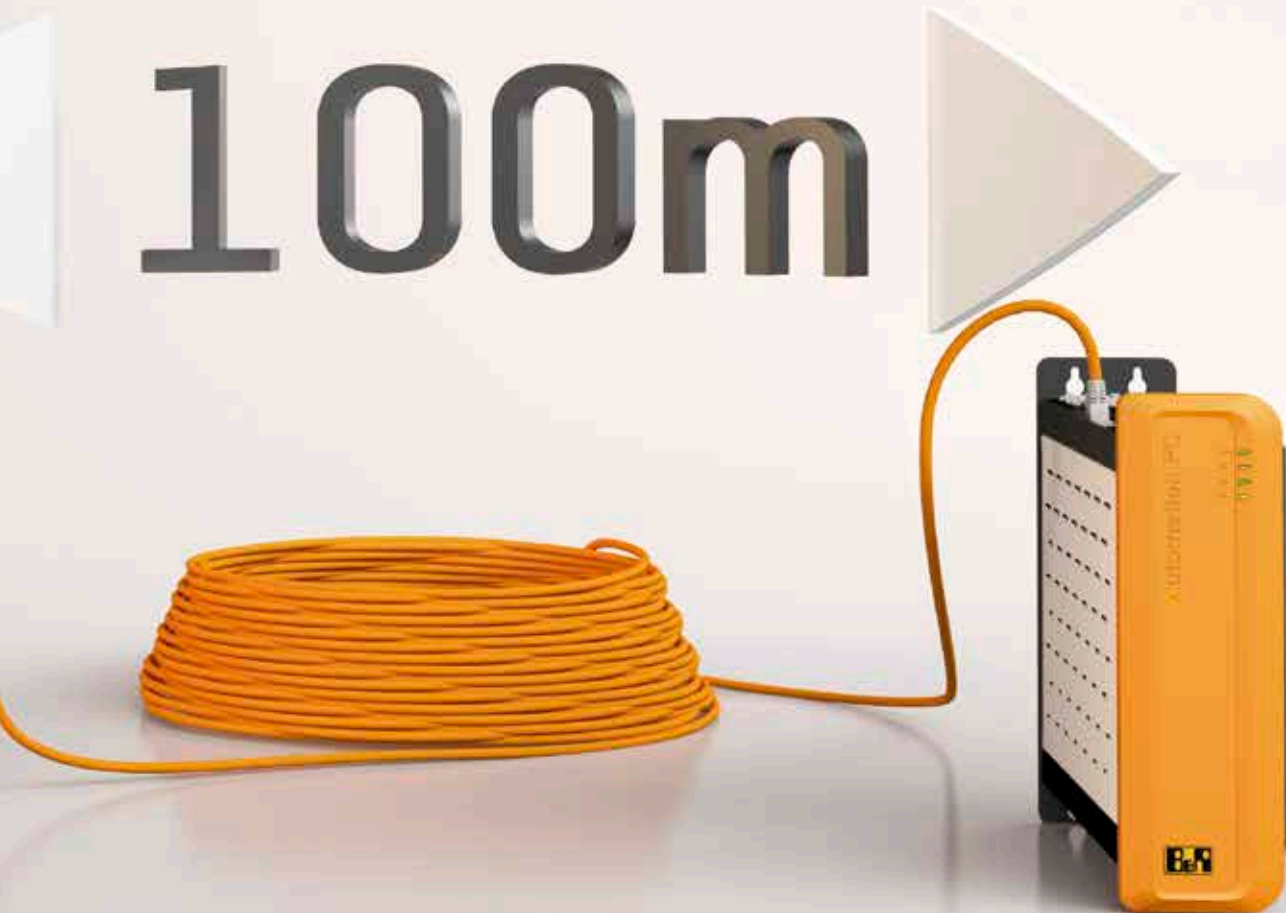


Transmission technology

# 100 meter data-dash

More and more often, groups of machines are being integrated to form complex production systems. These systems need solutions in place that allow workers to operate them efficiently and ergonomically. This creates two challenges for machine builders: Not only must data be transferred over longer distances, the cables must also be compact enough to be routed through swing arm systems. With Smart Display Link 3 (SDL3), B&R now has the perfect technology to meet both of these challenges.

100m

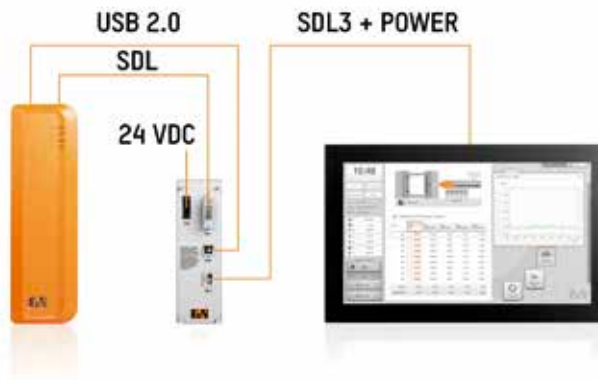




The Automation PC910 can be equipped with an optional SDL3 card.



If 24 VDC is already being supplied, the Automation Panel can be connected directly to the Automation PC 910 via SDL3.



The SDL3 converter can be connected to any Automation PC. Power is supplied to the Automation Panel via SDL3, so only a single cable is needed, which is optimal for swing arm systems and routing through tight openings.



SDL3 makes it possible to operate a panel up to 100 meters away from an industrial PC using a standard Ethernet cable. This allows HMI devices to be installed precisely where they are needed, even on large machines. This technology does not require the panel to be equipped with PC architecture. No CPU, memory or operating system is needed. SDL3 transfers image data uncompressed and in resolutions up to full HD. The image data is not converted or processed on the panel, so the display shows the content at the same speed and quality as it is generated by the industrial PC graphics unit.

To make operation as ergonomic as possible, machine manufacturers often mount the HMI unit on a swing arm system. With swing arms, the size of cable and the dimensions of the connector are crucial factors. SDL3 has a clear advantage compared

to conventional DVI cables: The standard Ethernet cable with RJ45 plug can be easily routed through narrow openings. CAT6 or CAT7 cables are used, which have low acquisition costs and can be assembled on-site if necessary. In swing arm systems, it was previously often necessary to use thin clients with a full-fledged PC design. They took up more space and were also dependent on software drivers and operating systems.

#### Independent of the operating system

B&R began as early as the 1990s to connect panels to industrial PCs via a digital interface – long before DVI became an established standard. Since DVI was designed purely as a display connection, B&R set off on a new path 10 years ago with Smart Display Link (SDL). SDL transfers data to the panel over a distance of up to 40 meters using a special dual-DVI cable. From the very beginning, B&R's transfer technology



**Raimund Ruf**  
Business Manager HMI, B&R

"With SDL3 and the sleek RJ45 connectors, difficulties wiring swing arm systems are a thing of the past."





SDL3 is compatible with all previously delivered Automation Panel 900 devices. This platform, which has been installed in the field for over 10 years, can be easily adapted to SDL3 in the course of retrofitting work thanks to the modular interface.

#### The advantages

- Spans up to 100 m
- Independent of operating system and software drivers
- Simple and inexpensive wiring
- Optimally suited for swing arm systems
- 10-year backward compatibility

provided unprecedented easy handling and complete independence from operating systems and software drivers.

The third generation of this digital display transfer technology opens up a new chapter in the Smart Display Link success story, offering both added functionality and considerably simplified handling. Upgrading from SDL to SDL3 can pay off starting at cable lengths as short as 10 to 15 meters. Like SDL, SDL3 transfers not only display data, but also the communication channels for the touch screen, LEDs and keys as well as service data such as the backlight brightness setting. In addition, the bandwidth of the integrated USB connection was increased so that SDL3 now also transfers USB 2.0 data. This allows operators to transfer recipe data from the panel to the industrial PC much more quickly.

Not only does SDL3 transfer all communication data between the industrial PC and the Automation Panel using a single cable; it can also handle the power supply for the panel. This is done using an SDL3 converter connected between the PC and the panel. This type of cabling is ideal when only supplying the panel and its membrane keys and LEDs.

Particularly when installing panels on swing arm systems, cabling is considerably simplified by using a single cable without the additional 24 VDC connection.

If additional mechanical switching elements such as hard-wired push buttons, key switches and E-stop buttons are also present and there is already a 24 VDC supply on the panel, an Automation PC 910 with integrated SDL3 transmitter may be a well-suited option. ←

#### 10-year backward compatibility

The transmitter can be integrated as an option with the new Automation PC 910. All other Automation PCs can establish a connection via SDL3 using the external converter. Like B&R's panels themselves, SDL3 technology is also modularly designed. This allows all previously delivered Automation Panels to be connected via SDL3 using a corresponding display link module. Software adjustments are not necessary, even for 10 year old panels. Assembly is very simple and can be done on-site. Panel PCs and Automation Panels can of course also be connected via SDL3. The type of touch technology being used doesn't matter; SDL3 supports both projected capacitive multi-touch panels and analog resistive touch screens. This is a significant difference to the extenders currently available on the market, which only transfer display and USB data. ←

A blurred person in a white shirt and dark trousers is walking on a modern, glass-enclosed walkway. The walkway has a metal railing and is set against a background of a highway interchange with multiple overpasses and ramps. The scene is brightly lit, suggesting an outdoor or well-lit indoor environment. The overall aesthetic is clean and modern, emphasizing movement and infrastructure.

Transport logistics

# The journey is the destination



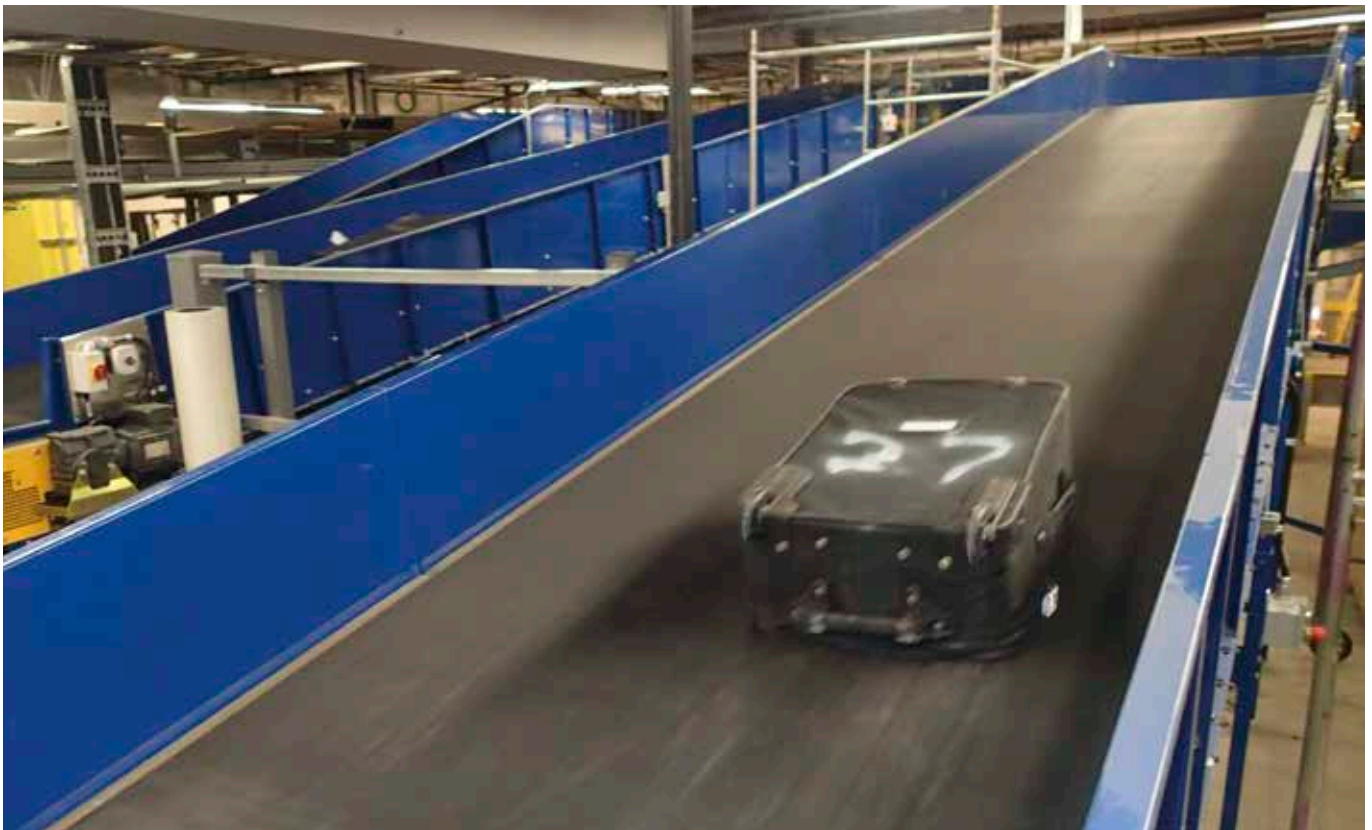
Each year, the luggage of 3.6 million travelers passes through the Halifax Stanfield International Airport in the Canadian province of Nova Scotia. Tasked with modernizing the airport's baggage handling system, Cofely Services set out to find a better solution for the automation required – and found it at B&R.



Intensified security is making airports a more stressful place than ever – a situation that is all too often exacerbated by long waits and lost luggage. Travelers don't want to spend any more time at the airport than is absolutely necessary. Nobody wants to wait in a long line to check in their luggage or sit around at baggage claim to pick it up – or worse, get the news that their suitcase will be spending the weekend in Tahiti while they're stuck at a conference in Detroit. What passengers would like to expect are quality airport services all around – including baggage handling.

With this in mind, Nova Scotia's world-class Halifax Stanfield International Airport – always striving to offer a more pleasant travel experience – set out to further improve its processes and services by implementing a quicker, more streamlined baggage handling solution. At the time, the airport had been using a traditional, centralized baggage handling system, which consisted of 100 conveyors with several sensors each, all wired back to the main control cabinet. Since upgrading their system, the Halifax airport is now able to better serve its 3.6 million annual passengers while substantially reducing costs.

The team at the Halifax airport recruited Cofely Services to spearhead the project of developing an improved bag room solution. Cofely Services is a subsidiary of the GDF-SUEZ group, a global leader in multiservice technical management, including the operation and maintenance of airport facilities. Their airport group operates in over 25 airports worldwide, among them Boston Logan, Louisville International, Montréal-Trudeau, Paris Charles de Gaulle, Athens, Brussels and London Gatwick. Cofely is best known for its airport software solution, Bagstage, and self-service bag drop, U-Drop.



Cofely's bag sortation software solution Bagstage automatically directs bags to their proper destination at the world-class Halifax Stanfield International Airport, serving 3.6 million passengers annually.

### Handling requirements

"It was important to the project team that the solution would increase added value by using new technology that could be easily integrated into existing as well as new systems," notes Yan Le Meur, Automation and Watch Technology Expert for Cofely Services. In airport bag rooms, the lines are used 20 hours a day, 365 days a year. It is therefore imperative that their systems are efficient and reliable as well as easy to troubleshoot should an issue arise.

First, the requirements for the bag room improvement project needed to be defined. Cofely determined that the bag room facility should be easy to use for maintenance staff and require minimal training. The control system would have to feature IP67-rated machine-mountable I/O and support controller platforms from multiple vendors, have a web server for diagnostics for each individual node, be able to communicate with scales or automatic tag readers (ATRs) and deliver a network response time of less than two milliseconds.

### Flexible and open solution

Cofely knew it would install its Bagstage bag sorting software onto each line to automatically direct each bag to the proper destination. At the same time, screening machines scan each bag to ensure that there is no risk or potential threat inside before being loaded onto the airplane. But Cofely still needed a partner for the

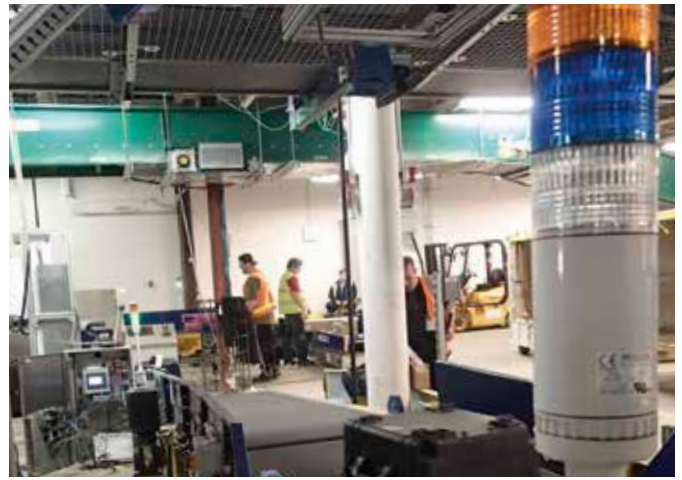
conveyor line's control system. After evaluating multiple automation supplier solutions, they selected a machine-mounted I/O system from B&R, known as the X67 system.

The X67 I/O system includes a 16-channel digital mix module to control the conveyor lines. Each of the channels is programmable, allowing a single module to be used for digital inputs, digital outputs or high-speed counters. Cofely took advantage of the flexible I/O design to configure one of the standard channels as a high-speed counter to be used for an encoder with square signals and in turn reduced the total number of components required for the application. "With fewer components in the control cabinet, we reduced the cabinet size and associated costs, as well as eliminating the need for junction boxes on the machine," reports Le Meur.

To ensure that the system was easy to use for maintenance staff, the conveyor I/O system was equipped with pre-assembled standard M12 connectors, which decreased commissioning time and reduced the potential for wiring errors. By switching to IP67-rated machine-mounted I/O and M12 field-wireable connectors, the number of M12 cordsets for the conveyor lines was significantly reduced. With the previous baggage handling solution, in addition to the abundance of wiring, each conveyor had its own remote panel. Now, over two-thirds of those panels have been eliminated.



A flexible IP67 rated machine-mount I/O system with 16 programmable channels was implemented for conveyor line control, allowing each channel to be individually assigned as a digital input, digital output or high-speed counter.



With conveyor bag line usage at 20 hours per day, 365 days per year, network response time is vital. With the new X67 I/O system, network scan times of one millisecond could be achieved.



**Yan Le Meur, Automation and Watch Technology Expert, Cofely Services**

"The decision to work with B&R gave us a solution that was very cost-effective, but more importantly, it allowed us to reduce the total number of components and amount of wiring necessary for the application, while also being very easy to support. Moreover, by implementing B&R's X67 machine-mounted I/O system, we were able to reduce the installation time for our bag room improvement project by 30%."

**Enhanced network performance and diagnostics**

As required, the solution supported the use of multiple network platforms so that the airport team could continue to work with the existing platforms they were already comfortable using. Using standard nodes on the multiple fieldbus networks significantly improved network performance beyond requirement. "The bus controllers could communicate between different automation platform PLCs with a single I/O module and we were able to achieve network scan times of one millisecond," Le Meur explains.

Le Meur continues: "The I/O is easy to support, even when integrated with a third-party master, due to the advanced diagnostics on the hardware LEDs and in the software." Because of the length of the baggage conveyors, Cofely knew it would be important to implement a solution with a flexible topology. The X67 I/O system adapts to the architecture of the conveyor line. Paired with B&R's free configuration software, FieldbusDESIGNER, the I/O data can populate the controller tags and automatically define input and output sizes, allowing the programmer to work in whatever software platform he or she is most comfortable.

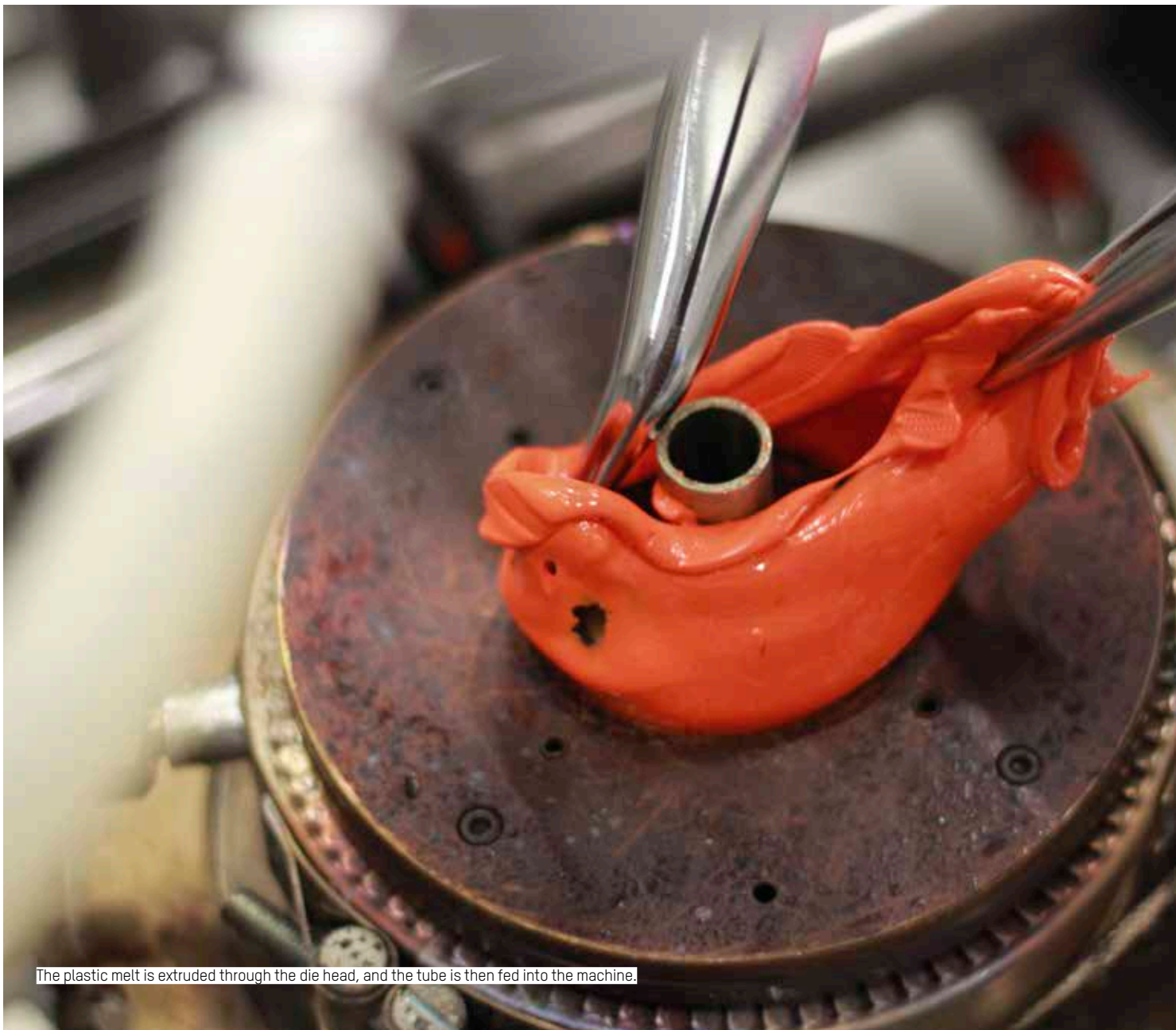
Furthermore, visual status indicators on the I/O modules and advanced status messages are delivered immediately via the bus and produce detailed diagnostic results. The system design features individual sensors and actuators per node, which makes

troubleshooting any detected issues simple and allows any faults to be quickly replaced using plug connections. In addition, the serial modules are linked to Cofely Service's automatic tag reader via Bagstage and I/O modules are linked to SCADA to help deliver diagnostic results. For maintenance and operation, additional savings were realized through the integrated functionality of the X67 system. Sensors and X67 modules are well protected against short circuits and overload.

The new, enhanced baggage handling solution for Halifax Stanfield International Airport delivers a highly efficient line with bag tracking that yields a very low percentage of lost baggage. Cofely reports that since the solution's implementation there have been no complaints from the airport or its maintenance team. "The decision to work with B&R gave us a solution that was very cost-effective," says Le Meur, "but more importantly, it allowed us to reduce the total number of components and amount of wiring necessary for the application, while also being very easy to support." With Ethernet now established as the fieldbus standard, Le Meur plans to implement the solution of IP67-rated I/O modules combined with M12 connectors as the model for future projects. "We could apply the same connectivity and modules to virtually any kind of new or existing network," explains Le Meur, "and this exciting flexibility is why we will continue to promote this type of solution to our customers - it's an honest win-win solution for everybody." ←

Universities

# Taming 500 bar



The plastic melt is extruded through the die head, and the tube is then fed into the machine.

When young graduates start their first job, it won't be long before they face their first complex interdisciplinary challenges. Professor Michael Koch has initiated a series of student projects aimed at honing precisely the skills they need to master these challenges. Among the most recently completed projects was the development and construction of a miniature blown film extruder featuring automation technology from B&R.



It's 8:00 AM on a Wednesday. In the Staudinger Technical Center, run by the Department of Plastics Technologies at the Technical University of Ilmenau, Germany, Martin Zschoche flips the main switch on the miniature extrusion line. After days of commissioning its drive axes and the heating and control circuits, today is the day he and his classmates will finally get to see their extruder turn plastic into film. Zschoche presses the softkeys on the B&R Power Panel 500, which serves double duty as both controller and operator interface. All five graduate students and their advisor Matthias Düngen have their eyes fixed on the display in anticipation. Have they thought of everything? Will it hold up under 500 bar of pressure?

After what seems like ages, the temperature reaches its setpoint and the extruder starts. Drives, heater, compressor – everything is running perfectly. Christian Simon fills the hopper with plastic pellets, which echo as they make their way down into the screw. All eyes are now on the die head; the melt should appear at any moment. And

appear it does: oozing from the side of the tool mounting flange like hot lava. Disappointment fills the room. An insufficient seal on the flange is quickly identified as the root of the problem, and by lunchtime everything is reassembled and ready for another try. Once again, however, the seal doesn't hold up. At the next of the seminars held regularly throughout the project, the students focus intently on finding a solution.

Professor Koch loves opportunities like this. "Working together to solve problems is something they'll have to do every day in their jobs. It's enormously important that they develop those skills now," he emphasizes. He follows the discussion attentively, offering up carefully aimed hints at the solution. A few days later they are rewarded with the first successfully blown film.

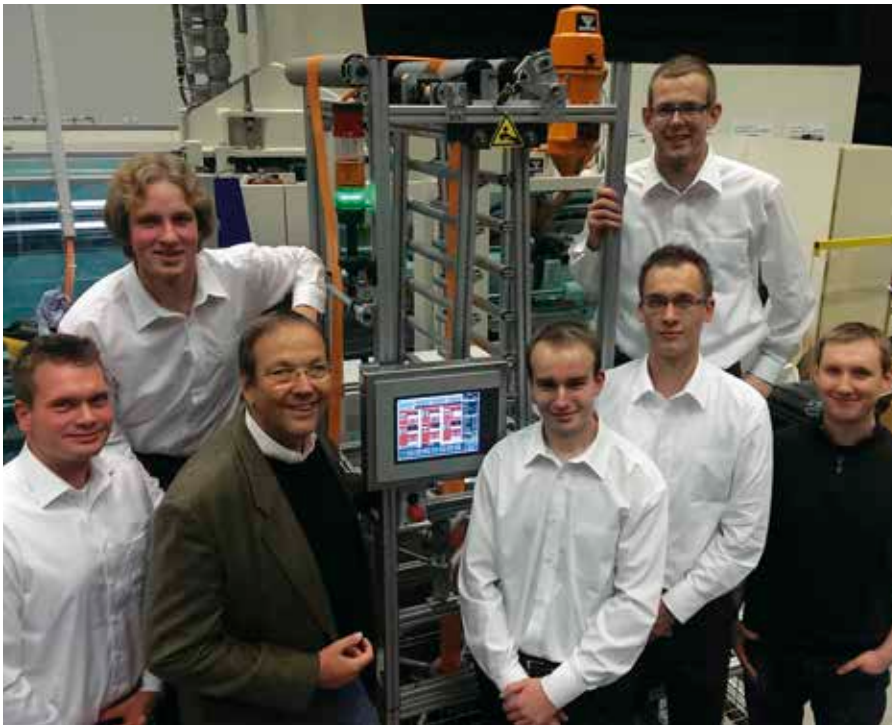
The extruder is now ready to be put to use testing the latest plastics processing technologies. The combination of material, machine and process development is part of what has made Koch's department so successful.

**Prof. Dr. Michael Koch, Head of the Department of Plastics Technologies at the Technical University of Ilmenau**

"B&R's development environment, Automation Studio, allows us to develop concepts in a way that is clearly structured and consistent."



Automation Studio 4 supports team-oriented engineering throughout the entire project – from conceptual design and simulation to commissioning and diagnostics. Working with application modules allows entire control projects from different engineers to be loaded onto the same system and then developed further individually. What's more, all development is completely independent of what hardware is ultimately used.



Blown film extruder project (left to right): Erik Gerhardt, Martin Zschoche, Prof. Dr. Michael Koch, Florian Jünger, Rico Grinke, Christian Simon, Matthias Düngen



Blown film extrusion running smoothly.

Each year, around 80 students complete the program for mechanical engineering and plastics technology and are highly sought after among employers. Numerous German and international companies also make frequent use of the Department of Plastics Technologies' research capacities. Among them Grafe Advanced Polymer, MöllerTech Thüringen and Schmuhl Faserverbundtechnologie, who, together with TITK

Rudolstadt and STIFT Thüringen under the umbrella of the PolymerMat e.V. network, hold endowed professorship.

For Professor Koch the collaboration with B&R has been an essential element of the project seminars. "Student research is always a matter of one-off projects. That's why it's important to have a partner whose products support our conceptual ap-

proach," he explains. "Particularly the development tool, Automation Studio, allows us to work very effectively as a team." B&R technology will be featured in the next project as well – a miniature injection molding machine. Once again, the students will be tasked with all aspects of the process and the mechanical design and will rely on proven B&R technology from day one. ←



# Combining proven and state-of-the-art technology



Automation Panels from B&R in 4:3 format are available in three different sizes.

## Full compatibility: New Automation Panels in 4:3 format



In addition to widescreen panels, B&R is now offering second generation Automation Panel displays in conventional 4:3 format with single-touch operation. For customers, this means 100% compatibility with existing systems without having to sacrifice modern features such as LED backlighting.

Since these panels are part of B&R's modular system platform, they can be combined with a suitable module to create a powerful Panel PC – with scalable performance up to Intel® Core™ i7 levels. Industrial PC and display not in the exact same location? Not a problem. Automation Panels can be equipped with a Smart Display Link 3 receiver that allows the display to be installed at distances up to 100 meters from the Automation PC.

### Display sizes from 12.1" to 19"

Existing visualization applications can be displayed using the latest screen technology on Automation Panels in 4:3 format without having to modify the software a single bit. 12.1" and 15" panels with XGA resolution are available for control cabinet installations in addition to a 19" panel with SXGA resolution that rounds off the product line.

These systems not only feature brilliant graphics, but also an extremely slim design; the 12.1" variant can even be used as a replacement for the 10.4" panel if a higher resolution is desired. To top it off, the LED backlight features a wide adjustment range that allows the displays to be dimmed for user comfort in environments with lower light levels. ←

# Smoother operation for absolute precision



B&R now offers premium helical gearboxes with either a shaft output (8GP70) or drive flange (8GF70).

## B&R introduces premium IP65-rated helical gearboxes



B&R is adding two new helical members to its premium family of gearboxes: the 8GP70 series with a shaft output and the 8GF70 series with a drive flange. These new products offer excellent synchronization characteristics and a very low noise level at high speeds.

As with all B&R premium gearboxes, minimal backlash is a defining characteristic – with an option available for reducing it even further (<1 arcminute). The ability of this premium series of gearboxes to handle high axial and radial forces, their high power density and their IP65 rating mean that they can be used in an extremely wide range of applications.

Whenever an application places especially high demands on smooth operation, synchronicity and low excitation frequencies, these helical gearboxes are right at home. Woodworking machines, for example, can produce much smoother surfaces with less chatter, while printing machines can render a more consistent printed image. Since there is less heat build-up, high-speed machines can run even faster.

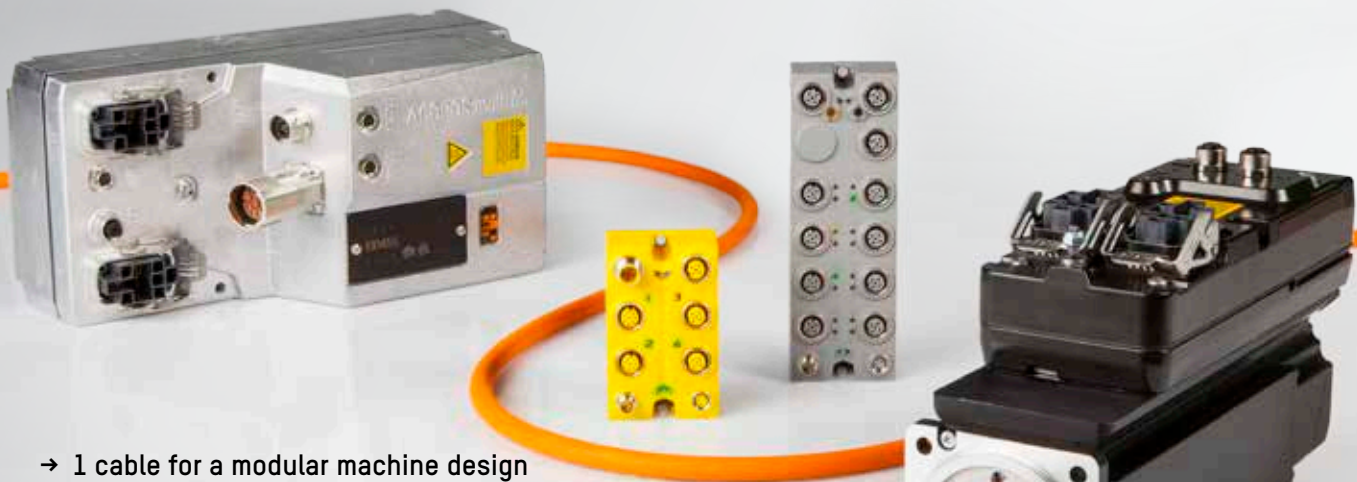
### Scalable and perfectly coordinated

By offering these new gearboxes with either a standard shaft or flange output, B&R not only provides the perfect gearbox to match any application, but also remains faithful to its successful Scalability+ concept. Thanks to compatible designs and connector dimensions, machinery can easily be adapted to changing requirements without having to make changes to the basic machine design. Both of these new gearboxes are available in 5 different sizes with gear ratios ranging from  $i=3$  to  $i=100$ . ←



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